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A qualitative assessment of tablet injectable opioid agonist therapy (TiOAT) in rural and smaller urban British Columbia, Canada: Motivations and initial impacts

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ABSTRACT

Background: The evolving and unpredictable unregulated drug market has driven an unprecedented overdose crisis that requires effective intervention. Growing evidence suggests that novel opioid agonist treatments, such as tablet injectable opioid agonist therapy (TiOAT), have potential to prevent overdoses and other drug-related harms. More evidence is needed to characterize their utility in achieving these outcomes. The current article is an analysis of two TiOAT programs implemented in British Columbia, Canada, to assess impact on health and well-being, including overdose risk. Moreover, we explored participants' enrollment goals and if they were achieved.
Methods: The study employed qualitative methods to evaluate the TiOAT program in two sites between October 2021 and April 2022. We developed a semi-structured interview tool to guide in depth interviews. All interviews ($n = 32$) took place on teleconference software or in person. Thematic analysis allowed for the emergence of themes associated with TiOAT participation.
Results: Participants discussed various motivations for enrolling in TiOAT, which included gaining financial stability, reducing or eliminating drug use, addressing withdrawal symptoms, wanting to work, and improving social circumstances. An assessment of initial programmatic impacts revealed that many participant-identified motivators were achieved. Participants also reported fewer or no overdoses since starting TiOAT, and many reported switching from injecting to smoking drugs. Some challenges included adequate dosing as evidenced by ongoing withdrawal and pain. Some participants requested additional opioids, such as diacetylmorphine, to aid in reducing illicit drug use.
Conclusion: Participants described how TiOAT helped them to achieve many of their goals. Suggested programmatic improvements include enhanced patient-provider co-design with respect to dosing to address ongoing withdrawal and pain. As the unpredictability the unregulated drug market worsens, novel options, such as TiOAT, ought to be implemented broadly to reduce overdose events and improve quality of life for people who use drugs.

1. Introduction

Throughout North America, the fatal overdose crisis is worsening and novel opioid agonist therapies (OATs), such as tablet injectable opioid agonist therapy (TiOAT) are being trialed in Canada to curtail overdose deaths (Weng et al., 2022). In 2021, 7560 lives were lost to overdose in Canada; constituting 20 deaths per day, which has more than doubled since 2019 (Government of Canada, 2022). Following the Yukon, the province of British Columbia has the second highest rate of opioid overdose fatalities [43.9 deaths per 100,000 people] in Canada, indicating a considerable disparity in overdose mortality compared to the national rate [20.7 deaths per 100,000 people] (Government of Canada, 2022). Rural communities in British Columbia are disproportionately affected by overdose mortality, yet the majority of research on

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overdose interventions, including OAT, exists in large urban settings (Bardwell & Lappalainen, 2021). Although this crisis is fueled by various factors (Bardwell, Austin, et al., 2021; Beletsky et al., 2018; Beletsky & Davis, 2017; Collins et al., 2020; MacKinnon et al., 2020; Muncan et al., 2020; Paquette et al., 2018; Strathdee et al., 2010; Tsai et al., 2019; Tyndall & Dodd, 2020) the increasingly unpredictable unregulated drug supply consisting of unknown drug composition, quality, and potency prior to consumption is of utmost concern (Beletsky & Davis, 2017; Ciccarone, 2017; Maghsoudi et al., 2022). Across North America, potent opioids such as fentanyl and nitazene analogues, and other central nervous system depressants such as benzodiazepines and xylazine, are regularly identified in the unregulated drug supply (Bowles et al., 2021; Centre on Drug Policy Evaluation, 2020; Karamouzian et al., 2018; Laing et al., 2021; Maghsoudi et al., 2022; Tobias et al., 2020, 2022). These drugs are potent in isolation. When prepared in combination, they interact and increase the likelihood of overdose risk (World Health Organization, 2020). Despite the longstanding assertion that the overdose crisis was driven by prescription opioids, emerging evidence suggests this correlation was overstated, and that under prescribing opioid pain medication might have compelled people to treat their pain and other health issues with illicitly-acquired opioids (Peppin & Coleman, 2021). To that end, the fatal overdose crisis is largely attributed to heroin having been supplanted with fentanyl and additional substances (Aubry & Carr, 2022; Crabtree et al., 2020). This evidence has implications for access to opioids beyond methadone and buprenorphine as novel alternatives to the dynamically dangerous drug supply.

Oral OATs like methadone and buprenorphine (National Institute on Drug Abuse, 2018) have been available for decades and are considered first-line treatments for reducing overdose risk, however, overdose fatalities have persisted (Health Canada, 2021). As such, across Canada, novel options for OAT dispensation, medications, and settings are being piloted. One such novel OAT approach is injectable opioid agonist treatment (iOAT), which has demonstrated success for individuals who have not benefitted from first-line OATs (Fairbairn et al., 2019). In iOAT, recipients attend a daily clinic whereby they receive prescribed doses of liquid hydromorphone or diacetylmorphine (i.e., heroin) in a prefilled syringe, which is required to be consumed onsite under medical supervision. TiOAT was born from iOAT; the key differences being that tablets are dispensed, consumed via the recipient's consumption preference (e.g., swallowed, crushed and injected), and is a less resource intensive model than iOAT (Weng et al., 2022).

