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# “I have such a hard time hitting myself, I thought it’d be easier”: perspectives of hospitalized patients on injecting drugs into vascular access devices

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## Abstract

**Background:** Hospital patients who use drugs may require prolonged parenteral antimicrobial therapy administered through a vascular access device (VAD). Clinicians’ concerns that patients may inject drugs into these devices are well documented. However, the perspectives of patients on VAD injecting are not well described, hindering the development of informed clinical guidance. This study was conducted to elicit inpatient perspectives on the practice of injecting drugs into VADs and to propose strategies to reduce associated harms.

**Methods:** Researchers conducted a focused ethnography and completed semi-structured interviews with 25 inpatients at a large tertiary hospital in Western Canada that experiences a high rate of drug-related presentations annually.

**Results:** A few participants reported injecting into their VAD at least once, and nearly all had heard of the practice. The primary reason for injecting into a VAD was easier venous access since many participants had experienced significant vein damage from injection drug use. Several participants recognized the risks associated with injecting into VADs, and either refrained from the practice or took steps to maintain their devices while using them to inject drugs. Others were uncertain how the devices functioned and were unaware of potential harms.

**Conclusions:** VADs are important for facilitating completion of parenteral antimicrobial therapy and for other medically necessary care. Prematurely discharging patients who inject into their VAD from hospital, or discontinuing or modifying therapy, results in inequitable access to health care for a structurally vulnerable patient population. Our findings demonstrate a need for healthcare provider education and non-stigmatizing clinical interventions to reduce potential harms associated with VAD injecting. Those interventions could include providing access to specialized pain and withdrawal management, opioid agonist treatment, and harm reduction services, including safer drug use education to reduce or prevent complications from injecting drugs into VADs.

**Keywords:** Vascular access devices, Substance-related disorders, Hospitalization, Harm reduction, Patient-centered care

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## Background

Hospitalization rates due to infections associated with injection drug use (e.g., infective endocarditis, osteomyelitis, and skin, soft tissue, and pulmonary infections) are



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increasing in the USA and Canada [1–4]. These infections are caused by unsafe injection practices (e.g., injecting with non-sterile syringes) [1, 5], drug excipients in certain pharmaceutical drugs [6, 7], and/or fillers and other particulates in street-sourced drugs [8]. Treatment of these infections includes prolonged parenteral antimicrobial therapy administered through vascular access devices (VADs). VADs comprise various types of catheters inserted to access peripheral or central vessels (e.g., peripherally inserted central catheter (PICC), intravenous (IV) line) [9].

Due to the extended length of parenteral antimicrobial therapy, patients who do not use drugs are frequently discharged to home and treated as outpatients [10]. Conversely, people who inject drugs (PWID) often remain hospitalized for the duration of their treatment due to concerns that unstable housing or ongoing drug use may inhibit treatment adherence and that patients will inject drugs and/or diverted medications into these devices [9–11]. However, there is a lack of empirical evidence on the prevalence and health risks associated with injecting drugs into VADs among either outpatient or hospitalized PWID [12–15]. Nevertheless, clinical guidance in many jurisdictions advises inpatient hospitalization and close monitoring as the primary strategy to prevent VAD complications for this patient population [9–11].

Yet drug use can occur in hospital settings [16–20]. Cohort and structured surveys with PWID in Canada [16–18] and the USA [19, 20] report that between 30 and 50% of participants continued to use drugs while hospitalized. Injection drug use in hospital can occur for many reasons including uncontrolled pain and withdrawal symptoms or to manage symptoms of stress or anxiety [21, 22]. To circumvent discovery by hospital staff and avert negative repercussions, patients have described using drugs in their hospital rooms and patient washrooms, in other areas of the hospital, and in other nearby public locations [21, 22]. Patients often consume drugs in non-sterile locations, reuse syringes, and rush their injection. These actions only compound the risk of developing infections and other health complications [17, 21, 22]. Patients who continue to use drugs while hospitalized are also at increased risk of experiencing stigma [23, 24] and initiating discharge prior to treatment completion, and experiencing unplanned readmission and mortality [19, 25–27].

Extant research that explores VAD injection primarily describes the prospective and retrospective experiences of outpatients participating in this practice and suggests that the practice is uncommon. For example, of 33 PWID eligible to receive outpatient parenteral antimicrobial therapy within a residential addiction treatment facility, over 90% reported that their PICC line did not

precipitate a desire to inject into the device or increase their motivation to use drugs [20]. In a cohort study of 67 PWID receiving outpatient therapy, only 2% of those who failed treatment did so because of VAD injection [12]. Three case studies have similarly described non-hospitalized people injecting into VADs, including a cannula self-inserted into a femoral vein [28], a central venous catheter [29], and a port-a-cath [30]. A recent Canadian qualitative study [31] examined the practice of injecting into PICC lines, a common type of vascular access device. Through retrospective interviews with 24 people who use drugs living with HIV/HCV who had been hospitalized at least once in the past 5 years and 26 healthcare providers, the authors found that even though few participants reported engaging in this practice, healthcare providers reported that fears of PICC line tampering influenced clinical care decision-making. Our study extends this work by exploring in depth the perspectives and experiences of VAD injection among a sample of PWID hospitalized on medical or surgical units of a large tertiary care facility.

### Objectives

The objectives of this analysis were to (1) describe inpatient experiences and motivations to inject drugs and/or diverted medications into VADs, and (2) propose clinically relevant and patient-centered recommendations to reduce the harms associated with this practice.

### Methods

#### Setting

The study was completed at a large, urban acute care hospital in Western Canada that treats many structurally vulnerable patients with complex health and social needs and high rates of drug and alcohol use disorders. The hospital has an addiction medicine consultation team. At the time of this study, the consultation team offered patients with drug and alcohol use disorders expert pain and withdrawal management, opioid agonist and other medication treatment, harm reduction supplies, addiction counselling, and wraparound health and social supports (e.g., brokered access to housing and income supports, and health promotion interventions such as screening for sexually transmitted infections and immunizations) [24]. This study was conducted by a University-based researchers affiliated and colocated on site with the addiction medicine consultation team (KD is also medical director of the team).

#### Methodology

Our findings are part of a broader mixed-method evaluation examining the provision of sterile injection supplies by the consultation team to hospital inpatients. The

results described in this study organically emerged as the study progressed and were analyzed as an independent theme. We used a focused ethnography as a research approach, which is a time-limited method of eliciting detailed answers to delineated research questions within a distinct group or context, and semi-structured interviews as our sole data collection tool, which comprise predetermined open-ended questions. In line with previous applied health research studies, our focused ethnography did not include participant observation [32, 33]. The interview questions explored hospitalized participants' experiences receiving clinical care, using drugs while hospitalized (including their perspectives of receiving sterile supplies), and their thoughts on how care for hospitalized PWID can be improved. A trained qualitative researcher (HB) obtained informed consent, audio-recorded, and conducted all interviews in a location within the hospital of the participants' choosing. Participants received \$20 CAD honoraria.

#### Participant recruitment and data collection

Between April 20, 2017, and March 7, 2018, we approached inpatients from general medical and surgery

units who had reported recent injection drug use to the consultation team and offered participation in a one-hour interview. We completed interviews with 25 patients (Table 1); theoretical saturation was reached after interview 21, meaning that no new concepts or themes emerge in subsequent interviews [32]. We asked almost all the participants ( $n=24$ ) about their perspectives of injecting drugs and/or diverted medications into VADs; one interview was terminated early by participant request.

