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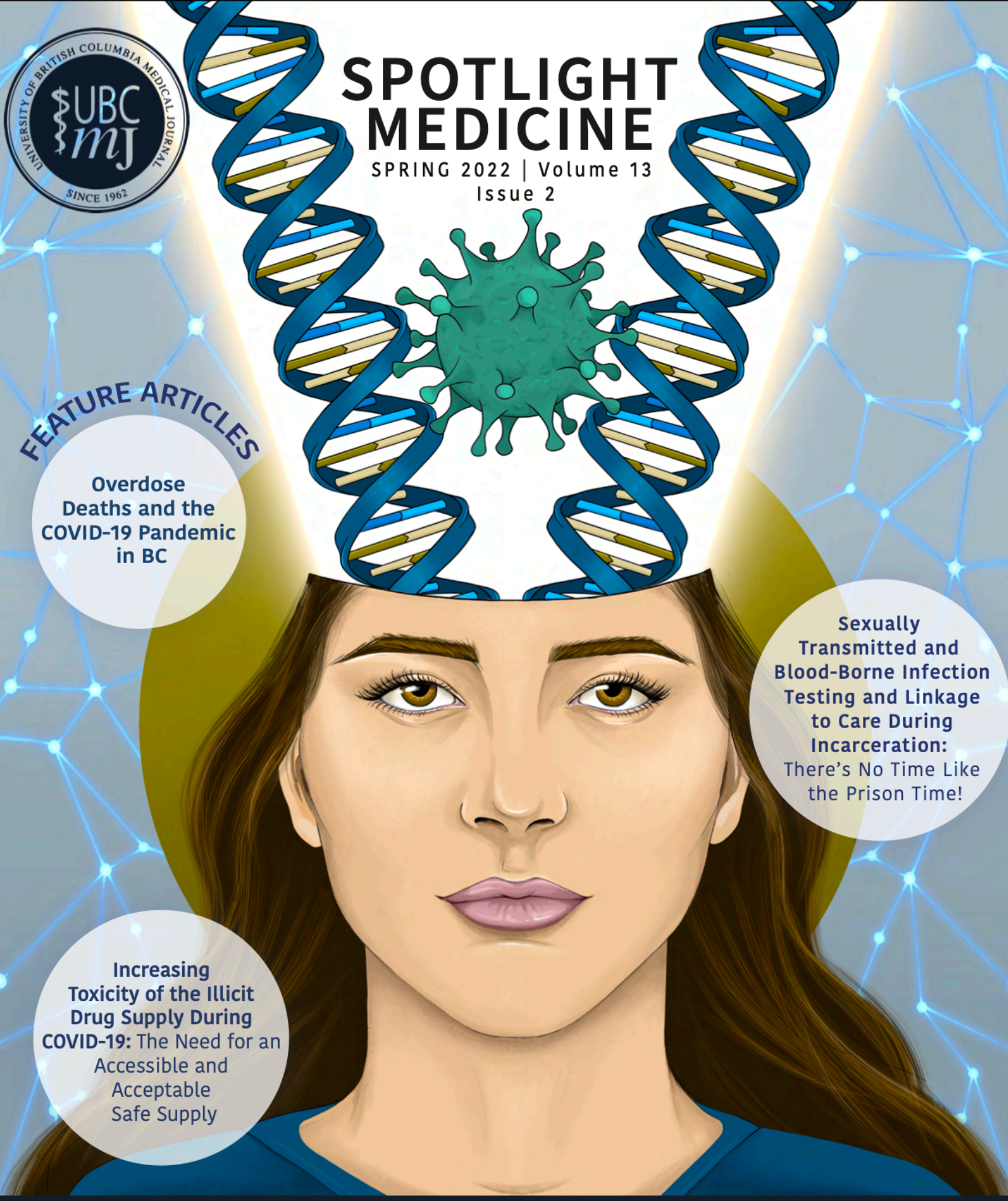


## FEATURE ARTICLES

**Overdose Deaths and the COVID-19 Pandemic in BC**

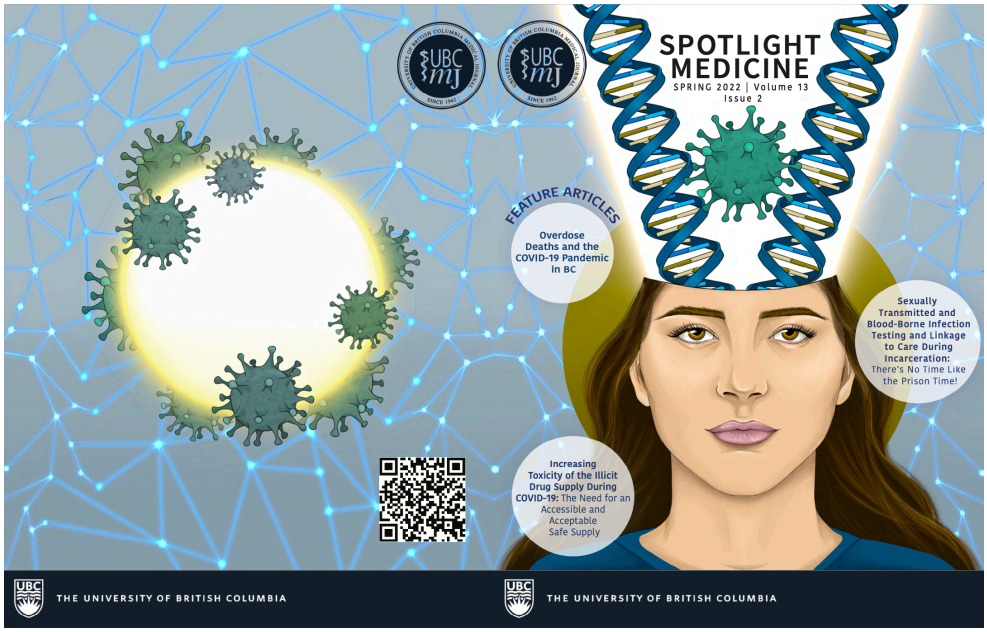
**Sexually Transmitted and Blood-Borne Infection Testing and Linkage to Care During Incarceration:** There's No Time Like the Prison Time!

**Increasing Toxicity of the Illicit Drug Supply During COVID-19:** The Need for an Accessible and Acceptable Safe Supply

THE UNIVERSITY OF BRITISH COLUMBIA

The University of British Columbia Medical Journal (UBCMJ) is a peer-reviewed, student-driven academic journal with the goal of engaging students in medical dialogue and contributing meaningful discourse to the scientific community.

# On the cover




In this issue, we explore many of healthcare's most discussed topics that are currently in the medical spotlight. In particular, the ongoing COVID-19 pandemic and its lasting effects on health and wellbeing are covered by several of our authors. To reflect this, this issue's cover art is centered around SARS-CoV-2. The virus takes centre stage within the spotlight being emitted from the physicians head to represent how COVID-19 has been, and still is, at the forefront of many healthcare workers minds.

Stephanie McCann, MD Program, Faculty of Medicine, University of British Columbia, Vancouver, BC, Canada

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# Contents

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# Spotlight medicine

Rehan Jessa[1], Emily Leung[1]

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As the coronavirus disease 2019 (COVID-19) pandemic continues into year three, preventing transmission of the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) and treating COVID-19 related complications remains at the forefront of public health matters. As of April 2022, the World Health Organization (WHO) has confirmed nearly 500 million cases and more than six million deaths attributable to COVID-19 worldwide.[1] As we transition into a period in which living with COVID-19 becomes the new normal, there remains an elevated sense of urgency to focus our attention on addressing the widespread social and economic challenges that the COVID-19 pandemic has inflicted and uncovered in our healthcare system. One of the most pressing issues the Canadian healthcare system faces today is healthcare worker burnout, a clinical syndrome classified by emotional exhaustion, depersonalization, and a decreased sense of personal accomplishment.[2] Nationwide, burnout rates were increasing before March 2020 but were significantly worsened by the pandemic, with more than 60% of Canadian healthcare workers reporting symptoms of severe burnout.[3] In fact, a recent study conducted in Vancouver, British Columbia (BC) reported that 2 in 3 internal medicine physicians have experienced burnout during the pandemic.[4] Ultimately, healthcare workers are the foundation of our healthcare system. To maintain this infrastructure, interventions to reduce inefficient workplace practices, foster community, recognize individual accomplishment, and provide resources to support the well-being of healthcare workers are necessary.[2-4]

At the patient level, advancements in telemedicine have provided convenient and timely access to patient care, but disparities in access to healthcare resources remain prevalent. For example, a meta-analysis of 68 studies in the United States evaluating disparities in COVID-19 outcomes by race, ethnicity, and socioeconomic status indicated that people of colour are more likely to test positive for COVID-19, be admitted to hospital intensive care units (ICUs), and experience worse disease outcomes compared to their White counterparts.[5] Furthermore, symptomatic cases of long COVID-19, increasing incidence of mental health conditions, and substance use continue to remain significant challenges in our healthcare system and require further attention, interdisciplinary care, and investment of resources.[6-7] Yet, our healthcare system will also need to continue making progress on delayed cancer screenings and surgical procedures. While hospital staff and resources were inevitably redirected to emergency units and ICUs throughout the pandemic, more than 550,000 surgeries were postponed or cancelled during the first three waves of the pandemic compared to the pre-COVID-19 period.[8] Ultimately, our healthcare system is poised to face great strain in the future. Further investments in the healthcare workforce including addressing the well-being of healthcare workers and providing additional supports for hospitals and clinics are required to meet the diverse needs of patients and overcome delays in care inflicted by the pandemic.

From an economic perspective, pandemic control measures including travel restrictions, lockdowns, and social distancing have affected supply chains and inflation rates, with subsequent increases in the costs of groceries, housing, and goods outpacing increases in wages.[9] While the federal government implemented temporary COVID-19 relief programs to provide short-term financial support to Canadian businesses and workers, uncertainty remains for many Canadians with respect to long-term social mobility and financial flexibility.[9] Unfortunately, economic uncertainty and financial distress have been associated with worse mental health and increased substance use.[10-11] It is, therefore, not surprising that mental health issues and substance use have increased among Canadians throughout the pandemic, which has certainly affected the volume of out-patient visits at physician clinics. It has been estimated that outpatient mental health and substance use visits increased by 13% per physician during the first year of the pandemic compared to the year prior.[12] On a community level, mental health and substance use has significantly affected Canadian families with children. A study examining the impact of the pandemic on mental health found that parents with children less than 18 years of age living at home reported worse mental health, increased alcohol intake and suicidal ideations compared to individuals without children living at home.[13]

Since the onset of the COVID-19 crisis, alcohol intake and illicit substance use has increased markedly among Canadians and has been indicated as a means of coping with SARS-CoV-2.[14] Concerns regarding financial stability, viral infection, marital challenges, and childcare are important factors that have led to increased substance use.[11,14] Individuals with existing substance use issues were also adversely affected by the pandemic. A Canadian study exploring how the pandemic has impacted substance use found that reduced drug supply and access to equipment, increased prices, greater rates of drug usage, and increased contamination of the drug supply were factors leading to a greater risk of adverse drug events and perception of overdose risk among people who use substances.[15] Of particular concern is that pandemic control measures limited access to care and in-person treatment programs for substance use. To overcome these obstacles, telemedicine was widely adopted by substance use treatment programs and appeared to have been efficacious in increasing patient attendance at scheduled appointments and support groups.[16] However, access to care remains a challenge for groups that have limited digital literacy or are living with severe substance use problems. As such, it has been recommended that telemedicine be blended with in-person visits to improve access to care for patients living with substance use issues.[16]

In UBC Medical Journal's Spotlight Medicine issue, we turn our attention to the most pressing healthcare challenges affecting BC today. Our first feature article by Lauren Airth, a practicing nurse and doctoral student at UBC Okanagan (UBCO) who currently serves as the team lead of the UBCO harm reduction team (HaRT), focuses on the evolution of the toxic drug supply and perspectives to improve harm reduction strategies and delivery. Our second feature article by Dr. Amanda Slaunwhite, a Senior Scientist at the BC Centre for Disease Control and an Adjunct Professor in the UBC School of Population and Public health, discusses how the COVID-19 pandemic has affected the toxic drug supply and provides possible solutions to alleviate this

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crisis. Our final feature article by Dr. Sofia Bartlett, a Senior Scientist for Sexually Transmitted and Blood-Borne Infections at the BC Centre for Disease Control, explores how prisons can perpetuate epidemics of sexually transmitted and blood-borne infections and what can be done to improve the health of incarcerated persons.