Like iOAT, the TiOAT programs in the current study's settings operate via daily clinic visits and tablets are ingested under medical observation as a means of prompt response in the event of an overdose and to prevent medication diversion (i.e., selling, giving away, or trading TiOAT medications) (Bardwell et al., 2023; Weng et al., 2022). The predominant medication prescribed to TiOAT recipients is hydromorphone, a pharmaceutical opioid determined by a sample of people who use opioids to be indistinguishable in blinded tests from heroin (Weng et al., 2022; Oviedo-Joekes et al., 2016). In TiOAT, additional medications are often prescribed in tandem such as a long-acting opioid like methadone or slow-release oral morphine (Weng et al., 2022). The goals of TiOAT are to reduce overdose risk, prevent injection-related infections, and improve participants' health and well-being (Health Canada, 2022).

Despite first-line OAT availability in some rural and remote areas of North America (Bardwell et al., 2023; Davidson et al., 2021), retention in British Columbia is low (Piske et al., 2020; Socías et al., 2018). Primary barriers to OAT effectiveness include stigmatizing dispensation settings, few medication options, untreated chronic pain and uncontrolled withdrawal, all of which result in underutilization and high attrition rates, thereby limiting effectiveness (Bao et al., 2009; Bourgois, 2000; Simoens, 2005; Yarborough et al., 2016; Zweben et al., 2021). Overdose prevention is the primary public health goal of a novel OAT program such as TiOAT, however, people who utilize these programs sometimes have goals that differ from public health goals, and understanding and tailoring programs to meet these goals can assist in optimizing OAT programs. Revealing participant goals, if they were achieved, and challenges to their success is critical for tailoring novel OAT in a manner that honors the well-being, health, and safety of people who use drugs according to their desired outcomes. To that end, the current qualitative study explores if TiOAT has reduced negative health outcomes (including overdose risk) among TiOAT recipients in two rural and smaller urban areas of British Columbia. We also explore recipient's enrollment motivators (i.e., goals), if TiOAT met those goals, and challenges in achieving them.

2. Methods

The current qualitative study is derived from data collected between October 2021 and April 2022 from a sample of people ($n = 32$) who were enrolled in TiOAT for at least one month prior to interview, were at minimum 19 years old, and lived in one of the two study settings. The study collected data from two municipalities in British Columbia where TiOAT was implemented in February 2020 and September 2021: Kamloops (rural/small urban; population 97,902) (Townfolio, 2022b) and Duncan (rural; population 4944) (Townfolio, 2022a), respectively. The Kamloops TiOAT program is hosted by a community-based organization. Kamloops participants can choose the host organization or a local pharmacy as their daily TiOAT medication dispensation site. The Duncan program is also based out of a community-based organization and is the sole TiOAT medication dispensation site in this setting. In Kamloops, the TiOAT program required witnessed consumption for each dispensation of hydromorphone and additional long-acting opioids, whereas Duncan's program required witnessed consumption of each dispensed dose with the exception of evening doses, which participants were given to consume unobserved (Bardwell et al., 2023).

The current study used qualitative methods to gather rich narrative data(Creswell et al., 2007)·(Elo et al., 2014) about TiOAT impacts. The research team developed a semi-structured interview guide, which was reviewed by a Community Advisory Board and TiOAT staff, and the guide was adapted according to feedback. This ensured the guide captured community needs and reflected community voice (Yuan et al., 2020). The guide aimed to provide participants the freedom to offer reflections and insight about motivations for enrollment, personal and unique programmatic impacts and experiences, and any challenges faced. Trained qualitative interviewers facilitated interviews, initially over Zoom (Zoom, n.d.) as data were collected during the SARS-CoV-2 (i.e., COVID-19) pandemic (World Health Organization, n.d.) However, internet-sited interviews were challenging for the Kamloops community and an interviewer subsequently commuted there to assist with recruitment efforts and conduct face-to-face interviews. All research materials, including amendments to the protocol, were reviewed and approved by the University of British Columbia/Providence Health Care Research Ethics Boards and Island Health Research Ethics Board prior to data collection. Former TiOAT participants were eligible for study participation so researchers could capture reasons for discontinuation. Following screening for eligibility and initial interest in participating, the interviewer reviewed the informed consent document with participants prior to commencing and digitally recording interviews. To uncover enrollment motivations, associated goals, and TiOAT impacts, interview questions included, “can you tell me why you enrolled in the TiOAT program(?)” and “can you tell me what your experience with TiOAT has been like so far(?).” The study gave participants $30 cash for their time.

Following data collection, we stored audio files securely on our institution's encrypted server and then sent them to a professional transcriptionist for transcription, which included removing any names mentioned or other potentially identifying information, but were otherwise verbatim. The transcriptionist also transliterated laughter, thought pauses, and other noteworthy emotions. We then uploaded data, i.e., transcripts, into qualitative software NVivo (QSR International

Pty Ltd., 2020) reviewed for accuracy, and organized with a priori codes. Analysis was furthered via thematic analysis (Braun & Clarke, 2012) to familiarize the research team with the data and search for emergent themes. The team then conferred and interrogated the analysis of emergent themes to assess credibility (Elo et al., 2014). A combination of deductive and inductive reasoning allowed our research team to explore expected impacts associated with TiOAT enrollment (e.g., *deductive*: overdose risk) and unknown impacts (e.g., *inductive*: achievement of participant-identified goals) (Nicholls, 2009).