#### Data analysis

Interview recordings were transcribed and deidentified, and participants assigned pseudonyms. The average interview length was 51 min. The software ATLAS.ti 8 was used to organize the data iteratively. We employed latent content analysis, which entails examining, highlighting, and labeling groups of words and sorting the labeled text using codes that reflect similar meanings. This form of analysis is inductive allowing classifications to flow from the text [34]. We then explored latent aspects of the text by collating codes, collapsing and

**Table 1** Participant information

Variable	Descriptive statistics <i>n</i> (%)
<b>Demographics</b>	
<b><i>N</i> = 25</b>	
<b>Gender</b>	
Female	12 (48)
Male	12 (48)
Transgender	1 (4)
<b>Ethnicity</b>	
First Nations, Inuit, or Metis	20 (80)
White	5 (20)
<b>Age</b>	
30–39	7 (28)
40–49	10 (40)
50–59	7 (28)
60+	1 (4)
<b>Drug use characteristics</b>	
<b><i>N</i> = 25</b>	
<b>Length of drug use (years)</b>	
1–10	13 (52)
11–20	4 (16)
21–30	3 (12)
31–40	5 (20)
<b>Utilization of drug consumption supplies</b>	
Accepted and used supplies	19 (76)
Did not accept supplies	4 (16)
Accepted but did not use supplies	2 (8)

reconsidering categories, and then abstracting at a higher level of interpretation [34].

### Rigor

Rigor in qualitative research is a set of strategies used to strengthen study quality [32]. To ensure rigor, we employed a second experienced qualitative researcher who was also a member of the research team to randomly and separately analyze 20% of the transcripts to ensure concordance of interpretation [35]. Additionally, we regularly consulted members of an advisory group to elicit feedback on the appropriateness of study procedures and validity of the analysis. The advisory group comprised people with lived experience of drug use and hospitalization; over half also self-identified as Indigenous [35].

### Results

Nearly all participants had heard of patients injecting into their VADs (specifically PICC and IV lines). Participants implied that hospitalized PWID with VAD would have at least contemplated participating in the practice. Some participants had unsuccessfully attempted to inject into their VADs, but a few had successfully injected into their VADs at least once during their current hospitalization, or during previous hospitalizations.

#### “You just connect her and...dial in direct”: reasons for injecting into a VAD

The primary motivation reported for this practice was easier venous access, because many participants and their peers had vein damage associated with long-term injection drug use or improper injection techniques. Injecting into their VADs was seen as “quicker,” “easy,” and “convenient” for people whose “veins [were] ...all done.” Participants perceived injecting into a VAD as less harmful than prolonged attempts to secure venous access because it reduced the frequency of injection site injury and associated infection risks. Participants also described that acute withdrawal could complicate injection drug use and challenge venous access, further increasing the appeal of injecting into a VAD. As “Allison” told us:

*‘Oh my god, some mornings, when it’s my first fix and I can’t do it and I just want to cry or just want to scream. It sometimes, it actually brings me to the point of tears because I can’t get it...It’s frustrating... It’s easier to [inject in your VAD] than having to find a vein and chance missing it. If you miss it then there goes the first shot you know. The strongest shot. The shot that counts.*

For some participants, the frustration associated with finding venous access was so severe that they described wanting a dedicated VAD for drug use while in hospital

and even to be discharged from hospital care with their VAD intact.

*Well, they’re always going to use [their VAD] because you know, they don’t have to dig in their skin or anything, it’s a perfect little port. And you know, when a person is leaving [hospital] they’re all like, no you can’t leave with that. Let them, you’re only helping so that they’re not going to go digging around in their skin and stuff. - ‘Carl’*

A few participants described how the psychoactive effects of drugs were stronger when using a VAD compared to injecting intravenously and believed some people may prefer injecting via this route.

*I’ve done it. Yeah...It’s just an easy port...you don’t have to mark yourself up, you don’t have to look for nothing, you just connect her and...dial in direct...I think it just hits you a little bit harder and faster... somebody that wants to get high, yeah, it’s probably the more enticing route to go. - ‘Kenneth’*

#### “One awful, fuckin’ big chance”: awareness of potential risks

Participants who actively injected into VADs, or those who supported the practice, either described no associated risks or implied that the benefits of injecting outweighed the risks. Yet most refrained entirely from the practice or reported stopping when they learned of potential risks or experienced related harm. These participants perceived the practice as “scary,” “risky,” “dangerous,” and “one awful, fuckin’ big chance” and people who participate in it as “nuts.”

In terms of potential risks, participants worried that injecting into a VAD with non-sterile syringes or contaminated drugs could lead to circulatory issues or additional infection risks.

*Oh yeah for sure. Right in the PICC line, for sure. It’s easy. It’s a mainline right to your veins. But that’s dangerous man, infection. Oh my god, lot of things, not good, I wouldn’t do it. I wouldn’t do it. I’m too scared. - ‘Leah’*

*In the process of diluting your substance...you might not even be able to see it but any particle...can be built right into that line, can get in your bloodstream and cause a clot, cause any kind of numerous problems, it’s very dangerous. - ‘Kenneth’*

Many participants were also aware that some types of VADs provide more direct access to central veins and, as such, believed that injecting into these devices (i.e., PICC lines) may increase their risk of overdose. For example, “Silvia” described contemplating injecting into her

PICC line but ultimately refrained. According to her, “I was actually thinking of it too, but then I thought... no, that’s a little bit too close to my heart.” “Silvia” did, however, describe a desire to inject into a VAD that was not a PICC line because of her struggles to inject herself. “Silvia’s” first experience with injecting drugs was when she was thirteen years old and after thirty years of use, she had developed severe venous damage. According to “Silvia”:

*Like we could put it in there and then you flush it and then you lock it...Make it safer...I’m not saying PICC line site either. But like where it won’t fall out...people are not getting their shot, because they’re wasting it, because they can’t get a line.*

One participant described overdosing after injecting into her VAD. When we asked “Elsa” if she had ever injected into a VAD, “Elsa” reported doing so a few times in the past. According to “Elsa,” “I’ll never do that again, because it goes directly to your heart and I like, I almost died.” “Elsa” described recent engagements with local harm reduction organizations where she received safer drug use education, and she had also been prescribed methadone. These supports, along with a personal desire to reduce physical harms to herself, helped “Elsa” refrain drug use during her current hospitalization.

Most participants, nevertheless, used general and vague terms when describing VADs and displayed limited knowledge of how the devices functioned. Several participants were not aware of how to inject properly into their VADs, despite the exigency some felt to use their devices.

*I’ve heard people say they’ve done it but I don’t know how they could do the PICC line because it’s so long right. It goes all the way to...I don’t know, I would have to ask somebody to show me how they do it. - ‘Linda’*

*But I actually tried, that wouldn’t work as far as here, so I maybe take this thing off and put it back on after. When you do the flush it’s massive, then I, lose a lot of water, probably work too. I did almost try it but not really. Because I have such a hard time hitting myself. I thought it’d be easier, you know what I mean. - ‘Owen’*

In addition, some participants reported unsubstantiated beliefs regarding VADs and safety. One participant implied that the risk of developing an infection after injecting into an IV line was less than the risk associated with injecting into a PICC line. According to “Andria,” “Obviously, going into the PICC line isn’t safe...but if they had like something in their foot...a foot you can lose, your heart...” Participants also described witnessing

specific unsafe practices related to VADs. “Thomas” recounted witnessing a fellow patient “take a needle out of their leg” to utilize it for injecting drugs through other means. “Oliver” described patients injecting into their VAD to “flush syringes,” meaning to retract blood into a used syringe and then reinject, to ensure any leftover drug residue in the syringe was consumed. “Washing” of syringes, filters, and other injection drug equipment in this manner is a strategy used by PWID to stretch limited personal drug supplies [36], which may be more difficult to maintain while hospitalized and unable to participate in work to generate income.