The social and economic consequences of the COVID-19 pandemic underscore many of the issues our healthcare system will face as we move forward in the next phase of living with SARS-CoV-2. As such healthcare worker burnout and continuing to implement accessible patient care are possible areas that can be addressed to prevent further crises while supporting the health of our population on a local, provincial, and national scale. Ultimately, the well-being of both healthcare workers and patients must be adequately addressed to tackle the most pressing health challenges facing our society.

## Conflict of interest

The authors have declared no conflict of interest.

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# Institutionalized harm reduction: A critique and potential approach to the toxic drug epidemic

Lauren Airth[1,2]

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On April 14th 2016, British Columbia's (BC) provincial health officer declared an epidemic related to the amount of deaths from unintentional, illicit opioid poisonings.[1] This public health crisis has since become known as the toxic drug supply (TDS) or drug poisoning epidemic; it is not only opioids, but the toxicity of an unregulated, illicit drug supply that is responsible for these deaths.[2,3] Moreover, significant systemic issues and barriers have also contributed, including the impacts of the coronavirus disease (COVID) pandemic and the associated public health response (e.g., increased barriers to accessing social supports, physical distancing increasing the risk of death when using drugs).[4,5] Subsequently, 2021 was the deadliest TDS year yet; BC lost 2,224 people to the TDS in 2021, which is a 20% increase from 2020.[6]

The most effective solution to this epidemic so far is the implementation of harm reduction (HR) practices.[7] Yet, despite the introduction of novel HR-based solutions in the healthcare system, the burgeoning TDS epidemic continues.[6] Thus, this article provides a brief history of Canadian drug laws to understand how the TDS evolved. A definition and history of HR will then be shared. This definition and history will be used to problematize the way the medical system has enacted HR. Finally, an example will be shared of a potential solution through interdisciplinary collaborations on a university campus. This article was written, and the work described herein occurred, on the unceded Syilx Okanagan nation territory.

This article will use the Government of Canada's definition of public health, which is "the organized efforts of society to keep people healthy and prevent injury, illness and premature death. It is a combination of programs, services and policies that protect and promote the health of all Canadians."[8] However, this paper will address all people, as HR work is not limited to Canadian citizens. Additionally, references are made to the University of British Columbia's (UBC) Wellbeing Strategic Framework.[9] This framework is based on the Okanagan Charter's calls to action, which are to integrate health into all aspects of the university and to be leaders in health promotion.[10]

## When Drugs Became 'Bad'

The start of Canada's war on drugs can be traced back to when opium became illegal in 1908.[11] This war began as an attempt from the government to punish people for the distribution and possession of illegal substances.[11,12] However, the government determined what was illegal based on what would benefit a white, neoliberal agenda; in a neoliberalist society, the commodification of resources was meant to strengthen the economy by increasing private sector competition and decreasing government spending.[11,12] This ideology also led to the commodification of citizens; humans were valued for what they contributed to the workforce.[11]

Therefore, when opium was made illegal, it was not solely for the sake of public health; opium was used for pleasure by people who had immigrated from China and it was seen as a disruption to their work ethic.[11] The creation, distribution, and use of drugs associated with immigrant populations were "viewed as a serious expression of nonconformity to, and a potential infection of, the country's"[11, p.60] white moral and neoliberalist order. As a result, police were given control of public sectors where they could eliminate threats to the neoliberal market; substances that allowed immigrant populations – the source of cheap labour – to relax and connect over cultural practices were seen as a threat.[11,13]

The 1960s saw an uprising of counterculture movements, which included an increase in public cannabis use within privileged groups.[11,13]Although cannabis was made illegal in 1923, the widespread use of cannabis amongst young, white, university men propelled conversations for legalization.[11,13] Similarly, calls for action on the TDS epidemic have also been propelled by the media's portrayal of white people as victims of the TDS instead of criminalizing them, as historically done with non-white victims of the TDS.[14] Over time, drug laws have become more punitive; there remains a disregard for the largely racist origins of these laws and how they have contributed to the increasing morbidity and morality of citizens.[6,11-13]

Importantly, Canada's history of genocide has also contributed to the inequitable impacts of the TDS.[12,15] The government used abusive, traumatic tactics to try and force Indigenous groups to align with the government's neoliberalist agenda.[12,15-16] This intergenerational trauma is an incontrovertible precursor to the potential harm that can come from substance use;[12,15-16] in comparison to other BC residents, First Nations people are 6 times more likely and First Nations women are 9 times more likely to die of the TDS.[17]

## Harm Reduction

Harm Reduction International describes HR as "policies, programmes and practices that aim to minimise negative health, social and legal impacts associated with drug use, drug policies and drug laws."[18] HR also exists on a spectrum ranging from abstinence to providing access to sterile supplies for drug use.[7] Notably, in the context of COVID-19, HR should include discussions about and access to personal protective equipment to allow people to use drugs in close proximity to other individuals.[4] To apply HR in practice, a recent concept analysis by Denis-Lalonde et al. (2019) identified seven core tenets of HR: 1) a focus on harms; 2) the involvement of people who use drugs; 3) alignment with human rights; 4) alignment with public health aims; 5) value neutrality and nonjudgement; 6) being practical and pragmatic and; 7) innovative and adaptive.[19]

Importantly, the HR movement began with activists who challenged societal norms and engaged in illegal behaviour to save lives and decrease stigma.[11,20] Safe injection sites, drug-checking, and the distribution of safe supply can all be traced back to the illegal actions of activists, which demonstrated the benefits of such approaches.[20] In the medical system, the first documented HR efforts of doctors began with prescriptions to combat opioid dependence in the early 1900s.[20] Over

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time, public health concerns - such as the acquired immunodeficiency syndrome (AIDS) crisis in the 1980s - facilitated the popularity of HR approaches.[20]

This recognition led the World Health Organization and other national groups to formally adopt HR approaches.[13,20] In Canada, HR was officially adopted in 1987 as part of the National Drug Strategy.[13] Now, the devastating impacts of the TDS epidemic have again led activists to speak up for HR approaches that align with the aforementioned tenets, which may contradict current medical system approaches.

## Neoliberal Harm Reduction is Not Harm Reduction

Based on the increasing number of TDS deaths in BC, there is something missing in the healthcare system's approach to HR.[6] That 'something' may be that HR practices in neoliberal healthcare systems are offered under the guise of empowerment.[12, 20-23] The idea of empowerment became popular in the 1960's and gained momentum with the self-help movement in the 80's.[22-25] The neoliberalist government convinced citizens they were being empowered to make their own decisions, as structural supports were removed and healthcare was commodified.[23, 26-28] For example, drug-abstinence education was offered to empower people, and facilitated individual blame for substance use issues.[7] Subsequently, neoliberalist governments manipulated citizens into doing the work of the healthcare system at citizens' expense and called it empowerment (e.g., fundraising for supplies, using volunteers to run services).[23, 26-27]

Moreover, the government has limited how patients seeking substance use support might be empowered, to align with neoliberal values; private care and pharmaceutical treatments are recommended despite considerable ineffectiveness, and some effective interventions (e.g. psychedelic therapy, safe supply) remain illegal or poorly funded.[7,29] Consequently, oppression is perpetuated by empowering patients to use colonial, government-approved treatments rather than more successful, culturally-informed ones; the government does not need to worry about the cost of systemic change if groups remain too oppressed to advocate for change.[27]

The empowerment movement clearly had unintended consequences; in neoliberalist healthcare systems, "instances of inequality and glaring social injustice are morally acceptable, at least to the degree in which they could be seen as the result of freely made decisions."[30, p.15] However, various public health crises (e.g., AIDS, COVID) have demonstrated an influential relationship between community health and individual decisions;[13,20,31] the impacts of an individual's substance use extend beyond a biomedical understanding to include the whole person and the systems they exist within.[31] Thus, in a system where HR is employed through empowering practices, communities suffer and responsibility is placed on the individual, regardless of influential policies (e.g., drug laws that promote a toxic drug supply).[24,26] Moving forward, to distinguish this form of HR from grassroots HR, neoliberalist approaches will be described as institutionalized HR (IHR).

With these things in mind, our current medical system may not be practicing HR in an effective manner. Considering the core tenets of HR,[19] IHR does not comply with human rights, as the right to life is compromised by the inability to access life-saving resources.[32] IHR also compromises public health, as evidenced by the increasing morbidity and mortality of the TDS.[6] Additionally, the values of being pragmatic, innovative, and adaptive are not easily integrated into large, bureaucratic systems like the current healthcare system.[19-20] It is critical for healthcare professionals to consider how they can adapt their HR practices to address the needs of the community.[20]

## Breaking Barriers to Enact Harm Reduction

Knowing the importance of the relationship between individual behaviours and community health, a community-based approach has been used to integrate HR into the University of British Columbia's Okanagan (UBCO) campus.[33-34] The small, resource-rich environment of UBCO (e.g., access to equipment, experts, funding, space) makes it an ideal place to test and establish innovative HR approaches that counter IHR; here, experts and students in various disciplines contribute resources and knowledge to inform initiatives.[19,34] Additionally, these collaborations inform HaRT's work in trauma-informed, culturally safe, diverse, equitable, and inclusive ways.

To enhance initiatives, partnerships have been formed with local and provincial HR experts, including people with lived and living experience of drug use (peers). Meetings have also been held with representatives from various campus health, safety, and student life offices. This work is conducted through the Voice Campus Health project (Voice), which uses community based participatory action research to understand the experience of the campus community and implement initiatives to address the health priorities of the campus.[34] The individual leading this work is also a graduate-educated registered nurse specialized in mental health and substance use.

Students working with Voice conducted community dialogues to understand the impacts of the TDS at UBCO, and found that the campus community desires more resources regarding lower-risk substance use.[35] Stemming from the history of drug policies described above, many students have expressed feeling uneducated, unsupported, fearful, and stigmatized regarding their substance use.[35] To address these concerns, UBCO's HR Team (HaRT) was established in December 2020 with the goal of enhancing access to resources for lower-risk substance use and decreasing stigma through policy work and interdisciplinary relationships through the lens of intersectionality.[36]

Members of HaRT aim to establish a culture of HR on campus that aligns with the tenets described by Denis-Lalonde et al. (2019), and incorporates and recognizes the role of HaRT's work in truth and reconciliation efforts;[36-37] "Indigenous [HR] is a way of life, embedded within traditional knowledge systems that see the spiritual world, the natural world, and humanity as inter-related."[37, p.4] To prevent IHR and to address the Collaborative Leadership aspect of the UBC Wellbeing Strategic Framework[9], the HaRT is made up of interdisciplinary staff, faculty, and students who are also peers with intersecting identities; working across professional boundaries facilitates community-based collaboration as opposed to individuals benefiting or suffering from neoliberal structures.[30,38]

HaRT members also conduct HR work throughout the region; HR services are provided at six different locations (e.g., supervised injection sites, clinics, non-profit organizations) in three different communities.[36] Using health authority supplies and support, the HaRT operates a Fourier Transform Infrared Spectroscopy (FTIR) machine for HR drug-checking, alongside immunoassay strips. When clients bring their drugs to get checked, HaRT staff use this technology to analyze the drug and provide clients with information on how to use their drug in a lower-risk way.[39] Although the HaRT uses the FTIR on campus and in the community, for the purposes of this article, the HaRT's work will be described in terms of their role on campus and will not detail the community work.