3. Results

Demographic information about the participants ($n = 32$) from Kamloops and Duncan (Table 1) indicate that groups were close in age (mean 43.56 and 41.29, respectively) and reported their drug of choice as fentanyl. Samples from both sites were proportionally over-represented by persons who identified as Indigenous (Bardwell, 2021), which is critical as persons who are Indigenous are significantly more likely to succumb to an overdose death (First Nations Health Authority, 2023). According to participants, the average time on TiOAT was 11.8-months for Kamloops participants (*range*: one-month to two-years) and 3.5-months for Duncan participants (*range*: three to four-months). Five participants were no longer enrolled in TiOAT at the time of interview. To protect participants' identities, we do not disclose demographic characteristics after each quote. Please see Tables 1 for sample characteristics.

3.1. Enrollment motivators & participant-identified goals

Participants discussed the motivations and channels that spurred their interest and subsequent uptake of TiOAT. Among participants in the current study, most were introdused to TiOAT by a medical professional, e.g., "*it was actually one of the nurses here who introduced us to the program and asked if we would be interested in doing it*" (Duncan, Interview 1). For some, an offer for TiOAT participation was influenced by first-line OAT not fully addressing their withdrawal:

> *It happened because we were on methadone, me and my girlfriend, at the time and every time we'd relapse. The withdrawal was getting worse and worse and we going up and up on our methadone. But it hit the point with the doctor where it's like he doesn't want to keep bumping you up on methadone so you're on a really high dose of methadone, you know? He's like why don't you guys try the TiOAT program. It's Dilaudid, it's like a pill that you get and I don't know if there's different levels they give to different people or what it, I don't know everything about the program but I was offered 2 pills, 8 milligrams, 2 Dilaudid pills and I could come up to 5 times a day and either inject it, [or take it] orally like put in our apple sauce* (Kamloops, Interview 1).

Another participant had similarly been on methadone but was unable to stop using illicit drugs and was tired of the struggles of daily drug procurement:

> *We came out here and I just didn't want to work the street and I just got, just kind of got to the end of my rope and I was trying to come off, get clean on my own, like going cold turkey and I couldn't do it, it was too hard. So, when I went, when I came here one of the nurses gave me a form on the TiOAT program and that sounded more useful to me - like I didn't like suboxone and I didn't stay on the methadone, I was still using when I was on the methadone. It [TiOAT] seemed to sound like a better option for me* (Kamloops, Interview 5).

Preexisting relationships with prescribers might provide an established sense of trust needed for participants to opt into a pilot program.

While a clinician offering TiOAT participation was important for some in their uptake, others heard about the TiOAT program and other novel OAT interventions through peers. As such, prior to TiOAT intake, some participants' explained how their uptake decision was rooted in

Table 1
Demographics qualitative sample Kamloops (n = 25). Duncan (n = 7).

Age	Mean: 43.56	Mean: 41.29
Gender		
Woman	10	1
Man	15	6
Race/Ethnicity (all that apply)		
Indigenous	10	4
White	20	3
Black	1	0
Middle Eastern	1	0
Unknown	3	0
Sexual orientation		
Straight	23	6
Gay	0	0
Lesbian	0	0
Bisexual	2	0
Two-spirited	0	0
Other	0	1
Housing status		
Supportive housing	10	0
Private housing	0	0
Apartment	3	2
Shelter	8	2
Other	4	2
Past 30-day drug use		
Cocaine (powder)	5	0
Crack cocaine (rock)	9	1
Crystal methamphetamine	22	7
Heroin (down)	5	5
Fentanyl (down)	25	7
Opioids (diverted pharmaceuticals)	5	1
Benzodiazepines	9	1
Alcohol	7	0
Cannabis	12	1
Other	5	4
Preferred drug		
Cocaine (powder)	0	0
Crack cocaine (rock)	0	0
Crystal methamphetamine	4	3
Heroin (down)	2	3
Fentanyl (down)	17	4
Pharmaceutical opioids	0	0
Benzodiazepines	0	0
Alcohol	2	0
Cannabis	1	0
Other	1	2
Past 30 days modes of drug consumption (all that apply)		
Inject	9	4
Smoke/Inhale	23	7
Snort	3	1
Ingest/Swallow	6	2
Opioid agonist treatments		
Methadone/dose	15	3
Suboxone	3	0
Kadian/M-ESLON	2	3
Dilaudid	20	7
Fentanyl (transdermal patch)	0	0
Other	0	1
Past 30 days income (all that apply)		
Full-time employment	0	1
Part-time employment	3	1
Sold drugs	6	0
Sex work	1	0
Recycling/binning	8	2

(*continued on next page*)

Table 1 (*continued*)

Age	Mean: 43.56	Mean: 41.29
Panhandling	5	0
Reselling goods	2	0
Social assistance	24	2
Other	4	3

their awareness of iOAT:

> *Well, I just had a sneaking suspicion that the TiOAT program might lead to something like the NAOMI [i.e., North American Opiate Medication Initiative] project over in Vancouver … I wasn't sure about that or anything but I just, it just seemed that, you know, it's a safer supply and all that, you know? And neat stuff. And I just thought well, I might as well give it a shot and if things work out, if it by some miracle we do end up with (a safer supply/TiOAT program), that I'll be on the list at least, right?* (Duncan, Interview 6)

Another participant had a similar experience and subsequently enrolled "*because my wife was on the NAOMI program and it seemed to work and I thought that the TiOAT program would be a lot like that*" (Kamloops, Interview 3). Awareness and knowledge of iOAT programs – such as the NAOMI project (Oviedo-Joekes et al., 2009)– in rural and smaller urban centers are noteworthy as this demonstrates dissemination of such interventions that were previously only available in large urban centers. These examples moreover highlight that in rural and smaller urban areas, concern of novel OAT scarcity might have been a motivating force in enrollment.