#### **“Show them the process...to be as clean as possible”: reducing harms**

Some participants we spoke with reported attempts to lower potential risks associated with injecting in their VADs by titrating their dose (using a small amount of drug to start) and keeping their VAD as sterile as possible. According to “Dean”:

*Mm-hmm. I’ve done it... It gets better, you don’t miss or nothing, it’s already there....And it’s safe to do it as long you’re not doing a whole lot, you keep it clean like the nurses do, you clean it with swabs and that.*

One participant felt most patients passively relied on nurses to keep their VAD clean. “Rhonda” explained that patients who inject in their VADs think to themselves, “I’ve got an IV, I don’t even have to try and find a vein now...the nurses come and flush them out before they do everything, so it stays clean.” However, “Andria” felt that staff should proactively educate patients with VADs on the risks associated with injecting drugs into their devices but also provide sterile injection supplies and knowledge on how to clean and maintain these devices if they choose to inject.

*Maybe show them properly. Say show them how to use the flush. Show them to, say if you’re going to do it and you’re going to do it here, then you’re going to do it properly... have to set your own standards too, to what you feel is safe...you could educate them... and then show them the process...to be as clean as possible. - ‘Andria’*

Yet only one participant described hospital staff discussing the practice of injecting into VADs. According to “Candice,” “the IV team, or the infectious disease team told me if I use my PICC line to get high they will shoot antibiotics into my [arm], muscular injection, the whole time I’m here.” She interpreted this admonition as benevolent concern on the part of her care team, and it successfully deterred her from using her device.

However, for most participants, the anticipation of severe repercussions, such as changes to their pain or withdrawal management medication regimes, resulted in them being mistrustful of hospital staff. They therefore concealed their drug use, including use that involved injecting into their VADs. “Curtis” considered injecting into his VAD, but according to him, “I didn’t, I didn’t, no I didn’t want to make it that noticeable that I was using when I left so to speak. When I had come back in, you can pretty much, [the nurses] know, you can just tell they know.” According to “Lydia,” nursing staff had suspected that she was actively consuming drugs after finding a powder in her purse and as a result, her pain medication regime was changed from tablet to liquid, which caused her distress. When “Lydia” was asked how to make sure patients were safe when injecting into their VAD, she responded that attempts by hospital staff to prevent drug use fostered mistrust and impeded patients from using safer injection techniques. According to “Lydia”:

*Well, that’s when you explain to them about [using sterile needles]. But then when you have your nurses screwing that up for you guys, good luck. Of course they’re going to go back to hiding, right?...People would care about having [sterile needles] and doing it cleanly and dadadada if, you know, you weren’t gonna get in trouble, right?*

## Discussion

In this study, nearly all participants were aware of the practice of injecting drugs into VAD. However, most participants chose not to regularly inject into their VAD because they perceived the practice as risky. Of those who participated in the practice, most described easier venous access as the primary motivation for themselves and others to inject into their VADs. This practice was often seen as pragmatic and less deleterious than direct intravenous injection, particularly for people who had difficulty finding a vein and injecting themselves. Despite these reported advantages, many participants described a lack of knowledge regarding how VADs functioned. Several participants, including some who had injected into their VADs, appeared unaware of the potential negative health outcomes or strategies to reduce associated risks and implied a need for nonjudgmental education to ensure their safety while injecting into their VADs.

Injecting drugs into VADs is a concern for clinicians administering parenteral antimicrobial therapy to PWID and is often the primary reason PWID are deemed ineligible for outpatient treatment [9–11]. Inpatient supervision by hospital staff is advised to prevent this practice [9–11], but our findings suggest that this advice may not be effective at either informing patients of the risks of,

or preventing, VAD injecting. Moreover, extant literature indicates that other common interventions designed to deter in-hospital drug use (e.g., confiscation of injection supplies, enhanced surveillance, and monitoring) may in fact increase risks for patients (e.g., rushed injection, using alone and in unsafe circumstances, premature discharge) [21, 22]. Our study did not systematically explore whether staff took measures to deter non-medical VAD nor whether participants experienced harms because of these deterrence measures. However, participant accounts demonstrated a need for hospital staff to be aware of the motivations and experiences of PWID injecting in their VADs. This may aid in providers anticipating and addressing patient needs through non-stigmatizing care, which could include staff adopting trauma-informed approaches to patient care, being mindful of words and body language when interacting with PWID, and prioritizing patient autonomy and choice [37, 38].

A key strategy for addressing VAD injecting is to reduce hospitalized patients’ need to inject drugs in the first place. It is imperative that patients have expeditious access to effective, tailored pain and withdrawal management [39, 40], injectable and oral opioid agonist therapy [41, 42], counselling [39, 42], and social supports, including peer support and social workers [24, 43] during their hospitalization. These interventions should be provided with the active consent and collaboration of patients.

There is also some evidence to suggest positive treatment outcomes in PWID receiving parenteral antimicrobial therapy outside of acute care hospitals [13, 14, 44, 45]. Patients with current or previous injection drug use have successfully completed parenteral therapy and participated in minimal, or at least comparable to average, drug use while residing in medical respite facilities (i.e., temporary shelters that provide medical services to people experiencing homelessness) [13, 46], and from within their private homes [44]. With sufficient support (i.e., access to stable housing, substance use disorder discharge planning, regular check-ins with clinical staff, access to agonist medication or other substance use treatment), PWID may be able to successfully complete parenteral antimicrobial therapy in the community and have low rates of substance use and VAD injection [13, 14, 17, 44, 45].

It is also important to recognize that even with maximal medical and social support, some PWID will continue to inject while hospitalized. For example, empirical evidence suggests that prolonged drug use may result in impaired volitional control [47]. Additionally, there are currently no evidence-based pharmaceutical treatments for those with stimulant use disorders [48] and many acute care facilities still do not provide patients with

opioid use disorders evidence-based medication treatment or harm reduction interventions [49]. Clinicians therefore should be educated and encouraged to engage patients with previous or active injection drug use in non-stigmatizing and factual conversations about reducing harms associated with drug use, including the potential risks of injecting into VADs [15, 50]. Research to quantify VAD injecting risks is urgently needed to facilitate such factual discussions. Meanwhile, staff may consider periodic laboratory monitoring to identify and treat incipient infections due to drug use [17]. Several outpatient clinics have established patient care plans, which have included verbal or written agreements from patients to refrain from injecting into their VADs [13, 14, 51, 52]. Clinics have also utilized specialized dressing or security seals on patients' VADs to more easily detect drug use [13, 14, 51, 52]. However, these technologies were not employed in our study setting, and patients' perspectives of these preventive measures are currently unknown, as is their effectiveness for preventing harm to patients.

If injection drug use into VADs is suspected or confirmed, discharging patients or abruptly discontinuing or modifying antimicrobial therapy to a less appropriate regimen is not recommended [9, 22, 53, 54]. These actions may preclude patients from completing vital treatment, compound the burden on hospital staff by increasing the likelihood of patients experiencing unplanned readmissions [54], and increase patients' risk of mortality [27, 55]. Instead, hospital policies should address how patients who continue to use drugs will be supported to complete their medical treatment [38]. Staff should be trained and encouraged to have non-stigmatizing and transparent conversations with patients and offer patients sterile injection supplies, safe syringe disposal instructions, and a naloxone kit [53]. To obviate patients' perceived need to inject into their VADs, clinical staff or a peer support worker could also educate patients on vein finding and maintenance to encourage safe injection practices [56, 57].

A hospital-based supervised consumption service, if available [58, 59], could further reduce health risks of VAD injecting. Supervised consumption services are well described in the literature [60, 61] and aim to provide a safer and cleaner environment where people can consume pre-obtained drugs in hospital under the supervision of trained staff without the need to rush or fear of criminal prosecution [59]. Supports available within these services, such as nursing assistance to locate a vein, may result in fewer patients needing to use their VAD due to inability to find other venous access. Early experience suggests that when patients are given access to supervised consumption services in hospital settings, the incidence of injecting into VAD is quite low (i.e., occurring in

only 5% of visits) [58]. Patients with refractory opioid use disorders could also be prescribed injectable opioid agonist therapy (i.e., hydromorphone, diacetylmorphine) and receive their doses (via self-injection or nurse-administered intramuscular injection) within the supervised consumption service. Injectable opioid agonist therapy is well established in community settings and has been shown to reduce drug use and improve treatment retention [62, 63].