The following will describe how HaRT's program aligns with the

seven core tenets of HR described by Denis-Lalonde et al. (2019).[19] These tenets also align with the UBC Wellbeing Strategic Framework priority areas of Mental Health and Resilience as well as Social Connection.[9] Notably, the work described herein is done in accordance with COVID safe protocols. The author would also like to note the importance of their partnership with the BC Centre on Substance Use in being able to meet these core tenets; this organization leads drug-checking work within the province and globally.

### 1. A Focus on Harms[19]:

Campus reports show that students use substances in ways that are harmful to their health due to a lack of resources (e.g., education, mental health support).[35] To address these harms, the HaRT model includes drop-in informational sessions (online and in person), overdose awareness and prevention training including naloxone distribution, workshops on lower-risk partying, creation and distribution of resources related to lower-risk drug use, drug-checking services, sterile supplies, and advocacy and awareness campaigns. This work includes resources for people who support loved ones that use substances, which has been identified as a gap in the community dialogues.[35]

### 2. Involvement of People Who Use Drugs[19]:

Resources are created and/or informed by peers (e.g., students, staff, faculty, community members). Furthermore, recognizing that HR exists on a spectrum, the HaRT partners with UBC's Student Recovery Community; the Student Recovery Community's "peer support, evidence-based model is designed to empower students with lived experience to support one another on their chosen recovery pathway. The community supports all pathways of recovery—from HR to abstinence, and everything in between."[40]

### 3. Human Rights and Public Health[19]:

HaRT members abide by the Canadian Charter of Rights and Freedoms and engage in public health through the prevention of substance use harms and promotion of harm-reducing resources.[32] However, HaRT recognizes that human rights should also include the addressing of systemic inequities.[41] Therefore, the HaRT model integrates four of the goal-oriented actions from UBC's Inclusion Action Plan:[42] 1) Inclusive Spaces and Initiatives – HaRT staff use trauma informed, culturally safe, diverse, and inclusive principles to foster safe and inclusive spaces for HR through multiple modes (e.g., e-mail, zoom, text, call, in-person); 2) Systems Change and Capacity Building – HaRT leadership represents and collaborates with historically marginalized communities and participates in equity, diversity, and inclusion (EDI) training; 3) Learning, Research, and Engagement – the HaRT has community relationships that foster learning and research opportunities for and about historically marginalized communities and engages Indigenous community members and peers as experts; and 4) Accountability - HaRT members use and promote EDI reporting mechanisms, engage external EDI experts, and complete annual evaluations on EDI.

Moreover, to address systemic issues related to human rights and public health, HaRT aligns with UBC's Indigenous Strategic Plan Goals 1-3 (Leading at All Levels, Advocating for the Truth, Moving Research Forward) and Goals 5-8 (Enriching Our Spaces, Recruiting Indigenous People, Providing Tools for Success, Creating a Holistic System of Support).[43] The HaRT meets these goals through relationships with Indigenous community representatives, workshops on decolonizing HR work, and collaborating on HR initiatives with Indigenous community members. Additionally, the HaRT program includes Indigenous ways of knowing, Indigenous staff who inform the work, and support/access to Indigenous specific resources. The team acknowledges and raises awareness about the influence of colonization, stigma, and criminalization on the inequitable impacts of the TDS.

### 4. Prevention and promotion[19]:

HaRT members provide people with evidence-based educational resources (e.g., social media posts, posters, workshops), tools (e.g., drug-checking, sterile needles, naloxone), and skills (e.g., overdose response, self-care) to prevent harms from drug use and/or harm from loved ones' drug use. The HaRT also promotes mental health resources and partners with a campus clinic that helps students assess their relationship with substance use. Collectively, these resources allow people to engage in alternative ways of coping when substance use may lead to additional harms.

### 5. Value Neutrality and Nonjudgement[19]:

Members of HaRT do not discriminate against the clients or stakeholders they collaborate with based on gender, income, sexual orientation, ethnicity, race, or religion.[42] Additionally, the intersecting and interdisciplinary identities of HaRT members allows them to operate from a mindset of curiosity instead of judgement, where they seek to understand the strengths and inequities that exist in their differences.[41] This mentality is assisted through mandatory training with EDI experts and resources.

### 6. Practical and Pragmatic[19]:

The HaRT program is based on the practical considerations of what students need and what interventions they believe will be effective at UBCO.[35] Rather than expecting students to leave the comfort of a familiar campus to pursue HR in unfamiliar environments, HR is integrated into student spaces (e.g., housing, student clinic, collegiums) at times when students are unlikely to encounter other staff or faculty.[38] Additionally, services are provided with the option for the most anonymity possible; reports have shown that students fear academic repercussions related to their substance use.[35]

### 7. Innovative and Adaptive[19]:

As far as the author is aware, the HaRT is the only Canadian team providing regular HR with spectroscopy drug-checking on a university campus. As such, the development and oversight of this service requires the adaptation of other drug-checking service models to adjust to an academic environment. Additionally, the HaRT was established mid-COVID pandemic, which meant the team had to adapt their services to be socially distanced and accessible to remote students. HaRT leadership continues to adapt their services in response to stakeholder feedback and the HaRT program model is the focus of an ongoing research study.

## Discussion

The first problem raised related to IHR is the offering of HR under the guise of empowerment. Recent statistics show that there has been a decline in the number of people accessing detox facilities and related professional supports.[44] It is possible that this decline is because of the way IHR is presented; it is unlikely that people want to engage with systems that claim to be non-judgemental but operate under racist policies and/or rely on colonial-informed treatments.[11,12,20] For this reason, in the HaRT model, relationships with peers are prioritized to inform practical and pragmatic interventions that reduce harm.[38] Additionally, high value is placed on relationships with community organizations who have long-standing relationships with peers and that operate in trauma informed, culturally safe, EDI ways.[45] Collaborating with their expertise establishes informed and effective interventions.[38]

Relatedly, by hosting the HaRT at a university, the resources of a privileged institution are harnessed to address public health, rather than forcing non-profit organizations to compete for resources in a neoliberal market.[23,30] HaRT peers are also compensated as experts; people who have historically been oppressed for operating in non-neoliberal ways are able to contribute to solutions.[38] By including peers in the HaRT model, people are also more likely to use the HaRT services, which further enhances the likelihood of reducing harm.[38] Hiring peers and strengthening community relationships leads to enhanced wellbeing for people who use drugs, the people who deliver services, and their communities.[38]

Through the HR approach taken by the HaRT, responsibility is integrated into the community rather than placed on the individual. The community approach considers the environments that people are situated in and challenges the messaging and policies that perpetuate inequities for historically marginalized groups.[20] Additionally, by removing the ownership of this program from one discipline to be interdisciplinary, the HR activities undertaken are done in alignment with what is best for the community rather than individual organizations, professions, or leaders.[11,20,41] By making it a community responsibility, shame can be removed from the individual, which enhances the likelihood of people accessing life-saving resources.[4]

## Challenges

Although the HaRT has made significant progress in pushing the boundaries of HR in a university setting, there are still challenges to be addressed. The HaRT operates within systems that are historically informed by discriminatory policies;[11-13] the legal system that oversees education and healthcare continues to influence HR possibilities.[20] Yet, the TDS is a fast-evolving public health concern and rapidly increasing deaths demand quick, effective solutions.[6] Peers hold the most expertise in this realm and need to be valued in the same way that researchers are to see sensible, life-saving policies implemented.[38]

Additionally, this work is undergoing more formal evaluation as part of the author's doctoral studies. Anecdotally, HaRT services have decreased stigma, prevented TDS deaths, and enhanced a sense of support on campus. However, the author is unable to share formal data currently.

## Conclusion: Harm Reduction as a Way of Being

This article demonstrated that TDS deaths have resulted from a failure to critique and evolve from the origins of corrupt drug policies in Canada.[11] This article also raised the question of whether IHR is HR. Subsequently, an HR program at a large, complex institution has demonstrated possible solutions by beginning to integrate HR through community-based partnerships and alignment with institutional strategies.

Rather than be intimidated and silenced by the legalities of implementing a novel HR intervention at a university, existing institutional frameworks were used to justify, inform, and align with the HaRT model. Healthcare professionals work in many diverse, complex systems, and will not escape the impacts of the history and current context of the TDS. When healthcare professionals enter these institutions, it is their responsibility to their patient to determine if and how the healthcare professional is perpetuating racist policies upheld under the guise of empowerment. Furthermore, it is also their responsibility to acknowledge the harm done by IHR, to partner with peers, and to engage the central tenets of HR not only through treatments, but through an embodiment of harm-reducing practice. The only way to put a stop to the increasing TDS deaths, is by changing the way things have always been done within established institutions.

## Conflict of interest

The author has declared no conflict of interest.

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# Sexually transmitted and blood-borne infection testing and linkage to care during incarceration: There's no time like the prison time!

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## Abstract

We provide a comprehensive overview of the role of prisons in perpetuating epidemics of sexually transmitted and blood-borne infections (STBBIs). The concentration of STBBIs in prisons is largely due to the over representation of people who inject drugs in these settings, and is amplified by inconsistent testing strategies, sub optimal connection to care, and the lack of access to comprehensive harm reduction in prisons. Universally offering STBBI testing, scale-up of harm reduction strategies, STBBI treatment, education and peer support in prisons could break this cyclical effect, and result in further improvements in the overall health and wellbeing of people who experience incarceration.


## STBBIs are highly prevalent among people in prison

Over half of people in prison in Canada report a lifetime history of injection drug use (IDU).[1] Additionally, over three-quarters of people who inject drugs (PWID) in Canada have been incarcerated;[2] a result of laws and policing that target substance use, broadly known as 'the war on drugs'.[3] While these efforts have been shown to have little impact on rates of substance use, they have resulted in the over representation of PWID within prisons.[4] Because IDU is a major route of transmission for sexually transmitted and blood-borne infections (STBBIs) such as human immunodeficiency virus (HIV) and hepatitis C virus (HCV), the prevalence of these infections is significantly higher among PWID compared to non-PWID.[5] Additional factors that are more common among cis-and-transgender women who inject drugs, such as involvement in survival sex work, mean this group has an even more elevated prevalence of STBBIs.[6] The higher prevalence of STBBIs among PWID, and over representation of PWID within prisons, results in the concentration of STBBIs among people in prison (Figure 1).[7, 8] Global goals to achieve HCV elimination by 2030[9] and end the HIV epidemic by 2025[10] have been endorsed by the federal Canadian government, and these strategies call for the prioritisation of people in prison as part of efforts to address these infections. Despite this, there is no consistency in implementation of STBBI screening as part of intake health assessments in correctional health care services across Canada.[11] Additionally, the same standard of harm reduction that is available in most communities, such as provision of sterile drug use supplies, or Opioid Agonist Therapy (OAT), is not available within most prisons in Canada or elsewhere.[12] As such, sharing of drug use equipment is common in prison settings.[13] This means that STBBI transmission can occur within the prison system,[14] resulting in amplification of STBBIs in prisons.[15]

Provincial and territorial correctional centres across Canada have reported inconsistent implementation of STBBI testing,[11] impeding rapid identification of STBBIs and linkage to care for treatment and follow up among people in prison.[16] As a result, deterioration of health status after entry to prison is common. The majority of people in prison will return to the community quickly; the average length of stay in BC Provincial Correctional Centres (BCPCCs), where people serving custodial sentence <2 years or people held on remand (unsentenced, awaiting trial, or on immigration hold), was 65 days in 2021.[17] While prisons are considered to be a closed environment, people are moving in and out of them constantly, resulting in dissemination of STBBIs from prisons.[18] After release from prison, there are many barriers to maintaining health for people affected by STBBIs, such as discrimination by primary care providers,[19] disruption to medications,[20] and other competing priorities.[21] This can result in considerable STBBI-related morbidity and mortality among people released from prison.[22] Re-incarceration occurs frequently, particularly for people released back to the community with on-going substance use,[23] therefore the damaging cycle continues.