Social/emotional harms experienced by participants also motivated some to enroll in TiOAT. When asked why they decided to join TiOAT, one participant detailed:

> *Daily drug use, loneliness, lack of any support, and – and kind of energy, lack of energy. And for me, a lot of the time, to get up and out and to find a way to get more substances to keep going, to keep on this roundabout kind of circle, this process of going out to get dope, doing the dope, the dope is finished now, and it takes some time to put some space in between me going to get more money for more dope, right? It's like – it's like how you have to get through it every day and drink water every day and stuff. It's like that. It's kind of it provides you with a certain amount of energy, but then you also get the downfall of losing all that energy because you're sick, and I'd really like to be able to not be (?) depending on opioids for my energy, or my well-being and learn how to cope with different means, and instead of drugs itself, right? Because there's more – more ways too – but if you do have enough drugs (via TiOAT), maybe you can be stabilized.* (Kamloops, Interview 25)

Related, one participant noted that they hadn't considered personal goals but when prompted said they had a goal of self-discovery: "*No specific goals, it's something I'm also trying to self-learn as well.*" They furthered*: "I've never had the experience of wanting a goal or anything, … [I'm] at this point I'm trying to figure out things out for myself and make decisions for my own for what I would like in my life"* (Duncan, Interview 5). Whether TiOAT participation was offered or sought, participants discussed a variety of goals they hoped to achieve via TiOAT participation. Stability and reduced illicit drug use were core goals many participants hoped to achieve from TiOAT participation, as less reliance on the unregulated drug market would lessen the turmoil of regularly seeking drugs. Less dependence on the unregulated drug supply was perceived as a means to achieve other goals regarding financial circumstances, chronic pain, social life improvements, and overdose risk.

Some participants' goals included discontinuing drug use entirely: "*I'm trying to get rid of drugs completely*" (Duncan, Interview 2) and "*I see it as a stepping stone to getting clean*" (Kamloops, Interview 5); whereas others had the goal of drug use reduction, "*I wanted to cut back on my usage*" (Kamloops, Interview 4) and *"(I want to) use less*" (Duncan, Interview 3). For some participants, discontinuing drug use was tied to parenting, "*I want to get better for them (kids), like that's part of the reason I joined the TiOAT program*" (Kamloops, Interview 1) and "*I want to make her (participant's daughter) proud*" (Duncan, Interview *7*). Participants also mentioned restoring custody of children, "*It's a steppingstone to getting my kids back*" (Duncan, Interview 1).

Some mentioned employment and economic-oriented goals, including obtaining a steady, fulfilling job, "*I do want to pursue counseling, you know, drug and alcohol counseling. I want to help kids*" (Duncan, Interview 7) and improving employment performance, "*Like it'd be nice to be able to go and do a whole work day and then just maybe use once or twice a day instead of every single hour"* (Duncan, Interview 3*)*.

Finally, although socially-oriented goals appeared to be paramount, overdose prevention was mentioned by some participants. One participant stated their goal in joining TiOAT was because:

> *I overdosed three times myself and my girlfriend OD'd once with me and I've saved I think about ten people since last Christmas. I brought them back from overdosing. Yeah, it's my main concern. That's why I've joined the TiOAT, is the dirty drugs on the street, like you don't know what you're getting* (Kamloops, Interview 9).

Meanwhile, other participants were motivated by witnessed overdoses, e.g., "(*I was) working on a 15-year-old kid who didn't make it from overdosing and trying to Narcan him and bring him back*" (Duncan, Interview 2). When asked if this experience prompted TiOAT uptake, they responded:

> Yeah, it did. Somebody just happened to be talking about it (TiOAT) and I was like huh? What's that? He told me what it's like for Vancouver and what it's like for Victoria, and I was like we should join and we happened to look it up, because there wasn't very much participants at the time.

3.2. Impacts

3.2.1. Overdose risk and drug use impacts

Reducing overdose risk is a foundational goal of the TiOAT program. The following section showcases participants' perception of overdose risk and overdose events since starting a TiOAT regimen. Although participants reported overdose histories, recent overdoses were not indicated: "*I haven't had any overdoses for a long time and I've been pretty responsible in regards to, you know, making sure that I get my opioid agonist therapy or whatever*" (Duncan, Interview 7) and "(*I have) not (overdosed) since joining TiOAT*" (Duncan, Interview 2). Another participant furthered that TiOAT not only kept overdoses at bay, but also emphasized the reduced need to "*hustle*" (i.e., various acts to obtain money), which were acts described as highly unfavorable:

> *Well, you know what you're using (with TiOAT). I mean you don't you don't have to keep on overdosing all the time … (and) you don't have to, uh, do things you don't necessarily want to have to do, you know. I could tell you horror stories some I've done over the years (*Duncan, Interview 2*).*

Tethering overdose risk reduction and hustle reduction importantly highlights the intersection of two positive impacts produced by less reliance on the unregulated drug supply on account of TiOAT.