In cases where education and available supports have not deterred VAD injecting, staff might consider supervising patients injecting into their VADs from within their hospital room (in jurisdictions where this is permissible) [64], or demonstrating how to more safely and sterilely inject into VADs, requesting patients avoid certain VADs, and establishing a non-punitive system for patients to report to hospital staff after use [15, 57]. However, more research is needed to evaluate the effectiveness of these harm reduction strategies for reducing health harms of VAD injecting for hospitalized PWID.

### Strengths and limitations

This study supports recent research that suggests hospital policies regarding the use of PICC lines in hospitalized PWID are inadequate and that the integration of harm reduction strategies into clinical care is needed [31]. However, this study used a subset of data from a broader mixed-method evaluation that elicited the perspectives of inpatients who reported recent or active injection drug use to a harm reduction addiction medicine consultation team and who were offered sterile injection supplies at the bedside (most participants accepted those supplies). As such, awareness of and experience with VAD injection may have been higher than other hospitalized patients with a history of drug use. Also, use of VADs for injection emerged as an independent theme as the study progressed, limiting a more in-depth a priori exploration of this topic. Finally, this study was conducted in a large city in Western Canada and may not be generalizable to other dissimilar contexts.

### Conclusions

Given the imperative to ensure PWID receive high-quality hospital care and are able to complete their antimicrobial treatments, we have outlined several potential strategies that could help to address the issue of VAD injecting in hospitals. However, further research is needed to identify and quantify the actual health risks and prevalence of this practice. Quantitative and qualitative studies that elicit the perspectives of both clinical staff and PWID could determine the acceptability and optimal mix of interventions for

preventing potentially deleterious patient outcomes associated with injecting into VADs.

#### Abbreviations

IV: Intravenous line; PICC: Peripherally inserted central catheter; PWID: People who inject drugs; VAD: Vascular access device.

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#### Author contributions

EH and HB conceptualized the study with input from co-investigators. EH, KD, GS, TB, MT, and BP acquired funding to support the project leading to this publication. HB and EH collected the data, and HB led the analysis with support from EH. HB wrote the initial draft of the study, and all authors provided critical review, commentary, or revisions prior to its submission for peer review. EH provided oversight and leadership for all aspects of the research reported herein. All authors read and approved the final manuscript.

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#### Availability of data and materials

Data sharing is not applicable to this article because it is a qualitative study.

#### Declarations

#### Ethics approval and consent to participate

The study received human research ethics approval from the University of Alberta's Health Research Ethics Board.

#### Consent for publication

Not applicable.

#### Competing interests

HB, BP, TB, MT, and GS have no competing interests to declare. EH received grant funding from the MSI Foundation, the Canadian Institutes of Health Research, and the Royal Alexandra Hospital Foundation. KD received salary funding from Alberta Health Services and the College of Physicians and Surgeons of Alberta.

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CASE STUDY

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# Self-injecting non-prescribed substances into vascular access devices: a case study of one health system's ongoing journey from clinical concern to practice and policy response

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## Abstract

**Background:** Overdose-associated deaths and morbidity related to substance use is a global public health emergency with devastating social and economic costs. Complications of substance use are most pronounced among people who inject drugs (PWID), particularly infections, resulting in increased risk of hospitalization. PWID often require intravenous access for medical treatments such as antibiotics; however, vascular access may be limited due to the impacts of long-term self-venipuncture. While vascular access devices including peripherally inserted central catheters (PICCs) allow reliable and sustained routes of administration for indicated therapies, the use of PICCs among PWID presents unique challenges. The incidence and risks associated with self-injecting non-prescribed substances into vascular access devices (SIVAD) is one such concern for which there is limited evidence and absence of formal practice guidance.

**Case presentation:** We report the experience of a multidisciplinary team at a health organization in Vancouver, Canada, working to characterize the incidence, patient and healthcare provider perspectives, and overall impact of SIVAD. The case study of SIVAD begins with a patient's perspective, including patient rationale for SIVAD, understanding of risks and the varying responses given by healthcare providers following disclosure of SIVAD. Using the limited literature available on the subject, we summarize the intersection of SIVAD and substance use and outline known and anticipated health risks. The case study is further contextualized by experience from a Vancouver in-hospital Overdose Prevention Site (OPS), where 37% of all individual visits involve SIVAD. The case study concludes by describing the systematic process by which local clinical guidance for SIVAD harm reduction was developed with stakeholder engagement, medical ethics consultation, expert consensus guideline development and implementation with staff education and planned research evaluation.

**Conclusion:** SIVAD is encountered with enough frequency in an urban healthcare setting in Vancouver, Canada, to warrant an organizational approach. This case study aims to enhance appreciation of SIVAD as a common and complex clinical issue with anticipated health risks. The authors conclude that using a harm reduction lens for SIVAD policy and research can provide benefit to clinicians and patients by offering a clear and a consistent healthcare response to this common issue.

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**Keywords:** Substance use, Vascular access devices, Harm reduction, Medical ethics, Healthcare policy, Intravenous substance abuse

## Background

Vancouver, British Columbia, Canada, with a metropolitan population of 2.5 million in a province of 4.7 million people, is facing a public health emergency of drug overdose and associated death [1]. In 2021 alone, 535 Vancouver municipal and 2267 provincial illicit drug toxicity deaths were reported, representing the leading cause of unnatural death with an average 6 deaths per day [2]. It is well known that persons who inject drugs (PWID) are at increased risk of overdose and invasive bacterial infections such as infective endocarditis or osteomyelitis, with associated increases in hospitalization rates, morbidity and mortality compared to those who do not inject drugs [3–6].

Many of these bacterial infections require ongoing intravenous (IV) medications and vascular access devices (VADs). Peripheral intravenous catheters and peripherally inserted central catheters (PICCs) are clinically indicated in these circumstances. A PICC is often used when vascular access is limited or IV medications such as antibiotics are required for several weeks. Traditional peripheral VAD options may be limited in some PWID as a result of chronic venous disease induced by years of self-venipuncture, making PICCs an important (and sometimes necessary) consideration when protracted IV therapy is required [7].

Clinicians caring for patients who use substances in hospital and community settings, including Overdose Prevention Sites (OPS) and Supervised Consumption Sites (SCS) [8], may encounter patients self-injecting non-prescribed substances into their vascular access devices (SIVAD) rather than performing self-venipuncture. To date, the incidence of SIVAD and related complications has not been well studied, nor is it known if harm reduction measures reduce risks associated with SIVAD. No formal guidance has been issued regarding an optimal approach to this complex clinical issue from healthcare institutions, professional colleges, or harm reduction research and policy development bodies.

This paper describes a case study at Providence Health Care (PHC), an organization in Vancouver, British Columbia, where SIVAD is encountered with relative frequency. It begins with an exploration of SIVAD from the perspective of an individual patient, followed by data collected from a local Vancouver OPS and a review of the available literature in an attempt to characterize the clinical context, incidence and anticipated risks of SIVAD. The case study concludes by describing the systematic

efforts of a multidisciplinary team in Vancouver to create and implement a local nursing clinical practice guideline and associated education and research plan around harm reduction approaches to SIVAD.

The authors also discuss current knowledge gaps and controversies around the medical, ethical and legal legitimacy of harm reduction for SIVAD and applicability of the Vancouver approach to other national and international contexts. This paper's aim is to enhance the clinical understanding of SIVAD and through transparent shared experience, encourage other healthcare teams to develop and research SIVAD-related practices that are appropriate for their local context.