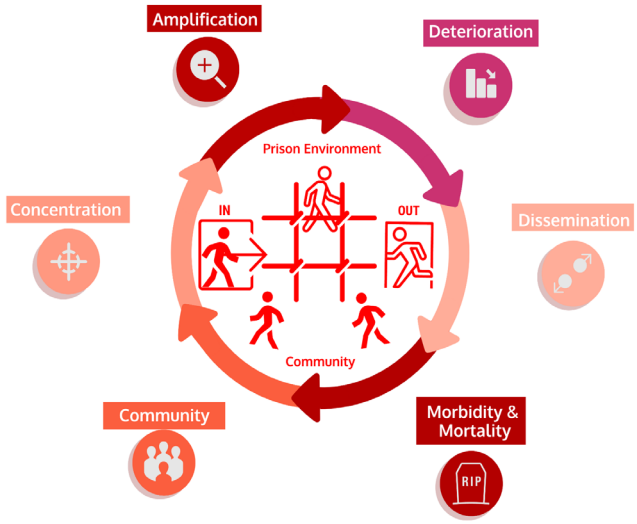


**Figure 1:** Conceptual framework for the role of prisons in the damaging cycle of sexually transmitted and blood-borne infection concentration, amplification, deterioration, dissemination, morbidity and mortality. Redrawn from Awofeso and colleagues[46] and Kamarulzaman and colleagues.[47]

## What can be done to address this damaging cycle?

Decarceration strategies, such as community supervision, have been implemented globally in response to the COVID-19 pandemic.[24] Decarceration would likely have a positive effect on reducing the concentration of people affected by STBBIs in the prison system (Figure 2). However this is largely out of the control of the health care system. As physicians and public health practitioners, we may instead focus on interrupting subsequent phases, such as amplification and dissemination. These could be disrupted through increasing coverage of OAT among

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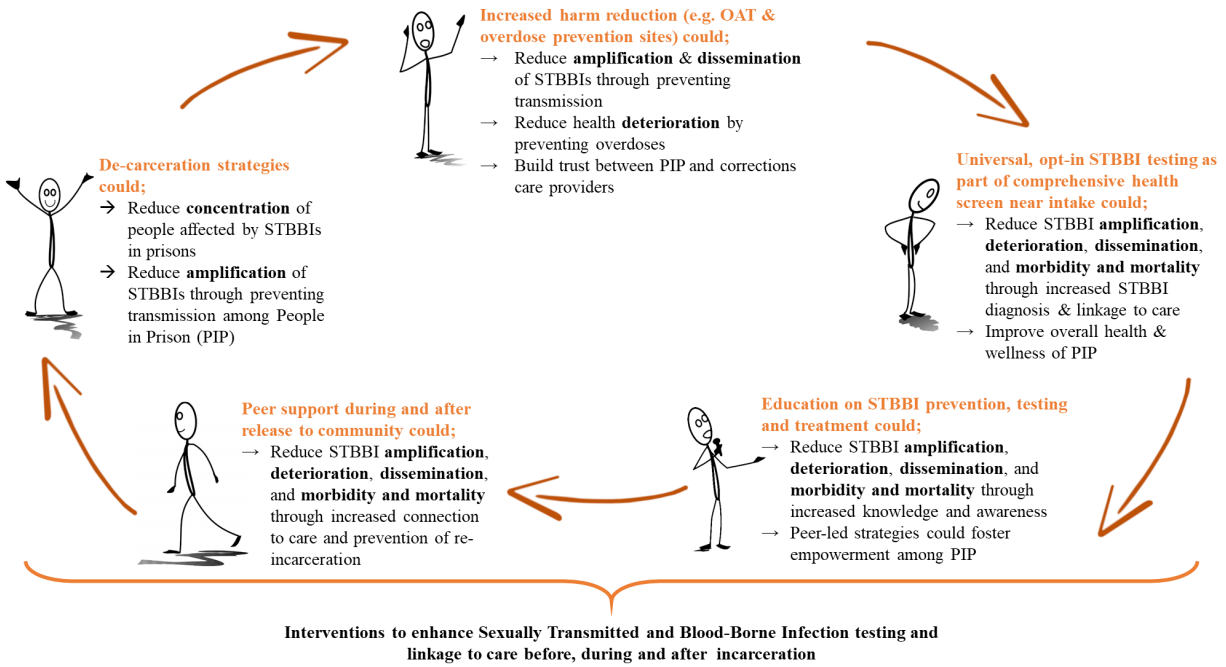


**Figure 2:** Conceptual framework for the interrelated and snowballing benefits of interventions to enhance Sexually Transmitted and Blood-Borne Infection (STBBI) testing and linkage to care before, during and after incarceration.

people in prison, which is already occurring within BCPCCs[25] but requires further scale up to meet needs in other provinces and territories and within federal institutions.[26] Additionally, expansion of harm reduction strategies such as overdose prevention sites within prisons may further reduce STBBI transmission, with the added benefit of reducing overdoses.[27] Deterioration could be disrupted by universally offering STBBI testing to all people in prison.[28,29] Studies have found that STBBI tests offered during or soon after intake to custody are effective strategies to increase STBBI diagnoses.[30,31] In order to normalize STBBI testing and ensure other unmet health needs are met, STBBI testing can be offered as part of a comprehensive health screen for conditions common among people in prison, such as mental illness, hypertension, diabetes, or arthritis.[32] To ensure client preferences and agency are respected,[33] as well as to incorporate trauma-informed care practices, people in prison should be asked whether they wish to receive this testing,[34] and testing only performed with client consent.

Education for people in prison on STBBIs is an effective way to reduce multiple phases of the cycle, including amplification, deterioration and dissemination.[35] Peer-based education strategies have been found to be particularly effective at increasing STBBI knowledge, and have additional benefits such as increasing self-esteem and confidence among people in prison.[36-38] Expeditiously linking people in prison diagnosed with an STBBI to treatment is another effective strategy to reduce STBBI prevalence within correctional settings. It has already been demonstrated that HCV treatment scale up within prisons can eliminate the virus from these settings,[39] therefore treatment may interrupt the amplification, deterioration and dissemination phases. Treatment while in prison could also further reduce morbidity and mortality after release, and reduce the concentration of STBBIs among people re-entering prison. Finally, linking people in prison to Peer support and mentoring prior to, and during, release from prison has been shown to support successful transition back to the community.[38,40] Test, Link Call (TLC) Project,[41] a Quality Improvement project run in collaboration by British Columbia (BC) Centre for Disease Control,[42] BC Mental Health and Substance Use Services (BCMHSUS),[43] Unlocking the Gates,[44] and BC Hepatitis Network,[45] utilizes Peer Health Mentors to provide linkage to HCV care after release from BCPCCs.

## There's no time like the prison time!

People in prison face a high risk of STBBI-related morbidity and mortality through a cycle of concentration, amplification, dissemination, and deterioration. Many strategies exist to disrupt this cycle and improve the health of people in prison through prevention, diagnosis, and treatment of STBBIs. In order to fully realise the benefits of these strategies, they must be scaled up within correctional settings and in the community. This will likely have positive effects on the health of people in prison, as well as contribute to goals of reducing the impact of STBBIs in the overall population, including contributing to HCV elimination by 2030 and ending the HIV epidemic in Canada by 2025. With all of these tools available to reduce the prevalence of STBBIs among people in prison, there truly is no time like the prison time.

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# Increasing toxicity of the illicit drug supply during COVID-19: the need for an accessible and acceptable safe supply

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## Abstract

Illicit drug toxicity (i.e. overdose) is the leading cause of unnatural death in British Columbia, with 2021 recording a 26% increase since 2020, and more deaths than recorded in any prior year. This rise has been largely driven by the increased toxicity of the illicit drug supply. While harm reduction and treatment interventions have reduced deaths, these services alone are insufficient to stop the illicit drug toxicity crisis. Calls are mounting to provide access to a "safe supply" of drugs. One size does not fit all, and a diverse range of substances must be made widely available to separate British Columbians from the illicit drug supply.

## Background

In 2021, there were 2,224 suspected illicit drug toxicity (i.e. overdose) deaths in British Columbia (BC), reflecting a 26% increase since 2020, and more deaths than recorded in any prior year.[1] Illicit drug toxicity is the leading cause of unnatural death in BC, outpacing all homicides, suicides, and motor vehicle deaths combined, and remains the leading cause of mortality among young people (aged 19-39). The median age of people who died from illicit drug toxicity in 2020 was 43 years, making it the second (after cancer) leading cause of years of life lost in BC.[2]

Rates of illicit drug toxicity death have increased significantly in during the Coronavirus disease 2019 (COVID-19) pandemic, reaching an all-time high of 42.8 deaths per 100,000 in 2021. This rise has been attributed in part to physical distancing protocols and the reduced service capacity of critical health facilities such as overdose prevention sites.[3] Such reduced service capacity can leave more people using alone, without anyone present to monitor for and respond to overdose if it does occur. Studies have shown that the characteristics of people dying from illicit drug toxicity death have changed since March 2020, indicating that existing inequities in services access have been exacerbated by the pandemic. For example, analyses from BC and Ontario identified more people dying in shelters[4] and outdoors and more deaths among older age groups.[5]

In the context of ongoing inequities in services access, recent studies have concluded the need for expanded and diversified harm reduction and treatment interventions in order to reach and engage people who remain at highest risk of morbidity and mortality.[6,7] While interventions are greatly needed to connect people to services and care, it is critical to acknowledge that access to these services is often only initiated after a drug toxicity event, and these services alone cannot stop the illicit drug toxicity crisis as they do not address the toxicity of the drug supply. So long as the drug supply remains highly toxic, this elevated risk of death persists for all people who use substances in BC, whether using occasionally or every day. As such, expansion of harm reduction and treatment interventions must be coupled with an accessible and acceptable safe supply of regulated drugs in order to end the ongoing crisis of preventable illicit drug toxicity death that kills six British Columbians each day.[1]

## The toxic drug supply as a primary driver of deaths

The initial rise in illicit drug toxicity deaths in BC that led to the declaration of the "overdose crisis" as a public health emergency on April 14, 2016 was driven by illicit fentanyl, a potent synthetic opioid that was detected in 5% of illicit drug toxicity deaths in 2012, and 85% of deaths in 2020.[1] The rising rates of illicit drug toxicity death observed since the declaration of the COVID-19 pandemic in BC have been mirrored by increases in the toxicity of the illicit drug supply. Given fentanyl and its analogues have been a consistent presence in the drug supply over the past decade, reporting on the presence or absence of fentanyl is not particularly useful. Instead, more recent drug toxicity surveillance and monitoring has included a focus on drug concentration data and the presence of novel substances to provide a clearer picture of the evolving drug supply. The BC Coroners Service post-mortem toxicology results reveal that approximately 7% of deaths had extreme fentanyl concentrations (concentrations >50ug/L (micrograms/litre)) in March 2020. This number has been steadily climbing since then in tandem with the rise in illicit drug toxicity deaths, reaching 28% in November 2021 (See Figure 1).