While some participants didn't overtly mention reduced overdose risk on account of TiOAT, they did acknowledge other impacts that improved the quality of their lives, some of which could directly and indirectly reduce overdose risk. For example, reduced hustling and achieving financial stability were impacts that led some participants to continue their TiOAT regimen, especially as these impacts were tied to their enrollment goals. Reduced drug use was a stated goal of many participants and is supported as an outcome by statements like:

I've slowed down on it (drug use) and I've, uh, just learned how to stretch it out during the day … And while I'm using so I'm not smoking it all at once I'm capable of just taking a puff and just putting it down for a while … Compared to before I signed up for the program it was constantly smoking it until the next one so yeah … That's what I've noticed with the substance use, I was capable of being able to know when to put the stuff down and do what I need to do during the day without, um, dwelling on it I guess … Uh, just, um, just normal things you need to do around the house to maintain, right (Duncan, Interview 5).

Overall, participants reported less illicit drug use stating that TiOAT medications successfully managed withdrawal symptoms, e.g., "*I'm not dope sick any more*" (Duncan, Interview 1) and curbed cravings "*[I was] just telling the nurse today recently that last night I didn't crave [drugs] at all*" (Duncan, Interview 2). We received reports of reduced illicit drug use such as, "*Sometimes I'll use street drugs once a month or once a week. Whereas before it's eight times a day*" (Kamloops, Interview 2) and, "*Surprisingly, you'd think that it would make me be doing drugs more, but it's actually the opposite*" (Kamloops, Interview 8); whereas others reported discontinuing illicit drug use entirely, "*I haven't used (illicit) drugs, I've been using the TiOAT program*" (Duncan, Interview 7).

Unexpectedly, many participants transitioned to less risky forms of drug consumption such as ending drug injecting, "*I haven't been shooting up. Like that's, that's a big one for me because I used to do like I know 10 to 15 shots a day and now I just smoke so that's a pretty big change for sure*" (Duncan, Interview 4). The same participants noted that TiOAT not only led to changes in their drug use, but developed contemplation on ending drug use altogether:

Um, aside from not injecting anymore, um, I don't know, I've been thinking a lot more perhaps about, um, getting off dope altogether, um, since I've started the program. I don't know if they're related or if I'm just, you know, at that point where I'm thinking about stopping. Um, I don't know if one ties into the other or not. But perhaps it started around the same time as I started the program I also started thinking about getting off dope so [Yeah] maybe they are.

Maintaining TiOAT and achieving associated goals was influenced by positive relationships with staff at organizations hosting TiOAT programs. According to one participant:

I use less because of the program. Like I know I do. It's because I can come here and like you know talk to people. It's helped me like with that part of it. Like before I kind of felt alone a lot of times so I was using a lot more when I wasn't on this program because I didn't have like that community. So, this program definitely has cut down my usage (Kamloops, Interview 1).

According to this participant, the dejection and loneliness noted as a motivating force for joining TiOAT was addressed by program staff, which speaks to the positive effects of staff developing social bonds (which we describe elsewhere; Bardwell et al., 2023). Most participants discussed less participation in illegal activities to get drugs and subsequently less police interaction and risk of incarceration:

*I haven't had any encounters with police since I've been on it [TiOAT] - I just like that it keeps from going back to jail kind of thing. That's one thing that I, that I noticed right away. It keeps me from doing crime as much (*Kamloops, Interview 5*)*.

Participants also noted safety concerns related to lateral violence that were addressed by TiOAT. One participant said that TiOAT offered "*a safe setting*" and "*takes a lot of the risk out*" with respect to getting "*robbed or shot or stabbed*" (Duncan, Interview 7). Ultimately, participants viewed TiOAT as facilitating opportunities in their lives that couldn't be achieved when strictly using drugs from the unregulated market or methadone alone:

That choice of having the TiOAT program available to me, was enough for me to get myself together and stay, if I say I want to do my own thing rather than doing something silly for someone, you know, like, or do something that I don't want to do that impacts my life that I wouldn't want to happen (Kamloops, Interview 20).

Well, it gives it, it gives you options so that … you're not out … they're seeking, seeking drugs to get high so then I'm actually doing more, I'm doing other things, more positive things for myself to get better because I'm not out, like because I'm not out there seeking it (Kamloops, Interview 5).

3.2.2. Financial & employment impacts

Reduced reliance on drugs from unregulated markets appears to have assisted stability, an important goal, which might have been facilitated by greater financial stability resulting from engagement with the TiOAT program. For some participants, the first stated benefit of TiOAT was that the program didn't cost them any money, and reduced illicit drug expenditures, "*I probably spent about $100 a week, $1000 a week… (and now) "not even $100*" (Kamloops, Interview 9). This was common as participants stated they spent less money on illicit drugs following TiOAT induction, "*I've noticed I've used less … (used to use) $400 between two, every two, three days … versus $20, $40 every two days*." (Duncan, Interview 2), which the same participant noted opened avenues to spending money on other basic needs "[*We] spend more money on food versus drugs*," which might also have a positive impact on health. When asked about TiOAT impacts on finances, most participants stated that they'd cut down their spending on illicit drugs. Other economic improvements were brought up when asked about TiOAT impacts:

Now with the TiOAT I'm able, like I'm able to help look for a place, I'm able to talk to landlords, I'm able to do job, like I've gone to a few job interviews as well. And that's something that I couldn't have done like six months ago, I wouldn't have been able to do that (Kamloops, Interview 5).