## Methods

This descriptive case study is comprised of multiple related research efforts sharing a common research objective: understanding SIVAD practice and impact at our health organization to inform development and implementation of related policy and practice. Rather than having a prespecified overarching research plan and methodology, this case study integrates mixed methods of multiple related projects identified and purposefully brought together through organization-wide efforts—risk management and ethics consultations—triggered in part by incident cases of SIVAD. The methodology of individual projects is further outlined in relevant sections.

### SIVAD patient perspective and clinical features

#### *Patient perspective of SIVAD*

Patient-centered care begins with exploring patient perspectives. As outlined in “Robin’s” case (see Table 1), hospitalization can be challenging for people with substance use disorders (SUD) as they may experience withdrawal symptoms and cravings following interruption of their usual substance use patterns [9]. Unmanaged pain, withdrawal and cravings may lead individuals to use non-prescribed substances while admitted to hospital [10]. Self-venipuncture options may be limited in some PWID because of venous thrombosis, sclerosis and occlusion of preferred injection sites in the upper and lower extremities [7]. A minority of PWID will inject into the internal jugular vein in the neck, the femoral vein in the groin, or smaller veins in the forehead or penis, which are often perceived as “higher risk” for complications, such as infection and excessive blood loss [11, 12].

As described by “Robin”, patients may perceive benefits arising from SIVAD such as avoiding self-venipuncture in

**Table 1** Patient experience and perspective of SIVAD

Robin is 38 years old and lives in Vancouver's Downtown Eastside. She describes herself as a vibrant, active community member who has been injecting drugs for the last 14 years. She lost both of her parents in a tragic accident in her young adulthood, creating complex and strained family relationships. In her early 20's, she started using stimulants and at age 25 began taking oxycodone for her osteoarthritis. At age 27, she began injecting drugs intravenously (IV). She receives injectable opioid agonist therapy (iOAT)<sup>1</sup> at an outpatient clinic, but iOAT alone has not been sufficient to treat her pain and opioid tolerance, and she continues to use additional non-prescribed IV drugs

Five years ago, Robin was admitted to hospital with a skin infection. It was around this time that she had run out of veins in her arm that she could easily inject into. Thus, she started injecting substances into her abdomen, legs, upper arms and jugular vein. Frequent vein misses ("missed hits") resulted in many areas of skin breakdown and abscesses. A peripherally inserted central catheter (PICC) was inserted for her to receive IV antibiotics

She remembers being in a lot of pain and watching the nurses clean and flush the line, attach syringes loaded with opioids, and administer the medication so easily. She thought "I could do that." She started collecting pre-packaged saline flushes accessible around the hospital unit and was relieved not to have to inject into her neck, and to have a way to avoid severe "dope-sickness" (withdrawal)

During subsequent admissions to hospital, she disclosed her PICC use to nurses and physicians and asked for sterile supplies. Sometimes the IV team inserting the PICC informed her about the risks of using it, and sometimes she was given supplies and education on how to use/access the PICC using sterile technique. One healthcare provider told her "You're going to kill yourself" by using the PICC, but she was not told how or why this may be true

On a recent hospital admission for another infection, her desired discharge plan was to receive IV antibiotics as an outpatient. Unfortunately, this was declined because she disclosed PICC use to healthcare providers. Instead, her IV antibiotics were switched to oral and her PICC removed. This came as a surprise to Robin, who felt as though she was being punished for her honesty. She does not recall anyone talking to her about this change in discharge plans. Because of this situation and based on variability in provider responses to her PICC line use, she no longer discloses her PICC use because she fears it will compromise relationships with healthcare providers, and ultimately, her healthcare

Robin says that she frequently sees patients at community OPSs injecting into vascular access devices using unsterile technique. Often, she will intervene and offer advice when she sees unsafe practices but worries about the lack of education among people who inject drugs

A review of Robin's medical record reveals that she has received care from addiction medicine, infectious disease, internal medicine and wound care specialists during several recent admissions. Notes indicate that clinicians were aware of Robin's PICC use, with some notes referring to "tampering" or "abuse" of the line. One provider noted that the patient was instructed by community workers on how to use her PICC to inject. There were no notes regarding patient-provider discussions around the risks of PICC use or teaching about sterile technique. She was given general education on overdose prevention. On several occasions, notes indicate that Robin left hospital with her PICC in place, despite the team's plans to remove it prior to discharge

Patient perspective reflects a synthesis of medical records and multiple voluntary interviews with 'Robin' conducted by an addiction nurse educator during hospital admissions and community follow-ups between 2017 and 2020 as part of an ongoing patient experience exploratory study. Demographic details have been anonymized. Permission for publication was obtained and consent signed by the individual providing the above perspective

<sup>1</sup> SIVAD self-injection into vascular access device, <sup>2</sup>iOAT injectable opioid agonist therapy, <sup>3</sup>PICC peripherally inserted central catheter

less desirable or challenging sites, or maintaining venous access to avoid or alleviate drug withdrawal. Patients may or may not be aware of SIVAD related health risks and may receive a variety of responses from healthcare providers ranging from PICC removal and discharge to education on risks and provision of harm reduction supplies.

Just as "Robin" experienced, the majority of PWID with a history of hospital PICC insertion interviewed by Guta and colleagues for a recent qualitative study reported that they had been subjected to "threats of discharge". Stigmatizing experiences were common. And similar to "Robin's" observations about awareness of risk, many PWID may be unaware of the possible risks of SIVAD [13].

#### **Potential infectious and non-infectious risks of SIVAD**

As exemplified by "Robin's" recurrent hospitalizations, PWID, independent of IV access or its use, are at increased risk of overdose and invasive bacterial infections [3, 4]. Additionally, VADs themselves have inherent risks. These risks are modified by device, patient, and care environment related factors. For context, among non-PWID with central venous catheters or PICCs, the estimated incidence of associated bloodstream infections (BSI) is between 0.5 to 5.8% and deep venous thrombosis 3%, over the time period that a catheter remains in place

[14, 15]. VAD malposition is estimated to occur in up to 9.3% of patients, while device dysfunction occurs at rates up to 78 per 10,000 indwelling days [16]. VAD complications often require device interventions, such as occlusion management, repair, removal, and replacement [17, 18].

Mirroring "Robin's" experiences in hospital, clinicians report concern about risks of using PICCs in PWID, especially in non-clinical environments, with some opting to remove PICCs and pursue second line oral antibiotic treatment for infections due to fears of liability and censure from colleagues [13]. While increased risk of VAD complication among PWID is often cited, empirical evidence demonstrating this is absent. Risk may be inferred and influenced by general conceptions about the risks of IV drug use (IDU) [19]. Where evidence exists, objective and perceived risk discordance becomes apparent.

Among a cohort of 159 PWID receiving extended courses of outpatient antibiotics via VAD, no significant differences in incidence of BSI, thrombosis, or complications warranting device removal were seen when compared with non-PWID in the same program [20]. A recent review of published studies evaluating the safety of outpatient parenteral (IV) antibiotics for PWID also

found no difference in rates of IV access-related adverse events when compared with non-PWID [21]. There are limitations of the available data including lack of standardized assessment for and documentation of SIVAD incidence among study populations. Furthermore, selection bias for more medically and socially stable PWID to include in studies and non-standardized application of SIVAD prevention policies and harm reduction measures may limit generalizability of existing studies.

In summary, although the rates and types of complications associated with SIVAD have not been clearly defined, it could be anticipated that patients who engaged in SIVAD may experience serious harms, with some resembling the risks of traditional self-venipuncture (e.g. blood stream infection, overdose) and others unique to SIVAD (e.g. air embolism, thrombosis, loss of device functionality). Harms may be more likely if patients are unaware of best practices around VAD care including the need for sterile technique and proper routine flushing following injection of substances [22, 23]. The potential impact of SIVAD harm reduction measures, including education on risks, sterile technique, or provision of single-use, sterile supplies is unknown.