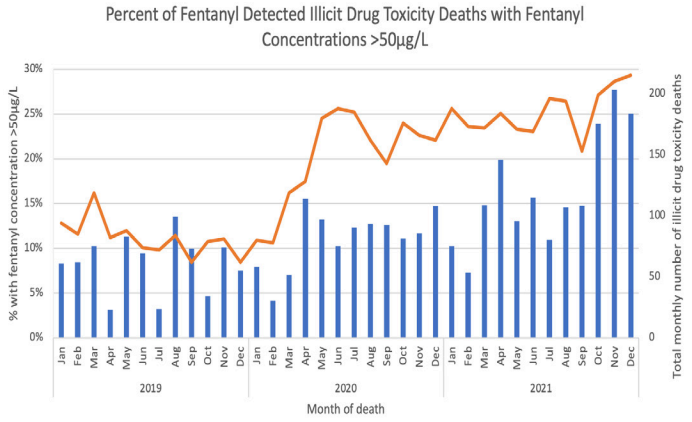


**Figure 1: Percent of fentanyl detected illicit drug toxicity deaths with fentanyl concentrations >50µg/L and monthly number of illicit drug toxicity deaths.** The denominator is number of deaths where fentanyl was detected and where concentration data were available. This is typically above 90% of fentanyl cases each month. Data are derived from the BC Coroners Service data on illicit drug toxicity deaths.

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Furthermore, novel benzodiazepine/benzodiazepine-like sedating substances including etizolam and flualprazolam have been increasingly detected in the drug supply since 2020[8] and among people who have died from illicit drug toxicity in BC.[9] While the detection of fentanyl and its analogues, other opioids, and stimulants have remained relatively stable in decedents during this period, the detection rate of benzodiazepines rose rapidly from 15% in July 2020 to 50% in December 2020 (See Figure 2). Benzodiazepines present a number of challenges to responding to illicit opioid toxicity events, including prolonged sedation[10] which can result in naloxone over administration, and subsequent opioid withdrawal. Dependence to and withdrawal from benzodiazepines can begin after only a few weeks[11] and can be difficult to differentiate from opioid withdrawal,[10] presenting further challenges to the management of already complex and potentially fatal illicit drug toxicity events.

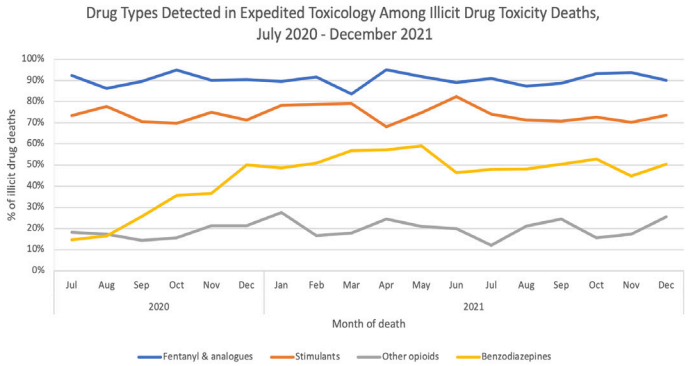


**Figure 2: Drug types detected in expedited toxicology among illicit drug toxicity deaths, July 2020 - December 2021.** Expedited toxicology is completed on approximately 70-80% of all illicit drug toxicity deaths each month; Fentanyl and analogues include: acetylfentanyl, fentanyl, carfentanil, norfentanyl; Stimulants include: Cocaine (inc. cocaethylene, benzoylecgonine), Methamphetamine/amphetamine, MDMA/MDA; Other opioids include: 6-Monoacetylmorphine, Codeine, Hydromorphone, Methadone (inc. EDDP), Morphine, Oxycodone; Benzodiazepines include: Alprazolam, Etizolam, Flualprazolam. Data are derived from the BC Coroners Service expedited toxicology data on illicit drug toxicity deaths.

## Prescription alternatives are not responsible for the rise in deaths

In efforts to reduce the increased risk of drug toxicity death for people who use illicit drugs in the context of the pandemic, in March 2020 the BC Ministry of Health and BC Centre on Substance Use released "Risk Mitigation Guidance" (RMG). This document provided guidance to physicians and nurse practitioners on prescribing pharmaceutical alternatives to the toxic drug supply. These alternatives included prescription opioids, stimulants, benzodiazepines and alcohol withdrawal management medications. Recent surveillance indicates that only a small proportion of people at risk of illicit drug toxicity death have been reached. For example, in the first year of implementation, approximately 3,771 people received at least one RMG opioid prescription,[12] representing <5% of people estimated to have an opioid use disorder diagnosis in BC.[13] Despite the lack of widespread availability of RMG medications, there have been concerns that access to these medications might be driving the observed increase in illicit drug toxicity deaths in BC. As noted by the BCCS, there is no data to support this claim.[1] For instance, analyses conducted using records of all illicit drug toxicity deaths in BC between March 2020 and May 2021 reveal that hydromorphone was detected without fentanyl or its analogues in less than 2% of deaths and that the proportion of deaths with hydromorphone detected did not change significantly following the introduction of RMG in March 2020.[14]

## Improving the accessibility and acceptability of a safe supply

Calls are mounting in BC and in North America, from advocacy groups, researchers, and policy makers to provide access to a "safe supply" of drugs.[15-20] While "safe supply" can include prescribed medications like those listed in the RMG, the term refers more broadly to a legal and regulated supply of drugs that have traditionally been accessible only through the illicit drug market.[19] Safe supply approaches have been informed by evidence from injectable opioid agonist treatment programs (iOAT) in Europe and Canada[21] whereby patients receive access to injectable diacetylmorphine (medical grade heroin) or hydromorphone (a potent opioid analgesic). Access to these medications has led to significant reductions in illicit opioid use, and improvements in health and social outcomes.[22-24] These pragmatic approaches to reaching and meeting the needs of people who use illicit drugs by providing safe versions of their preferred drugs have been practiced for decades in European countries with positive individual and societal outcomes.[25, 26] Furthermore, where a range of options have been available, there has been no evidence of excessive demand for any single medication,[27] emphasizing the need for diversified options to meet a range of individuals' needs.

Recent analyses reflect important insights with regard to opioid use preferences in BC. For example, a survey of people accessing harm reduction services in health authorities across the province found that despite fentanyl's dominance in the illicit drug supply, the majority of participants reported heroin as their preferred opioid.[28] Existing iOAT programs in BC have demonstrated the possibility of safely and effectively transitioning people from illicit fentanyl to injectable diacetylmorphine (prescription heroin) or hydromorphone[29] using an accelerated dosing protocol. Flexible and accelerated dosing protocols such as this one reflect an evidence-based approach that could be expanded to meet the preferences of many people currently using illicit opioids in BC. Nevertheless, expansion of injectable options on their own will not be sufficient to meet all needs, given the rise in other modes of consumption in recent years. For example, smoking has been the most commonly identified mode of consumption among people who died of illicit drug toxicity death each year between 2017-2020 in BC,[9] yet currently available opioid safe supply options do not include smokable options. One size does not fit all, and substances made available as part of "safe supply" must be acceptable to people who they are intended to reach. Given the breadth of substance use preferences that exist among British Columbians this will require a broadening and diversifying of the substances offered as part of "safe supply". This could include expanded substance types that can be safely used by various modes of consumption (e.g. injected, smoked), and offered in quantities that are sufficient to not require ongoing contacts with the illicit drug supply.

The pandemic has created opportunities for approaches to delivering services that were previously not made possible, for example, by providing take-home rather than daily witnessed doses.[30,31] Instead of serving as exceptional cases, substances must be routinely delivered in more flexible ways and in adequate doses to align safe supply programs with the goals of harm reduction[31], and to replace the illicit toxic drug supply. This expansion will have the best chances of success if it is guided by people with lived and living experience of substance use who are

experts in their own preferences and substance use needs.[32,33]

## Conclusions

While harm reduction and treatment interventions have been effective at reducing deaths, illicit drug toxicity events have continued to increase since the declaration of the overdose public health emergency in 2016. The illicit drug supply is the foremost contributor to illicit drug toxicity deaths in BC and the leading cause of death for young people (aged 19-39). There is a clear need to provide access to a safe supply of substances for all British Columbians.

## Conflict of interest

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# Genetic testing for familial hypercholesterolemia in acute coronary syndromes

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## Abstract

Familial Hypercholesterolemia (FH) is a highly prevalent genetic cardiovascular disorder affecting an estimated one in 311 individuals and characterized by increased low-density lipoprotein cholesterol (LDL-C). Patients with FH have an elevated risk of atherosclerotic cardiovascular disease (ASCVD). If left untreated, 50% of men and 32% of women with FH develop ASCVD by age 60. Importantly, numerous patients under 60 years of age presenting with a premature ACS have undiagnosed FH. Despite its prevalence, FH is highly underdiagnosed worldwide. Genetic testing and cascade screening for FH are powerful tools in addressing the current gap in FH underdiagnosis. Genetic testing is currently recognized as the gold standard diagnostic tool in widely accepted validated diagnostic criteria for FH. First-degree relatives of patients identified to have FH can be screened with molecular and genetic testing in a process known as cascade screening.


## Introduction

Familial hypercholesterolemia (FH) is the most common inherited autosomal codominant cardiovascular condition and causes an increase in atherogenic low-density lipoprotein cholesterol (LDL-C), leading to a ten-fold increased risk in atherosclerotic cardiovascular disease (ASCVD).[1] Although FH is estimated to affect one in 311 individuals, is classified as a tier I genetic condition, and meets the World Health Organization criteria for screening, it is largely underdiagnosed worldwide.[2,3] In British Columbia (BC) alone it is estimated that >85% of patients with FH have not yet been diagnosed, and thus are not receiving appropriate treatment.[4] If left untreated, 50% of men and 32% of women with FH develop ASCVD by age 60.[5] Furthermore, compared to normolipidemic individuals, ASCVD risk increases six-fold when LDL-C > 5 mmol/L, and increases 22-fold in patients with a confirmed pathogenic variation in the LDLR, APOB, or PCSK9 genes.[6] Specifically, treatment for FH includes aggressive lipid-lowering therapy in addition to lifestyle modifications; together, these can reduce the risk of an adverse cardiovascular event down to the background population level.[7,8] Although there are clear benefits to early diagnosis of FH, there are many challenges that have prevented widespread testing. These challenges include a lack of accessible and easily interpretable genetic testing. Due to recent advancements in next-generation sequencing assays, there are many solutions that can be used to overcome these challenges.

## Relationship Between FH and Acute Coronary Syndrome

As FH leads to an increase in LDL-C, and high LDL-C is an established risk factor for acute coronary syndromes (ACS), it can be expected that patients with FH should have higher levels of ACS. Indeed, this has been confirmed in a recent meta-analysis which showed that one in 22 patients with ACS has FH, and this increased to one in 14 for patients who are younger than 60 years of age, and one in seven for patients under 45 years-of-age.[9] These findings suggest that targeted opportunistic testing in patients with ACS is a highly effective method of identifying new cases. In particular, testing of all patients under 60 years of age presenting with ACS would be a high yield method of identifying patients with FH.[9] As these patients have an elevated risk of subsequent acute coronary events, they warrant close follow-up and aggressive lipid-lowering treatment.[10] To establish a diagnosis of FH, there are many clinical definitions including the Dutch Lipid Clinic Network Criteria, Simon Broome Criteria, and the simplified Canadian definition of FH, all of which take into account results from genetic testing.[11–13] Furthermore, genetic diagnosis of FH better reflects coronary artery disease (CAD) risk in the context of lifelong exposure to elevated LDL-C.[14]

## Monogenic vs Polygenic FH

FH can be further classified as having a monogenic or polygenic cause.[15] When trying to classify FH, the American College of Medical Genetics and Genomics and the Association for Molecular Pathology (ACMG/AMP) guidelines can be used for known pathogenic monogenic variants.[16] Furthermore, the ClinVar database has identified annotated known pathogenic genetic variants in the FH-associated genes proprotein convertase subtilisin/kexin type 9 (PCSK9), low-density lipoprotein receptor (LDLR), and apolipoprotein-B (APOB). Thus, the ClinVar database can be used as a reference for characterizing variants as being either pathogenic or not. For any variants that are not classified within the ClinVar database, there are the Clinical Genome Resource (ClinGen) FH Variant Curation Expert Panel guidelines.[17] These guidelines classify pathogenicity into very strong, strong, and moderate pathogenicity as well as the supporting criteria for this classification. The diagnosis of polygenic FH depends on the calculation of a polygenic risk score based on a patient's identified single nucleotide variants.[18] Ultimately there is a spectrum of FH, with the most clinically relevant being the monogenic variety. To simplify the process of diagnosis and management, genetic reports should include interpretations of results including the clinical impact of the discovered variants.