While this participant had not secured work at the time of interview, the ability to participate in such opportunities was uplifting for this participant. A few participants noted having work opportunities in harm reduction, "*I'm working, working here at OPS [overdose prevention site]*" (Duncan, Interview 7) and "*I was doing outreach work on the side. But, uh, it got cut down*" (Kamloops, Interview 2).

Participants with the goal of obtaining a job encountered difficulties doing so. For example, multiple daily trips to the clinic or pharmacy were a hindrance that limited employment options because few workplaces permited frequently leaving work for medication pickup. Not working impacted one participant's self-image, "*I don't feel like a member of society that's contributing and helping pay taxes and stuff. I don't feel like I'm really helping the system that much doing this*" (Kamloops, Interview 1). Also, some noted pain as an ongoing issue that impeded employment opportunities. When asked about job status, a participant from Kamloops said, "*No. My pain is really bad lately*" (Interview 6) and another furthered, "*No, I'm not working right now, I'm trying to figure out what I want to do for a job because I also go through body pains from my previous work at a young age*" (Duncan, Interview 5). Chronic physical pain was tied to TiOAT as seventeen participants mentioned it as a reason for their opioid use, and they hoped that TiOAT and OAT medications would function to manage their pain.

3.2.3. Social & health improvements

While financial impacts were not overwhelming for all participants, when asked about TiOAT, some participants brought up improved familial and financial circumstances in tandem;

Um, I guess yeah it's kind of, um, bringing myself a bit closer to my family and, uh, I guess for the finances it's kind of getting way better I suppose, not as rough as it was trying to spend the money on the drugs (Duncan, Interview 5).

Others commented on feeling cared for by the TiOAT community, "*I've got more people who you know, [are] worried or concerned with my, well my health, you know? Which is kind of nice*" (Duncan, Interview 6) and "*A lot more people in the community willing to interact with me, in a positive way*" (Duncan, Interview 2). Others felt that the air of support was ubiquitous among TiOAT participants;

> *Everybody that I know that's on it seems like they're a lot happier, you know? Compared to before when there was no program there is a lot of miserable people around and now there's a lot more people that are in a better spirit you know. And it's noticeable* (Duncan, Interview 3).

The general tenor of improved social well-being associated with TiOAT extended to improved emotional and health status, "*I definitely feel more healthy and people tell me that I'm looking healthy and like, uh, just in another headspace I guess" (*Duncan, Interview 3).

Chronic pain was an issue some participants noted as a reason for their drug use, which was adequately managed by TiOAT medicines and reduced illicit drug use. The theme of TiOAT being useful for pain continued, "*Yeah, it does kill the pain, that's for sure; it does work for pain pretty good*" (Kamloops, Interview 3), and that supplemental opioids with a longer duration of effect, like methadone, were helpful for withdrawal pain during the time span between TiOAT organization operating hours, "*I just took my methadone though and that will start helping in a little while*" (Kamloops, Interview, 3). Additionally, participants in each setting noted serious infections in their medical histories that they attributed to drug use and homelessness, and that since joining TiOAT and achieving associated stability, "*I haven't had it (infection flare-up) from running around in the cold and in the snow and wet feet, and, yeah, so I've been pretty g*ood" (Kamloops, Interview 10).

While some participants didn't discuss health impacts directly related to TiOAT participation, others noted direct and indirect impacts on their well-being after starting TiOAT, particularly changes in health behavior since starting TiOAT, "*I'm actually more active and that than what I used to be*" (Kamloops, Interview 4), "*I'm able to sleep more*" (Kamloops, Interview 5) and "*I've also been able to start eating more. And, actually want to eat. Getting more sleep*" (Duncan, Interview 1). The latter participant noted that: "*the only negative would be the constipation*," which is a common and treatable side effect of opioid use. However, not all participants ascribed their health improvements to TiOAT, when prompted about health one participant stated "*Yeah, I'm not homeless (anymore), so I can sleep and not worry about anything bad happening*" (Kamloops, Interview 15), suggesting the benefit of adjacent TiOAT services.

Unsurprisingly, participants described issues of stigma within the healthcare system. For example, "*They (medical professionals) just put their nose up in the air at me and didn't want to help. Now that I've got a house, I don't look at them because I don't need their help anymore*" (Kamloops, Interview 19). However, medical staff from the TiOAT program were able to address others' health issues:

> *I feel like I'm more involved with the (TiOAT) nurses which, which makes it so that you know when I have questions, I would feel more free to ask. Like you know something's wrong or you know like I feel more free to ask about my health whereas before I didn't have anyone to ask because I went in and seen someone for five minutes a week to get my suboxone prescription and they really didn't give a shit about, they didn't really ask anything like how I'm feeling or what you know, you know other than do I need my suboxone, they didn't really care about anything else* (Kamloops, Interview 5).