#### **Experience from Vancouver overdose prevention sites and supervised consumption sites**

In the absence of formal practice guidelines, Overdose Prevention Sites (OPS) and Safe Consumption Sites (SCS) in Vancouver have developed informal harm reduction approaches to SIVAD. OPSs, like SCSs, are spaces where people can inject their own non-prescribed substances using single-use, sterile equipment. While SCSs are federally funded and have nursing staff on site, OPSs are typically staffed by peers (people with lived/living experience of substance use) and are provincially sanctioned as a temporary response to British Columbia's drug overdose and death public health emergency [8, 24].

At Insite, an SCS in Vancouver's Downtown Eastside neighborhood, staff report engaging in harm reduction activities around SIVAD since 2006 and have developed an internal nursing resource covering risk education (e.g. overdose, VAD dysfunction) and sterile self-injection procedures [25, 26]. Staff at Insite encourage clients to access veins via self-venipuncture or to inject into a muscle rather than use their VAD if present. Nurses also assess VAD function and for localized signs of infection. If a client elects to use their VAD despite education regarding risks, staff provide education on the safest possible SIVAD technique and sterile injection supplies. This informal nursing guideline is currently for internal use only and is not published or publicly accessible at this time.

In 2018, the St. Paul's Hospital Overdose Prevention Site (SPH OPS) was opened [27, 28]. This OPS was located in a small trailer adjacent to the hospital, staffed by peer workers and was accessible to both hospital inpatients and community members. Between its opening in May 2018 and February 2021, there were 34,229 visits to this OPS of which 4931 (14%) were hospital inpatients and 1318 (27%) of patient visits involved SIVAD. A visit is defined by one individual encounter with a client, with some clients visiting multiple times per day to inject substances. Clients used identification "handles" instead of names so it is not possible to attribute the number of SIVAD visits to specific individuals (i.e. if an individual visits frequently to use their VAD, each visit is counted towards the total visits involving SIVAD). SIVAD was recorded whenever a peer noted a patient accessing their VAD to inject drugs.

When the OPS initially opened, peers reported witnessing a variety of approaches to SIVAD including, but not limited to, using water from a water bottle to flush VADs, not cleaning the PICC hub prior to injection and inserting needles into the IV tubing itself as opposed to the access port [29]. At the same time, clinical staff inside the hospital reported to Clinical Nurse Educators that hospitalized patients were engaging in SIVAD on inpatient units, often in unsupervised settings.

Due to these observed safety concerns, quality improvement measures were instituted at the SPH hospital-adjacent OPS and other Vancouver OPSs. Since 2019, peers receive standardized education on how to provide harm reduction interventions for SIVAD through a "street degree" program and OPSs stock supplies specific to SIVAD (e.g. pre-filled syringes with sterile flush solution, needleless syringes) [30]. Hospital and community patients known to be engaging in SIVAD are directed to OPSs for supervision and supplies.

#### **Systematic approach to create standardized clinical guidance for SIVAD and address knowledge gaps**

In response to observed SIVAD in Vancouver acute and community care settings, as well as growing SCS/OPS experience offering SIVAD harm reduction education and supplies, a multidisciplinary healthcare team at Providence Health Care (PHC) took steps in 2018 to examine SIVAD more formally. PHC is a health organization in Vancouver that administers care to approximately 600,000 patients annually via two acute care hospitals with approximately 500 acute beds in total. The goal of this work was to develop consistency in the response to SIVAD through a practice guideline based on available evidence and expert consensus, as well as to identify SIVAD as an issue worthy of formal clinical response, education and research.

### ***Incident cases and risk management engagement***

Instigated by a series of distressing SIVAD incidents noted by healthcare providers (e.g. patients performing SIVAD in unsupervised and unsafe environments such as medical ward shower stalls), the organization's Risk Management and Patient Safety program commissioned a SIVAD risk analysis review. A group of Infectious Diseases, Urban Health and Addiction Medicine specialist physicians, nurses, clinical ethicists and the organization's lawyer, was assembled to discuss potential patient, healthcare provider, institutional and wider community implications of SIVAD and potential harm reduction policy interventions [31]. A failure modes effect analysis (FMEA) was conducted to systematically identify and evaluate the anticipated risks of SIVAD and the impacts of potential adverse outcomes following a policy change ('failure modes'), in this case harm reduction interventions for SIVAD [32].

The FMEA ranked priorities to be anticipated and addressed when considering policy development and monitoring. The most concerning risk anticipated to arise following harm reduction implementation was increased SIVAD rates amongst the larger community of PWID (not just in those specifically educated) should it be misperceived that "clinicians now condone the use of VADs for self-injection". VAD access dysfunction was the next most concerning risk. Somewhat surprisingly, participants articulated less concerns about risk of infectious complications and overdose. This may reflect acknowledgement of baseline risks associated with IDU independent of SIVAD and an understanding that a SIVAD policy or guideline would intentionally aim to mitigate such harms.

### ***Formal organizational SIVAD ethics consultation***

Building from the FMEA, a more in-depth investigation was required to explore the implications of possible practice changes around SIVAD. In November 2019, the organization's Ethics Services program was consulted by the Urban Health program to review the following questions:

1. Will the organization support the development of a policy/guideline that permits clinicians' discretion to deliver SIVAD harm reduction education and supplies to patients with substance use disorders upon request, while also allowing for conscientious objection should clinicians wish to opt out of the practice?
2. What ethical, medical and organizational considerations ought to be considered with this approach?

Following approval from the Senior Leadership Team in February 2020, Ethics Services conducted an

organizational ethics consultation that took 6 months to complete. Organizational ethics is the discipline concerned with the principles and standards by which an organization operates. It focuses on finding the "right" way to respond to complex challenges and opportunities within the communities that the organization serves [33]. Because providing SIVAD harm reduction was recognized to be a response that could significantly impact the lives of patients, clinicians and the organization's reputation, formal ethical reflection was requested given limited medical evidence on the subject and a general absence of practice standards.

A total of 50 stakeholders were interviewed, including patients with lived/living experience of drug use/SIVAD, program leaders, physicians and nurses working in acute care or community in Vancouver, as well as clinicians at other Canadian sites. An interview question guide was developed by Ethics Services in consultation with a Clinical Nurse Educator in Substance Use. Interviews were one hour long, semi-structured, non-remunerated and occurred in person or over videoconferencing, either individually, or in small groups of up to 4 participants per participants preference. Several individuals provided information only over email. We identified stakeholders by contacting program leaders in Infectious Disease, Internal Medicine, Urban Health, Addiction Medicine, Psychiatry, IV Therapy, Risk Management, and Nursing Professional Practice. Additional stakeholders were identified during the interviews themselves (i.e. "who else should we speak to about this question?"). Stakeholder responses were organized into themes (see Table 2). No other local or national center was found to have formal organizational guidelines or policies on SIVAD harm reduction.

Following a detailed ethical analysis, the Ethics Services team determined that it would be ethically permissible to create an organizational harm reduction guideline around SIVAD. In light of the risks of harm—that is, the degree of severity and relative certainty of harms related to overdose and drug-poisoning deaths when SIVAD occurs covertly and without supervision, sterile supplies or education—the ethics team identified proportionate rationale and clear ethical justification to move forward with supervised SIVAD harm reduction, particularly within a monitored setting such as an OPS, with organizational oversight including research and dedicated staff education. With an overarching goal to save lives and engage patients in care, harm reduction strategies were believed to be appropriate as part of the comprehensive program of services PHC provides for people who use substances.