## Barriers to Testing in Canada

Opportunistic testing for FH can also be used for cascade screening, which is a highly effective way of identifying new cases.[19] Cascade screening involves starting with a known case of FH and screening first-degree relatives with subsequent molecular and genetic testing. When screening identifies another individual who has FH, these steps are repeated, thus leading to a cascade of diagnoses. Due to the autosomal dominant nature of FH, there is a 50% chance that tested first-degree relatives will also have FH, making cascade screening highly effective.[19] Currently, the only way to obtain a genetic diagnosis of FH in BC is through the FH registry at the Healthy Heart Program. All FH diagnoses are based on LDL-C

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levels, past medical history, symptoms, and any available genetic testing results for commonly associated FH genes. Such genes include PCSK9, LDLR, and APOB. Known pathogenic variations in these genes allow for the diagnosis of definite FH in all the previously mentioned criteria. In other words, genetic testing can unequivocally establish the diagnosis of FH based on worldwide guidelines. Despite this direct link, Quebec is currently the only Canadian province that funds genetic testing for the diagnosis of FH.[11] In BC, a reimbursed test is not available, therefore, testing is not accessible for most patients and clinicians. Furthermore, lipid screening for asymptomatic patients is not indicated until after 40 years of age in BC, meaning that FH patients may be exposed to elevated LDL-C for up to 40 years prior to starting lipid-lowering therapy.[20]

## Benefit of Genetic Testing

Targeted next-generation sequencing assays have been shown to be both sensitive and specific in the diagnosis of FH.[21] A research-based assay has been used to identify hundreds of patients with FH in BC.[14] Among patients with a diagnosis of FH, those with a positive genetic test have been shown to have a higher risk of cardiovascular events, therefore, screening patients with premature CAD can better identify new cases.[14] Furthermore, opportunistic genetic testing, if implemented in the context of cascade testing, has the potential to be a powerful tool in both preventing adverse cardiovascular outcomes and providing prognostic information about a patient's risk of cardiovascular events. Using genetic testing to identify individuals with FH also has great practical importance, as certain potent cholesterol-lowering medications, particularly PCSK9 inhibitors, are specifically indicated for treatment but are only reimbursed by BC Pharmacare when the diagnosis of FH is made.[22,23] Although coverage of PCSK9 inhibitors does not require a genetic diagnosis, genetic testing can help achieve a diagnosis of FH and help with targeted therapy.

## Current Solutions

Genetic testing and cascade screening are central to addressing the current gap in FH diagnosis. Currently, in BC, there are strides being made to bring genetic testing for FH to mainstream treatment. The first is the use of research-based genetic testing at the Healthy Heart Prevention Clinic. Once diagnosed at the clinic, patients can be entered into the Canadian FH Registry.[24] The registry was first started in BC and has now been expanded nationwide. Having a centralized resource of FH patients can help facilitate cascade screening on a much larger scale. The second is the Advancing Cardiac Care Unit-based Rapid Assessment and Treatment of hypErcholesterolemia (ACCURATE) study which started recruiting patients in late 2021.[25] ACCURATE is a nonrandomized controlled trial testing the hypothesis that opportunistic genetic testing for FH among patients hospitalized for ACS will increase the diagnosis of FH. Patients presenting with ACS under the age of 60 and meeting the inclusion criteria will be recruited to have research-based genetic testing performed. Results from testing will be shared with care providers to study the impact that genetic investigation for FH has on treatment and management.

## Conclusions

FH is a relatively common cardiovascular disease that is underdiagnosed worldwide. Patients with FH have an elevated risk for ASCVD, specifically ACS. Presently, there is a need to test the feasibility of using a genetic testing-based diagnostic methodology in populations that are shown to have a high prevalence of FH. Although there have been many retrospective studies that have evaluated the use of genetic testing for FH in patients with ACS, none have prospectively used genetic testing in a Canadian population in an acute care setting. Strategically using genetic testing in patients presenting with ACS while they are in hospital can be an effective way of identifying patients with FH and ensuring they receive appropriate care in preventing future ACS. Currently, there are efficacious genetic assays with validated methods of determining pathogenic variants. Identified carriers can then serve as the proband for identifying other individuals with FH, in a process known as cascade testing. To address the many shortcomings in FH diagnosis and management, the Canadian FH Registry collects information from all patients with a known diagnosis of FH. To study the impact of genetic screening on care, the ACCURATE study started recruiting patients in late 2021.[23] Data from ACCURATE is expected to help guide approaches to improving the diagnosis and treatment of FH in BC and worldwide.

## Conflict of interest

The authors have declared no conflict of interest.

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# Emergency preparedness for heat waves, and the role of medical education

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## Abstract

Over the course of six days, extreme temperatures in the Pacific Northwest exacerbated chronic respiratory and cardiovascular disease, as well as caused heat-related illnesses, claiming the lives of 445 people in British Columbia. The purpose of this commentary is to frame the heat wave of 2021 as a health crisis, explore the effects that extreme heat events have on health, and discuss the necessity of incorporating emergency preparedness for future health consequences of global climate change into medical education.


## Introduction

In the summer of 2021, the Pacific Northwest experienced an unprecedented heat wave that lasted six days between June 25th and July 1st, with temperatures exceeding 40 degrees Celsius in Oregon, Washington, and British Columbia (BC).[1] These conditions had significant negative impacts on the health of people living in the region, especially those without access to shelter, hydration, and air conditioning. According to the BC Coroners Service, 445 heat exposure-related deaths occurred in BC over the course of the six-day heat dome, and 124 more heat-related deaths were recorded in the following weeks.[2] This commentary aims to offer a description of the health impacts of the 2021 Pacific Northwest heat dome and a discussion of the importance of adequate preparation for future extreme events with the integration of climate preparation into medical education.

## The Health Impacts of the Heat Waves

Heat waves are defined as short-term spells of elevated temperature in a region.[3] Importantly, extreme heat events can have severe consequences on human life. Robinson (2001) conceptualized heat waves according to their effects on people, suggesting that these events are best described not only as meteorological phenomena, but also according to their impacts on human physiology and social conditions.[4]

One of the threats posed by these events is their ability to exacerbate chronic respiratory diseases, such as chronic obstructive pulmonary disease (COPD). This was demonstrated by an analysis of 12 cities in the United States, which found that heat can increase the risk of COPD-related mortality by up to 25%.[5,6] In addition to aggravating respiratory diseases, data on emergency department visits has shown that heat waves are significantly associated with an increased incidence of ischemic heart disease, cardiac dysrhythmia, and stroke, especially in people with a history of cardiovascular disease.[7] Many researchers have investigated the breadth of the health impacts of heat waves. For example, Isakesen et al. (2016) found that extreme heat events in King County, Washington caused significant increases in mortality due to cerebrovascular, mental, accidental, and non-traumatic causes in people between the ages of 68 and 84, and non-traumatic, circulatory, cerebrovascular, and cardiovascular causes in people over the age of 85.[8] The risk of diabetes-related mortality also increased during heat events for people between the ages of 46 and 64.[8]

Extreme heat events can also cause acute heat-related illnesses, such as heat exhaustion, heatstroke, and heat syncope.[9] These events disproportionately impact older adults, people with comorbidities (such as diabetes mellitus, cardiovascular disease, and obesity), and low-income individuals, who are less likely to have access to air-conditioning.[10,11] According to a report from the Centers for Disease Control and Prevention (CDC), which assessed the impact of the 2021 Pacific Northwestern heatwave on emergency department visits in Oregon and Washington, the two states documented 2779 heat-related visits between June 25-June 30.[12] These findings demonstrate that these extreme heat events can acutely heighten the demands on the healthcare system and workforce.[12]

## The Integration of Emergency Preparedness Into Medical Education

The Pacific Northwestern heat wave of 2021 was not an isolated event; instead, it was a warning of more extreme manifestations of global climate change that will arise in the years and decades to come.[13] In fact, a recent international collaborative study concluded that global climate change increased the chance of an incident Pacific Northwest heat wave by approximately 150 times.[13] Moreover, the effects that global climate change is already having on the health of communities in the Pacific Northwest, and around the world, is not limited to heat waves, and extends to changes in air quality, water scarcity, the accelerated spread of infectious diseases, and food insecurity, among other consequences.

Existing initiatives undertaken by medical schools around the world can be used to guide responses to the climate crisis. Students at McMaster University, for example, have successfully advocated for curricular time to be dedicated to topics related to climate change, such as workshops on the role of physicians in climate advocacy and the intersection of racism as a social determinant of health, with the climate crisis.[15] McMaster University medical students have also worked with administrators to integrate climate preparedness into the program by providing students with educational materials on the effects of climate change on specific pathologies and disease processes when they are discussed in case-based learning sessions and tutorials.[15] Another hopeful example of the successful implementation of climate education in medical school is the introduction of a first-year climate and health course at the University of California San Francisco (UCSF) School of Medicine.[16] The program offers students an opportunity to explore the intersections of climate change, environmental justice, and healthcare.[16]

In addition to the instances described above, a recent report from Lakehead University titled, "Climate Change in Medical School Curricula: A Status Report," outlines more examples of initiatives that medical programs around the world have undertaken to address climate change.[16] The report outlines how Bond University and the University of California Berkeley have integrated climate change into their global health curriculum, while Stanford University and Universidad Javerian

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have created courses on the effects of climate change on health and medical practice for medical students.[16] Many of the most successful projects around the world, such as the initiatives implemented at Georgetown University and the University of Illinois, Urbana-Champaign (UIUC), have not only made climate change a stand-alone curriculum element, but have integrated climate preparedness into various levels of medical education such as coursework, elective courses, case-based learning, and clinical experiences.[16] The integration of climate change into clinical experiences at UIUC, for example, takes the form of training on climate-exacerbated asthma and a required third-year Observed Structured Clinical Examination encounter related to the health effects of climate change.[16]

To appropriately respond to the climate crisis, medical programs that have yet to address climate and emergency preparedness should look to schools that have already acted by introducing climate change into many different parts of medical education. Developing a nuanced understanding of the impacts of climate change on the health of our future patients is a requisite to being prepared to provide effective care in the context of a planet that is drastically changing. As the climate changes, so should how we approach learning medicine.

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## Conflict of interest

The author has no conflict of interest to declare.

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# Challenges and solutions in the manufacturing and widespread clinical adoption of CAR T-cell therapies

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## Abstract

Chimeric Antigen Receptor (CAR) T-cell therapies are a relatively new addition to our arsenal of treatments against various hematological malignancies and have opened up a new frontier in cancer immunotherapy research. Despite the remarkable clinical efficacy of this treatment modality in conditions such as acute lymphoblastic leukemia (ALL) and diffuse large B-cell lymphoma (LBCL), scalability challenges contribute to a high per patient cost and limit its clinical adoption. This commentary provides a brief discussion of the various technical challenges preventing the large-scale adoption of this therapy in the Canadian healthcare system and potential solutions to these obstacles.