When asked about the health impact of TiOAT, many participants noting feeling healthier on account of accomplishing goals and new routines:

> *I feel more healthy, yeah. Since I've like been up and about and my routine is like get up and I clean like the, the shelter that I stay in. I clean for like an hour and then I just start walking and I come to the pharmacy and then sometimes I don't do much. I just go to the library or walk around town kind of shit. But just doing that is good for my routine. I feel more healthy because of it. There's no crime or anything in my life so it's good.* (Kamloops, Interview 8)

Finally, some felt they were treated better by society because "*it (TiOAT) changes the way people perceive you*," and as a result felt more inclined to respond to society "*with kindness, embracing everything with an open heart*" (Duncan, Interview 6).

3.3. Impact challenges

While the TiOAT regimen was successful for many in reducing overdose risk, illicit drug use, and hustling, and many felt their health had improved; some participants felt their TiOAT medication dose was too low resulting in continued use of illicit drugs. Participants felt that stronger doses of hydromorphone would not place them at higher risk of overdose. To demonstrate, when asked about overdose risk, one participant said: *"I'm hoping that the people running it [TiOAT] will figure out that we need more [hydromorphone] … the way it is now, that's impossible [to overdose on pharmaceutical grade drugs]* (Kamloops, Interview, 3)" Dosing challenges also resulted in continued illicit drug use because of the inability to obtain pleasure from hydromorphone – an aspect of the drug use experience that was valued by several participants. These limitations made substituting illicit opioids with hydromorphone a challenge. One participant summed up, "*I'm not dope sick anymore but I'm not achieving [euphoria]"* (Duncan, Interview 1). TiOAT dosage, medications, and pain were linked for a few participants:

> *The only barrier is the amount [TiOAT dose]. It works for the pain and it lasts a little longer than the fentanyl. I wish I could tell the person running the program that if I had enough to stabilize me, I would (be) off the fentanyl (*Kamloops, Interview 3*).*

Conversely, other participants felt that hydromorphone didn't control their withdrawal or pain as well as fentanyl or other opioids might. Another reason participants felt stuck using the street supply of fentanyl is because of benzodiazepine adulteration in the illicit fentanyl supply, which put TiOAT medications at a disadvantage since benzodiazepines are not part of a TiOAT regimen, and some subsequently felt the need to continue illicitly-manufactured fentanyl use to assuage benzodiazepine withdrawal: "*I noticed if the dope is filled with benzo the withdrawal it is probably 10 times worse than the other dope"* (Duncan, Interview 3). Meanwhile, others wished for different medications such as pharmaceutical-grade fentanyl or diacetylmorphine instead of hydromorphone, as evidenced by statements like, "*I wish I was on the NAOMI program where it was real heroin*" (Kamloops, Interview 24). Some participants had discontinued their participation on account of TiOAT medicines not being helpful, "*I just didn't feel anything from it. I just didn't feel like it was working.*" (Kamloops, Interview 25). The same participant finds their life *"always seems to lead back to the fentanyl*" but that "*it's too dangerous and it only lasts like maybe an hour. It has no length at all… but it is effective for that hour, it is very effective for that hour*."

4. Discussion

Our findings revealed that the goal of reducing overdose risk via the TiOAT program was successful. Moreover, many study participants' unique TiOAT enrollment goals were attained, suggesting that TiOAT shows promise in improving the health, social well-being, and economic circumstances for some people who use opioids. Many of these goals stemmed from harms participants were undergoing, which included loss of child custody, inability to obtain housing, lateral violence, general unhappiness with life, and frustration with the "hustle" needed to procure drugs on a daily basis, are all which are events that increase overdose risk (Boyd et al., 2022; Fine et al., 2022; Ivsins et al., 2022; Thumath et al., 2021) Success in addressing these harms might have been a motivating force in TiOAT retention. TiOAT uptake was

facilitated by it being mentioned by a peer or an already trusted medical professional, which suggests that TiOAT prescribers are successfully implementing destigmatizing services, which is of critical value as stigma is a phenomenon regularly faced by people who use drugs and is known to undermine service uptake (Bardwell et al., 2023; Muncan et al., 2020)'(Paquette et al., 2018) including in rural and smaller urban settings (Bardwell et al., 2022; Landry et al., 2016; Pijl et al., 2022).

As Canada continues to take steps to address the fatal overdose and contaminated illicit drug crises, decisive action is sorely needed. In our study, TiOAT medications in tandem with first-line OAT medication methadone, appeared to facilitate success in reducing overdose events and achieving other participant-identified goals. These findings are critical as methadone retention in British Columbia is presently only 16 % after one year; and buprenorphine demonstrating no significantly different clinical outcome than methadone alone (Klimas et al., 2021; Piske et al., 2020). Methadone is a full opioid agonist that has been prescribed as OAT for over 50 years, with the initial societal response being one of concern that methadone was "substituting one addiction for another" (p. 2304) (Kleber, 2008). Over time, though, evidence revealed that methadone was effective in reducing disease transmission, overdoses, drug-associated crime, addressing pain, repairing relationships, and patients were more likely to find and hold jobs compared to people using drugs from the unregulated market (Gerra et al., 2003; Marsch, 1998; Teoh Bing Fei et al., 2016). However, given substantial changes to the illicit drug market over the past decade, methadone alone might no longer be sufficient in managing withdrawal, and clinical experience indicates that the physiological tolerance developed by fentanyl requires a stronger OAT regimen than the physiological tolerance developed by heroin (British Columbia Centre on Substance Use, 2022). To that end, prescribing novel OATs like hydromorphone in tandem with methadone or another slow-release oral morphine might have been what contributed to TiOAT's success for some people in the current study, although further research is needed to confirm these findings.