Importantly, given the general lack of directive evidence in this area, providers who do not feel comfortable

**Table 2** Stakeholder Perspectives from the Organizational Ethics Consult. *Source* Providence Health Care Ethics Services Organizational ethics consult: Harm reduction, an approach for patients who self-inject non-prescribed substances into their vascular access devices, December 2020

*Patient Stakeholders*

- Identify personal experience with self-injection of non-prescribed substances into vascular access devices (SIVAD), but an incomplete awareness of risks, and interest in more education
- Endorse benefits of SIVAD that may not be valued by healthcare providers (e.g. avoiding “high risk” venipuncture, better management of drug withdrawal, and stabilizing substance use disorder enabling completion of medical treatment)

*Nursing Stakeholders*

- Indicate SIVAD harm reduction appears “common sense” and patient-centered
- Some already engage in SIVAD harm reduction, while others are uncertain and desire more education and organizational guidance and support
- No nurses interviewed expressed objection to SIVAD harm reduction but noted that some nurses will object based on moral or philosophical grounds, or because of lack of experience or evidence

*Physician Stakeholders*

- Desire organizational support should a legal challenge arise following an adverse event
- Infectious Diseases physicians endorse experience with infectious complications of SIVAD
- Some believe that SIVAD should prompt vascular access device removal and switch to oral antibiotics
- Some believe that shared informed decision making would be helpful in patients who SIVAD

*Risk Management and Professional Practice*

- Documenting a discussion on anticipated risks of SIVAD would satisfy the need for informed consent, and could mitigate legal risk to individuals and the organization
- Legal liability coverage for nurses is provided by the organization
- Harm reduction interventions are within nursing scope to provide

**Table 3** Recommendations from the organizational ethics consult. *Source* Providence Health Care Ethics Services Organizational ethics consult: Harm reduction, an approach for patients who self-inject non-prescribed substances into their vascular access devices, December 2020

1. At a minimum, develop a patient education intervention around the risks of self-injection of non-prescribed substances into vascular access devices (SIVAD)
2. Consider an interim SIVAD harm reduction guideline for use in the organization, with expert stakeholder input, and an opt-out option for providers who disagree
3. Continue to develop and promote wraparound care for patients with substance use disorders (Addiction Medicine consultation, social work, and overdose prevention site (OPS) models of care)
4. Study the incidence and outcomes of SIVAD harm reduction within the organization
5. Use a standardized SIVAD chart document to demonstrate patient informed consent
6. Position SIVAD harm reduction in an OPS environment initially to ensure consistency, quality, and research opportunities
7. Develop an education program for clinicians around harm reduction generally, and practices and patient counselling techniques specific to SIVAD
8. Consider additional legal/risk evaluation regarding SIVAD harm reduction
9. Involve partner organizations in the development of guidelines, given the possible impacts to the community

with SIVAD harm reduction could opt out. See Table 3 for specific consult recommendations, which were reviewed and approved by the institution’s Risk Management department and Senior Leadership Team in February 2021.

***SIVAD nursing harm reduction guideline development***

The Senior Leadership Team’s endorsement of the Ethics Consultation recommendations was instrumental to support the development of a harm reduction guideline for SIVAD. Although intended as guidance for all healthcare

providers, the document was created primarily as a nursing guideline, as it was acknowledged that nurses are the frontline providers of harm reduction education and supplies. Given that SIVAD and the impact of potential harm reduction is an emerging area of study, the guideline was positioned as an internal interim document, subject to future review and amendments as new information becomes available.

To create the guideline, a nurse educator with experience in substance use convened a working group of stakeholders that included nurses, patient care managers,



physicians, educators and social workers representing disciplines of Addiction Medicine, Infectious Diseases, and Urban Health. The group utilized the limited research evidence available (including sources referenced in the FMEA and Ethics Consult), existing organizational guidelines related to general VAD care and maintenance and information regarding strategies employed by other sites (including community run OPSs/SCSs as described above and a community OPS in Ottawa, Ontario) [34, 35].

A common concern raised by frontline nurses was potential legal liability if a nurse inadvertently flushed an IV line containing substances previously injected by a patient, resulting in patient overdose. Risk Management indicated that nurses are not liable for autonomous decisions made by capable patients, including use of substances and/or if patients experience an adverse event attributed to SIVAD. The importance of documenting an informed discussion with patients regarding risks of SIVAD was emphasized. As the organization takes a more formal harm reduction approach to SIVAD, liability coverage is in place provided nurses are practicing at the expected standard and this has been indicated within the guideline itself.

The group also consulted PHC's Nursing Professional Practice consultants and the British Columbia College of Nurses and Midwives about nursing scope of practice pertaining to harm reduction and SIVAD specifically. These bodies endorsed that harm reduction practices, including providing education and sterile supplies, are within the scope of nursing practice [36]. Importantly, they indicated that nurses can act independently of physician oversight when assessing patients and implementing harm reduction measures within scope, however, conferral with the multidisciplinary care team is encouraged to problem solve around addiction management and medical care (see Table 4).

The guideline also emphasizes that nurses have the ability to exercise discretion as to whether they will provide SIVAD education and sterile supplies to patients. If

nurses choose to opt-out of this practice (e.g. concerns over the absence of evidence for SIVAD, moral objections, or clinical concerns related to patient factors), they are advised to transfer patient care to another clinician who can assess the patient. Nurses can also consult addiction medicine or more experienced colleagues and/or direct patients to the in-hospital OPS where this care is routinely offered.

The revised version of the guideline was approved and posted within the organization. The guideline is clear that providing supplies and education does not equate to condoning SIVAD or substance use in hospital and patients are directed to the in-hospital OPS. The guideline also formalizes clinical practices around SIVAD that were already being *informally* provided to patients by nurses on a case-by-case basis in hospital as well as at community SCS/OPSs over the last several years.

#### ***SIVAD nursing harm reduction guideline implementation at the SPH OPS***

At the end of 2020, the hospital-adjacent OPS moved to a new location which created a gap in service for hospital inpatients. In response, SPH opened an in-hospital OPS in February 2021 [37]. It is staffed by nurses who receive specialized training on providing harm reduction education and sterile supplies. The opening of the in-hospital OPS roughly coincided with the release of the interim SIVAD nursing harm reduction guideline, as outlined above. As such, SIVAD harm reduction training is provided to nurses based on the guideline and supplemented by education from an IV Therapy nurse specialist (e.g. assisting clients with alternate vein identification and vein care) [34].

Between its opening on February 1st to October 23, 2021, the site has had 1,655 visits, 611 (37%) of which involved SIVAD, which is recorded whenever a nurse notes a patient accessing their VAD to inject substances. Staff anecdotally report that SIVAD harm reduction education is the most common education requested by

**Table 4** Clinical practices around SIVAD that can be provided to patients by nurses as outlined in the clinical nursing practice guideline

1. Engage in standardized and comprehensive discussion on the risks of self-injection of non-prescribed substances into vascular access devices (SIVAD)
2. Primarily discourage SIVAD and encourage use of alternate injection techniques (e.g. venipuncture, muscular injection)
3. Complete a standardized documentation template (located in the hospital electronic medical record) that an informed discussion took place
4. If the patient decides to engage in SIVAD despite risks and alternate route suggestions, offer education on safer sterile injection techniques and provide sterile supplies, including saline flushes and alcohol swabs
5. Facilitate nursing communication about SIVAD activities to other providers, including Addiction Medicine and Infectious Disease clinicians, so that ongoing medical indication for the VAD can be assessed, and substance use disorder, withdrawal and cravings can be assessed and treatment optimized

patients, many of whom already express existing knowledge about harm reduction practices for self-venipuncture [38].