## Introduction

Pioneered by Dr. Carl June and colleagues in the early 1990s, chimeric antigen receptor (CAR) T-cell therapies have revolutionized the field of cancer immunotherapy, specifically for the treatment of hematological malignancies such as acute lymphoblastic leukemia (ALL), multiple myeloma, and large B-cell lymphoma (LBCL).[1-3] What makes CAR T-cell therapy such a substantial advancement is its remarkable clinical efficacy in difficult-to-treat hematological malignancies such as relapsed or treatment-refractory LBCL. In a phase 2 study published by Neelapu and colleagues in 2019, administering CD19 CAR T cells in individuals with refractory LBCL resulted in a treatment response rate of 82%, with an 18-month survival rate of 52%[2]; this is in comparison with existing LBCL treatment regimens with a treatment response rate of 26% and a median overall survival of 6.3 months.[4] Despite its remarkable clinical efficacy, there are major issues surrounding the cost, manufacturing, and therefore, the scalability of CAR T-cell therapies. This commentary aims to briefly discuss these shortcomings and the potential solutions aimed at addressing them.

## Current Manufacturing Practices and Challenges

Difficulties with the generation of clinical-grade CAR T cells are a significant bottleneck in the large-scale clinical use of this treatment modality.[5] As an autologous cell therapy, the manufacturing process starts with obtaining a patient's own peripheral blood cells (leukapheresis), followed by the removal of myeloid cells (elutriation).[5] Isolated T lymphocytes are then enriched, transduced with the CAR transgene, and expanded ex vivo. Following expansion, CAR T cells are subjected to rigorous release testing by assessing identity, safety, purity, and potency.[5] One of the most critical challenges in the manufacturing process involves the efficient isolation of T lymphocytes, especially in patients with hematological malignancies that significantly affect the nature and mix of leukocytes in the peripheral blood.[6] This is further compounded by the fact that many patients have been treated with several cycles of chemotherapy, which can also reduce the number of functional and circulating leukocytes.[6] In individuals with hematological malignancies, leukapheresis products consist of a heterogeneous population of myeloid cells, natural killer cells, and malignant cells; with certain conditions such as leukemia, tumour cells may comprise most of the leukapheresis sample.[7] Despite the application of isolation and enrichment methods, autologous T lymphocyte isolates may still be contaminated with other autologous cells that inhibit in vitro and in vivo expansion,[6] or may be contaminated with leukemic cells that confer treatment resistance if transduced with the CAR gene.[8] These autologous T cells themselves are heterogenous, leading to variability in proliferative capacities and patient outcomes.[9] One way to avoid problems involving the contamination of CAR T-cell products with malignant cells is to use allogeneic T cells isolated from non-cancerous individuals, or T cells derived from umbilical cord blood.[10] However, this treatment modality can create additional problems, ranging from graft vs. host disease to allograft rejection.[11] Alternatively, using genetically engineered, hypoimmunogenic CAR T cells derived from pluripotent stem cells (PSCs) could also be a viable option to overcome the bottlenecks associated with CAR T-cell production,[12] allowing for the generation of defined and homogenous CAR T-cell products. This treatment modality can also ameliorate the inherent lack of scalability involved with traditional CAR T-cell manufacturing practices and will be discussed in the next section.

## CAR T-CELL Therapy Costs & Alternative Platforms To Improve Treatment Scalability

The scalability of CAR T-cell therapy is also hindered by its personalized nature and the resulting complexities in the manufacturing process. As a result, CAR T-cell manufacturing costs comprise a large fraction of the total cost associated with the treatment,[13] with acquisition costs alone reaching 475,000 USD per infusion.[14] Many patients require multiple treatment rounds as well and the previous figure does not account for the cost of treating side effects.[14] In Canada, CAR T-cell therapies are approved for relapsed or refractory ALL or LBCL,[15] which equates to approximately 700 patients being eligible annually for the treatment.[4, 16-18] Extending treatment eligibility to the approximately 2000 individuals diagnosed with ALL or LBCL each year,[17] instead of waiting for refraction or relapse, may improve patient outcomes. Recently, Health Canada approved CAR T-cell therapy for relapsed or refractory multiple myeloma, but again extending the treatment to all individuals with multiple myeloma may reduce the mortality of multiple myeloma in Canada which is approximately 1600 individuals per year.[19] Reducing the costs of CAR T-cell therapy would make improving treatment accessibility more feasible.

Scaling-up of cell therapies reduces production costs by reducing labor, equipment, and materials cost per unit.[20] While marginally scaling-up cell therapies reduces cost, cost reduction often increases with production scale.[21] Increasing the market for CAR T cells, by applying

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them effectively in other diseases or distributing them for use in other countries, could allow drastic scale-up and substantially decrease the price per patient for CAR T-cell therapy. Increased usage of CAR T cells would enable further scale-up and would drive down prices by spreading research and development costs over a larger number of patients.[22] Work has been done in applying CAR T-cell therapy in solid-tumour treatment,[23] a large potential market (approximately 90% of cancers are solid tumours[24]), and adoption for treatment of infectious diseases may also benefit patient outcomes.[25] An off-the-shelf T-cell therapy is especially necessary for infectious disease treatment as beginning treatment as soon as possible is critical for favourable treatment outcomes.[26] Further development of CAR T cells to treat these diseases effectively may encourage scaling-up of CAR T-cell production, reducing costs for all CAR T-cell-based therapies.

Reducing costs through scale-up is an essential step for improving the accessibility of CAR T-cell therapy and an allogeneic, off-the-shelf T-cell source would drastically reduce production costs through improved scalability. Furthermore, occasionally a patient's own T cells are not viable for CAR T-cell therapy, so an allogeneic source of T cells is necessary in these cases.[6] In vitro production of CAR T cells from PSCs is a promising platform that may enable efficient scaling-up and cost reduction of these treatments because of the self-renewing nature and unlimited growth potential of PSCs.[27] Aside from the cost reducing benefits, this platform could be designed to produce an off-the-shelf and hypoimmunogenic therapy that would drastically reduce the time between diagnosis and CAR T-cell treatment by avoiding the leukapheresis and expansion of a patient's own cells before treatment.[28] Currently, the 2-4 week waiting period between leukapheresis and treatment administration is detrimental in the treatment of aggressive tumors that need to be treated immediately upon diagnosis for optimal patient outcomes.[29,30] Additionally, in clinical trials it was found that many patients (27%)[31] become ineligible for CAR T-cell therapy during this period leading to poor outcomes and cost sunk into manufacturing unused CAR T cells.[32] An off-the-shelf CAR T-cell therapy would be available immediately upon patient diagnosis which would improve outcomes in these cases.[28] This platform may also better accommodate engineering cells to contain kill switches,[33] or highly specific receptor activation systems to mitigate off-target effects and cytokine release syndrome.[34]

Scaling-up of CAR T cells would be especially effective with a highly modular platform to enable efficient T-cell engineering that allows the cells to target various antigens. While this could be implemented with genome editing, an alternative approach is to produce a universal T-cell product that can be directed to a specific target using a modular targeting modality. For example, universal chimeric antigen receptors have been successfully used in vitro and rely on a single homogenous T-cell product with a universal CAR T-cell receptor that binds to a single-chain variable fragment (scFV) adaptor molecule targeting the CAR T cell to a desired antigen and cell.[35] A universal CAR may also be an inexpensive way to implement CAR T-cell therapy for a broad range of diseases with a universal production process.

## Conclusion

While CAR T cells are an exciting cancer treatment, production challenges, the highly personalized nature of the treatment, and the limited clinical applications contribute to high drug costs. Alternative approaches such as PSC-derived CAR T cells are a promising approach that would enable efficient scale-up, and further development and application of CAR T cells in other pathologies may reduce per patient costs and improve patient outcomes. Increased implementation of CAR T cells in other diseases may benefit treatment in the same dramatic manner seen with hematological malignancies, and this implementation is feasible given the modular nature of CAR T cells. Given this, it is imperative we continue to push towards a reduction in manufacturing costs and an increase in adoption by the Canadian public healthcare system, as an increase in usage may drive down costs per CAR T-cell treatment.

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## Conflict of interest

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# Capitalizing on the COVID-19 pandemic: The role of patient and visitor hand hygiene programs in health care settings

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## Abstract

The COVID-19 pandemic has heightened public attention to the need for robust infection prevention and control (IPAC) practices. Hand hygiene (HH) is a critical and effective intervention to break the chain of infection. Current IPAC guidelines emphasize health care worker HH, but patient and visitor HH is rarely addressed despite being suboptimal. Barriers such as lack of education, misconceptions and infrastructure costs impede the success of patient and visitor HH programs. Before "COVID fatigue" reverses the recent advances in IPAC awareness, health care systems must capitalize on lessons from the pandemic to promote long-term reductions of health care-associated infections.


## Introduction

The coronavirus-disease 2019 (COVID-19) pandemic caused by the SARS-CoV-2 virus has impacted nations around the world in different ways, but one commonality has emerged to unify them all – the weakness revealed in health care systems' infection prevention and control (IPAC) measures.[1-3] During the early months of the pandemic, the lack of preparedness resulted in shortages of personal protective equipment and hospital-based transmission of COVID-19 infections.[2-4] In the first wave, 6% of hospitalized cases in Canada and 11% in the UK were acquired in hospital.[2,3] As of May 2021, an estimated 115,000 health care workers (HCWs) have died from COVID-19; when compounded with the current global death count of over 5.3 million overall in December 2021, these devastating losses serve as a testament to the need for prioritizing IPAC policies world-wide.[5,6] In addition, despite measures that were rapidly put into place to try to prevent COVID-19 transmission, rates of other health care-associated infections (HAIs) have increased.[1,7,8]

However, in this dark situation lies a silver lining – if health care systems across the world can work together to grasp it. Seldom has there been such a heightened public awareness of the field of IPAC. Specifically, hand hygiene (HH) has been emphasized as a critical practice among the general population, with COVID-19 messaging continually reminding individuals to "clean your hands" in health care and non-health care settings alike.[9,10] While HCWs receive regular training on IPAC practices, this unique situation has demonstrated that solving major health crises cannot solely rely on the actions of a few. Rather, engaging mass cooperation among all citizens is needed to fully protect each other. In health care settings, HH among patients and visitors is an underutilized yet practical area of IPAC that should be further emphasized – especially before the newfound attention on this field begins to wane.[11,12] This paper will discuss the benefits, barriers, and recommendations for the incorporation of patient and visitor HH improvement programs throughout health care systems.