Three participants spontaneously mentioned the North American Opiate Medication Initiative (NAOMI) (Oviedo-Joekes et al., 2009) as a reason for enrolling or wishing TiOAT offered the same medication options. The NAOMI study found that prescribing liquid-suspension diacetylmorphine and hydromorphone, i.e., iOAT, was associated with high retention rates, reduced use of illicit drugs, and less participation in crime than those on methadone alone (Oviedo-Joekes et al., 2009). As the unregulated drug market has become saturated with fentanyl, benzodiazepines, and other contaminants (Maghsoudi et al., 2022); ensuring a range of medications to address these contaminants is central to reducing the harms associated with their illicit use. In particular benzodiazepines, due to the danger of their withdrawal symptoms, could improve withdrawal management. Supportive monitoring when incorporating a benzodiazepine to a TiOAT regimen is warranted as the interaction between opioids and benzodiazepines is a known risk factor of overdose (Afzal & Kiyatkin, 2019). Finally, some participants unexpectedly switched from injecting drugs to smoking them, however it's connection to TiOAT is unknown, and is worthy of further enquiry.

Despite positive outcomes described about TiOAT, room for improvement exists. Participants in the current study described some ways in which TiOAT could better meet their needs including more medication options (e.g., diacetylmorphine) and dose adjustment. Some research has called for patient-clinician shared treatment decision making (i.e., "codesign") as a way of increasing novel OAT satisfaction and retention, and possibly addressing concurrent pain issues (Marchand et al., 2020; Palis et al., 2020; Tofighi et al., 2019). Employment goals were hindered by multiple daily trips to pick up TiOAT medications, which is a policy intended to address concerns of medication "diversion," i.e. to sell, give away, or trade their tablets to someone else, however this is a commonly misunderstood phenomenon, in that people who use drugs have described the ethical pull of sharing their pharmaceutical-grade medications with peers who do not have access (Bardwell, Ivsins, et al., 2021). While many participants saw TiOAT as treatment, and liked the daily social interactions with staff, others found this requirement taxing and would prefer and alternative mode of dispensation. Further research on novel OATs, safe supply programs (i.e., similar TiOAT medications but witnessed consumption not required), and compassion club models (i.e., a model whereby people who use drugs can purchase unadulterated drugs) (BCCSU, 2019; Gomes et al., 2022; Ivsins, Boyd, Beletsky, & McNeil, 2020; Ivsins, Boyd, Mayer, et al., 2020; Young et al., 2022) will benefit the range of people who use drugs at risk of overdose and other harms.

4.1. Limitations

Our study is not without the limitations. The COVID-19 pandemic was occurring during data collection, particularly during a spike in the omicron variant.(Vitiello et al., 2022) Although participants in other qualitative studies might have found Zoom-facilitated interviews to be highly satisfactory and in some instances preferred over face-to-face interviews, (Archibald et al., 2019) access to Zoom could be an issue for people experiencing structural vulnerabilities, such as those in the current study. During COVID homelessness amplified, services shuttered or were limited without notice, and meeting basic need was increasingly difficult (Bonn et al., 2020; Hyshka et al., 2020; MacKinnon et al., 2020; Public Health Ontario, 2020) This might have created difficulties recruiting the full range of people eligible for the study and hampers follow-up interviews presently in process. Moreover, social desirability bias might have influenced how some participants answered some questions.(Grimm, 2010) However, self-report among people who use drugs is determined to be reliable, therefore enhancing the trustworthiness of our data and analysis.(Darke, 1998)

5. Conclusion

In sum, participants in the current study reported social and health benefits from TiOAT, including reduced overdose risk, which is imperative as the overdose crisis has been unrelenting, fentanyl tolerance requires stronger OAT regimens, and the contamination of fentanyl and other adulterants in the unregulated drug supply is worsening (British Columbia Centre on Substance Use, 2022; Weng et al., 2022). Participants also reported increased financial stability, felt healthier, slept better, and ate better than before TiOAT enrollment, which might encourage retention in the TiOAT program. Participants with the goal of reducing drug use also found that TiOAT facilitated achievement of that goal. Many also noted not having overdosed since they began TiOAT. These outcomes suggest that expanding the TiOAT program in their present sites and to other geographic regions is warranted. Addressing challenges by including more OAT medication options, dosing adjustments as needed, and dispensation that facilitates employment might result in increased retention and reduced use of illicit drugs, subsequently improving physical and social health of people who use drugs.

Acronyms

TiOAT	Tablet injectable opioid agonist therapy
iOAT	injectable opioid agonist therapy
OAT	Opioid agonist therapy
NAOMI	North American Opiate Medication Initiative
COVID-19: SARS-CoV-2	severe acute respiratory syndrome coronavirus 2

CRediT authorship contribution statement

JB's roles included original draft writing, conceptualization, formal analysis, review and editing; MM's roles included writing - review and editing, project administration, investigation, and data curation; DW's roles included writing -review and editing, resources, and validation; TK's roles included writing -review and editing, supervision, funding

acquisition, validation, conceptualization, resources, and methodology; and GB's roles included writing -review and editing, validation, funding acquisition, conceptualization, methodology, and project administration.

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