#### **Staff education on harm reduction and SIVAD**

Nurse educators specialized in the care of patients with substance use disorders presented the new guideline at in-service sessions across acute care settings. The sessions equip nurses with skills to engage in harm reduction counselling with patients (e.g. language to use, trauma-informed care, information on medical risks) and to ensure that nurses understand the purpose and limitations of harm reduction. The guideline was also presented to nursing leadership at frontline nursing meetings across the organization so that nurses could bring this information back to their colleagues.

To enhance the reach of SIVAD-specific guidance, presentations at departmental rounds have been an important avenue for ongoing discussion and education. The British Columbia Centre on Substance Use hosts a monthly “What’s New in Addiction Medicine?” lecture series that is attended by a diverse range of healthcare professionals provincially. A rounds presentation reviewing SIVAD literature and approaches to VADs in PWID was delivered in May of 2021. This presentation had 65 live attendees and 102 registrants with access to online material [39].

#### **SIVAD research in progress at providence health care, Vancouver**

In line with the organizational ethics consult recommendations, research has been prioritized. Ethics approval has been obtained for a mixed-methods study of the attitudes, beliefs and practices of patients who engage in SIVAD and is currently in recruitment and data collection phases. Investigators are exploring patients’ understanding of SIVAD-associated risks (e.g. infection, air embolism), personal beliefs (e.g. why patients are using VADs to inject) and influencing factors (e.g. how the practice is being learned). Investigators will also conduct chart reviews to evaluate patient outcomes, including incidence of blood stream infections, thrombosis, occlusion, VAD malposition or accidental removal. Research to determine prevalence of SIVAD in an existing community study cohort of PWID is also underway.

#### **Discussion**

There is evidence that a patient-centered, harm reduction approach to care helps PWID engage in healthcare and reduces overall harms of IDU [27, 40–42]. Harm reduction does not condone, endorse, or condemn substance use. Rather, it recognizes substance use as a reality for some individuals and focuses on reducing its harmful

consequences [43]. PWID often inject in non-sterile, unsupervised settings due to stigma and criminalization, but when supported in safe environments, rates of IDU-related infections and fatal overdose decrease [44–46]. Harm reduction strategies ideally exist within a continuum of care, giving patients the option of accessing various social and medical supports that may improve their overall health [47, 48].

For patients who are informed of the anticipated risks associated with SIVAD but continue to endorse a plan to use their VAD, harm reduction interventions, including counselling about sterile technique and flushing and provision of sterile supplies is philosophically, ethically and medically analogous to sterile needle exchange/availability programs. If patients fear judgement from healthcare providers about SIVAD, they may engage in SIVAD covertly to avoid consequences such as VAD removal and premature discharge from hospital. Loss of patient engagement and concerns about overdose and adverse events up to and including death must be acknowledged. Harm reduction interventions, including safer injection techniques for non-prescribed substances helps support safer drug use patterns, access to primary care and reduced overdose frequency [49]. It is therefore plausible that supporting SIVAD harm reduction will lead to improved patient outcomes. Acknowledging that some providers may have moral distress in relation to SIVAD associated care—as highlighted in our case study—ongoing and targeted education about the purpose of SIVAD harm reduction and the existence of care pathways linking both patients and providers to skilled providers of such services must be central to any implementation plan.

There may be concern among healthcare providers that inserting PICCs or providing education on SIVAD to PWID may lead to increased IV drug use or SIVAD. Data is currently being collected and analyzed with respect to the incidence of SIVAD at the in-hospital SPH OPS following the introduction of the nursing guideline, to ascertain trends in SIVAD over time. It should be noted that the percentage of visits involving SIVAD rose from 27% in the hospital-adjacent OPS (May 2018–January 2021) to 37% at the in-hospital SPH OPS (February–October 2021). The significance of this observation requires more detailed analysis accounting for confounders and clinical outcomes. Populations accessing community and hospital-adjacent OPSs and those visiting in-hospital OPS are dissimilar and difficult to compare.

In order to mitigate the risk of increased SIVAD among populations of PWID following the introduction of harm reduction measures, it is important that any policies or guidelines developed are clear that the main goal of SIVAD harm reduction counselling is to provide

education regarding potential risks and to discourage the patient from using their VAD to inject substances. Guidelines should be clear that providing supplies and education does not mean substance use or SIVAD is condoned.

Ongoing data collection to establish baseline incidence of SIVAD among PWID in inpatient and outpatient settings and documenting the type and rate of complications are needed to understand incidence and impact of SIVAD. Furthermore, qualitative assessment of patient experiences and perspectives regarding SIVAD are needed to contextualize this data and understand how it intersects with overall health and substance use. While a study in Vancouver is underway to begin to delineate these aspects of SIVAD, larger more inclusive multi-center collaborative research evaluating SIVAD is needed to appropriately account for heterogeneity of substance use behaviors, health system resources, policies and practices. Studies relating to PICC use and complications in PWID should include consideration of SIVAD, including creating standard means of identifying and documenting SIVAD in research protocols.

Assessment of the impacts of possible SIVAD harm reduction interventions (e.g. education on risks and sterile technique, provision of sterile supplies) are also needed. Such harm reduction-oriented studies should include evaluation of the rates and types of complications, while also exploring impact on patient quality of life, engagement in healthcare and substance use trajectories. Concurrent guidance and research, rather than a typical sequential approach of research followed by policy development should be considered, reflecting urgency arising from the ongoing overdose crisis in BC and elsewhere [50, 51].

Vancouver represents a unique intersection of patient population and practice landscape, where addiction medicine services and harm reduction interventions are widely accepted and available, including SCS/OPSs. The generalizability of the work described herein may be limited or of low priority in settings without such resources and research opportunities may be scarce in settings where SIVAD incidence is believed to be low.

## Conclusion

SIVAD poses complex clinical and ethical challenges that require efforts to close knowledge gaps towards the creation of guidelines and policies that support patients, clinicians and organizations in reducing harms and improving health outcomes for PWID. Although healthcare providers and organizations may prefer that patients avoid SIVAD, clinicians must be willing to engage with patients within the reality that currently exists. Much work remains ahead to establish a foundation of evidence and organizations should actively seek opportunities

within their own institutions and multidisciplinary teams to study and formalize guidelines and policies around this important area of practice, reviewing and amending them as new evidence becomes available. As organizations gain experience, the publication of guidelines and collaborative efforts between institutions will be essential.

## Abbreviations

BSI: Bloodstream infections; FMEA: Failure modes effect analysis; IV: Intravenous; IDU: IV drug use; OPS: Overdose prevention site; PHC: Providence health care; PICC: Peripherally inserted central catheter; PWID: Persons who inject drugs; SCS: Supervised consumption site; SPH: St. Paul's hospital; SPH OPS: St. Paul's hospital overdose prevention site; SUD: Substance use disorder; SIVAD: Self-injection of non-prescribed substances into vascular access devices; VAD: Vascular access device.

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## Author contributions

All authors contributed to development of the manuscript. JC lead the institutional ethics consultation process and provided related content; WC and VW served as content experts on infectious complications and medical risks of SIVAD; EG, ED, MN have worked in and provide educational support the SPH OPS and provided statistics and guideline development related content; RB served as the addiction medicine content expert contributing related information on harm reduction and substance use disorders; JH was the vascular access and skilled nursing content expert providing related information about vascular access. All authors read and approved the final manuscript.

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## Availability of data and materials

The St Paul's Hospital Overdose Prevention Side datasets presented are not publicly available as they include internal organizational documentation and program statistics but are available from the corresponding author upon reasonable request.

## Declarations

### Ethics approval and consent to participate

Ethics approval was not obtained for this case summary, but ongoing unpublished research studies referred to in the manuscript have received ethics approval from the University of British Columbia Research Ethics Board.

### Consent for publication

Permission was obtained and consent signed by the individual providing details for the patient perspective case description.

### Competing interests

The authors declare no competing interests with respect to the research, authorship and publication of this article.

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