## Why hand hygiene?

With the rise of antibiotic-resistant organisms, addressing health care-associated pathogens such as *Clostridium difficile* (*C. difficile*) and methicillin-resistant *Staphylococcus aureus* (MRSA) is an ongoing issue.[13,14] Over half of HAIs are preventable, but they make up a massive economic burden on the health care system.[15] In Canada, HAIs result in over 8,000 deaths per year.[16] HH is considered the most critical measure in breaking the chain of infection.[17,18]

## Why focus on patients and visitors?

Although HCW HH has been well established as a method to prevent HAIs, there has been far less emphasis on patient and visitor HH.[17] Hospital infections can be acquired by patients from their own hands, and incoming visitors may introduce new pathogens into health care environments.[19-21] Before the pandemic, patient and visitor HH compliance in hospital settings had been as low as <10%.[22-24] However, improving HH among these populations can have promising benefits in reducing rates of HAIs, and beyond – involving patients in their health care can produce feelings of empowerment, increased medication adherence and improved communication with HCWs.[12,21,25–27] Furthermore, engaging staff in promoting patient and visitor HH may improve HCW HH compliance by encouraging them to act as role models, creating a culture of strong IPAC practices.[11]

## What are the barriers to patient and visitor hand hygiene practices?

Factors impeding improvements to HH practices are present at the individual and systemic levels. Firstly, the lack of education regarding when HH is needed remains a significant barrier to adherence. Patients often know about performing HH after toileting, but can be less aware of other moments for HH such as before eating, after touching objects in the environment, and entering/exiting patient rooms.[28,29] This knowledge gap may stem from insufficient public health messaging, differing cultural and religious beliefs or low patient interest in receiving HH education.[28-30]

Furthermore, misconceptions and beliefs surrounding HH can severely hinder IPAC practices. In a mixed-methods study using patient and visitor surveys and on-site HH observation, alcohol-based hand rub (ABHR), the gold standard for HH, was mistakenly believed by many survey respondents to cause skin damage and to be less effective than soap/water.[29] This was reflected in the quantitative observations, with 75% of HH events by patients and visitors using soap/water rather than ABHR.[29] Concerns about excessive HH causing skin damage have also been observed.[31] However, using ABHR containing moisturizers and implementing skin care programs in hospitals can mitigate these issues.[32,33]

Finally, accessibility and cost are long-standing systemic barriers to HH compliance. Implementing IPAC practices is seen as labour-intensive and costly, requiring investments for staffing, ABHR, and/

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or educational and promotional materials.[34] However, recent economic analyses in the United Kingdom have found that HH can lead to enormous annual net cost savings related to the burdens of HAIs including *C. difficile* infections and antibiotic-resistant organisms.[34] For MRSA infections alone, HH prevention campaigns could save between $1.2 – 2.5 million CAD annually.[35] This argument of cost-effectiveness favouring the implementation of HH infrastructure has been supported in various countries throughout the world, including Australia, India and Thailand.[36-38]

## What can we do going forward?

Considering the multi-faceted nature of HH compliance, multi-modal approaches should be explored to improve this issue.[22] Beyond traditional measures such as patient and HCW education, behavioural change strategies will be needed to instill long-term changes. Possible methods include a combination of educational materials (patient-focused posters, HCW training courses), reminders (visual and verbal), accessible object cues (hand wipes or ABHR dispensers), social role models (front-line HCWs and other patients) and financial supports (funding to increase HH equipment/dispensers available in hospitals). Innovating accessible solutions like individual-sized ABHR or hand wipes at bedsides is also critical for hospitalized patients with limited mobility.[39]

Admittedly, the effects of preventative interventions are seldom seen quickly. This delay can be frustrating, adding challenge to participant engagement. However, systems must be implemented soon to address this issue before the phenomenon of "COVID fatigue" erases our current progress.[40] The University of Chicago Medical Centre found that after an initial increase to over 90% HH adherence at the beginning of the pandemic (March 2020), perhaps due to fear and strict enforcement of IPAC protocols, this compliance was not maintained.[41] By August 2020, rates dropped back to the pre-pandemic baseline values of about 55%.[41] Unfortunately, these findings have been replicated independently in other North American institutions.[42,43] Long-term systemic changes for IPAC practices may only be achieved when these behaviours are universally considered routine. Further research studying sustained behaviour change and organizational culture for HH is needed.

Irrespective of the methods used to improve HH, collaboration is needed to inspire each other towards a common goal – patient safety. Policy makers, HCWs, patients and visitors must work together, against the clock, to capitalize on the momentum of COVID-19 – using the lessons learned for positive change, rather than letting them fade. This global crisis could be the catalyst leading to a public culture shift where HH receives the recognition that it deserves.

## Conflict of interest

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# Rapid response to COVID-19 in long-term care: The role of on-site simulation in interprofessional training and confidence

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## Abstract

During the COVID-19 pandemic, long-term care homes in Canada were among the earliest and most impacted care sites. In response to an urgent need for staff support and education, a multidisciplinary network on Vancouver Island developed a novel on-site simulation training program. Through rapid scale-up over a wide geographical area, over 300 staff at eight long-term care homes received training early in the pandemic and reported enhanced confidence to provide care for vulnerable patients in extremely challenging conditions. We describe this local innovation, outline its impacts, and reflect on future opportunities to leverage simulation-based education for interprofessional health teams.


## Introduction

During the first six months of the COVID-19 pandemic in British Columbia (BC), long-term care (LTC) home residents were disproportionately at risk for illness and death, comprising 57% of COVID-19 mortalities.[1] In Campbell River, BC, the leadership team at Yucalta Lodge recognized an immediate need to train LTC staff on COVID-19 protocols and best practices. The team also addressed rising anxieties about safely providing care under new and challenging conditions. A novel simulation-based training program was developed and implemented in a diverse network of publicly and privately funded LTC sites across Vancouver Island.

Simulation is a widely used teaching modality in healthcare education, allowing learners to practice clinical competencies and receive feedback in a controlled setting.[2] Though most simulation teaching occurs in lab settings, in-situ and on-site simulation allows care teams outside of academic medical centres to train together.[3] Simulation has also been shown to facilitate opportunities for interprofessional staff training, improve communication within teams, and promote a greater understanding of personnel roles during care.[4]

Simulation was rapidly implemented in healthcare centres across Canada to meet the emerging demands of the pandemic, such as care provision and workflow changes.[5-9] While simulation is a common training strategy in acute care settings, it is less commonly used in LTC facilities despite literature demonstrating positive impacts on communication with patients about death and advanced care planning,[10] team communication and handover,[11,12] and patient monitoring and assessment.[13] Given the robust simulation evidence base, local gaps in simulation use beyond acute care, and the professional development needs spurred by the pandemic, we introduced the current training program. Discussion of the program's immediate impacts and significance for future LTC education follows.

## Program development

Expanding on the grassroots initiative established at Yucalta Lodge, a multidisciplinary team was formed, including The Centre for Interprofessional Clinical Simulation Learning, Island Health leadership, and patient partners. This collaboration was key to strengthening and scaling up the program across Vancouver Island. The team created resources to enable rapid implementation at new sites,[14] recruited healthcare staff from the regional COVID-19 Resource Coach Program to facilitate training sessions, and incorporated evaluation methods.

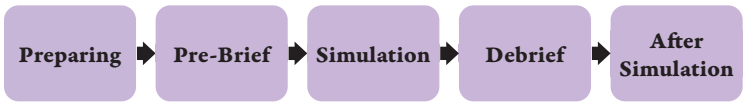


**Figure 1** | The instructional format followed during the simulation training sessions.

The simulation training program covered learning objectives on procedural clinical skills, team communication, and safe patient handling. For example, participants practiced donning and doffing personal protective equipment, using documentation and disclosure tools, and performing nasopharyngeal swabs. The program offered five different simulation sessions, including the care of a suspected positive case, a confirmed positive patient, a palliative patient, an interprofessional team huddle, and a family disclosure conversation.

As per simulation standards of best practice,[15] facilitators first led a pre-brief to orient participants, establish a safe learning environment, and assign roles. Next, the learners watched the session simulation video and re-enacted the scenario together. During the debrief, facilitators elicited participants' reflections, peer feedback, and concerns, then practiced again as needed. Afterward, participants completed anonymous surveys to rate their confidence in achieving each learning objective on a Likert scale and left open-ended comments. This instructional format is outlined in Figure 1.

## Discussion

This program was created in response to LTC staff requests for more clinical preparedness and confidence to care for residents during the pandemic and to support anxieties about personal and family safety in the event of an outbreak. We conducted 59 simulation sessions with 307 interprofessional staff at eight LTC homes. Of the 274 staff who completed the post-training survey, 92.0% indicated improved confidence in all clinical learning objectives; confidence levels remained unchanged for another 6.2%. All respondents indicated that they would recommend the program to others.

By bringing simulation-based education to LTC sites, real-world teams were able to learn and practice together in a safe environment and discuss workplace-specific concerns and needs. Participants included healthcare aides, nurses and nursing students, social workers, and dietary

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and housekeeping staff. Their comments assured that the program supported skills practice, clinical education, and personal safety. These included:

"Great reminder; it's like a fire drill."

"It is so valuable to practice this. It feels like we are better prepared and have less stress."

"It was great to understand the protocol of what to do in a suspected COVID positive case. I didn't know before but now I'm glad I do."

"Very helpful. Helps to protect myself and people in our facility."

Practiced frequently in acute care, and to an even greater degree during the pandemic,[5-9] simulation is an under-used training modality in LTC settings. This may be due to traditional reliance on simulation lab space and high-cost equipment,[2] mitigated by our training program by delivering on-site sessions in a watch-and-reenact video modality. Other barriers include a lack of trained facilitators[4,9,10] and inconsistent curriculum content and delivery.[5,16] We addressed these challenges through mass mobilization of healthcare coaches and a publicly available standard curriculum on the BC Simulation Network. These adaptations resulted in a centralized program rapidly scaled-up across a wide region and facilitated the adoption of this simulation program in other healthcare regions.

Limitations of this program include the use of pre-set video content, which may not take into account site-specific considerations, and the lack of facilitator observation or assessment beyond an initial training workshop. Additionally, while we relied on COVID-19 coaches to serve as simulation facilitators, adoption of this simulation program in other regions may be infeasible without access to a similar coaching program. Finally, our evaluation did not assess how improved staff confidence benefits the health and safety of LTC residents. As a result, more research is needed in this area

## Conclusion

A greater role for on-site simulation within LTC teams is envisioned at Island Health, including training for dementia care and quality improvement projects. This project demonstrated strategies that successfully overcame previously identified barriers to simulation training implementation. We are optimistic that expanded awareness of simulation as a valuable teaching tool for practicing teams in their workplaces may be a positive by-product of the pandemic.

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## Conflict of Interest

No conflicts of interest to declare.

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# Single-use medical plastics: Sustainability in the operating room

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## Abstract

Surgery and perioperative services are resource-intensive and account for upwards of 30% of all hospital waste. Heavy reliance on single-use medical plastics poses a major environmental burden and is a significant contributor to global warming. We highlight some of the plastic waste management challenges exacerbated by the COVID-19 pandemic and discuss an innovative recycling program that can help reduce the environmental impact and waste production associated with surgery.


## Commentary

*Looming over a disposal bin brimming with plastic syringes, IV tubing, and packaging waste, my preceptor sighed, tossing another disposable oral airway into the heap. "It pains me every time I have to dispose of a perfectly functioning oral airway after a single use. If nothing is done to reduce plastic waste, I worry that your generation will bear the brunt of its burden."*

Environmental pollution by healthcare plastic waste is a complex, pervasive, and precarious problem that is often overlooked, but the ongoing coronavirus pandemic has made its effect more visible than ever.[1] In 2014, the provision of healthcare activities accounted for 4.6% of Canada's total greenhouse gas emissions and was responsible for as many as 23,000 years of life lost from disability or early death.[2] While other industries have made efforts to reduce their carbon footprint,[3] there is an unprecedented increase in medical plastic waste fueled by our increasing reliance on single-use products, continued demand for disposable personal protective equipment (PPE), and increasingly limited plastic recycling opportunities.[1,4,5]

Plastic waste poses a major environmental burden due to its widespread use, mismanagement, and limited removal options, particularly in the aquatic environment where it exerts adverse effects on wildlife.[6] Canadian hospitals produce a staggering 300 tons of medical waste daily.[7] Operating rooms (ORs) are disproportionately energy and resource-intensive and are responsible for upwards of 30% of the total hospital waste stream.[8,9] The need to maintain an aseptic environment has led to the routine use of disposable products packaged in large volumes of sterile polypropylene wraps that are both discarded after a single use. For example, a single abdominal hysterectomy procedure can generate up to 20 pounds of plastic and packaging waste,[10] more than what a family of four produces in a week.[11] Given the rising demand for surgical services in a growing and aging population, interventions for waste prevention and management are needed to make the OR more sustainable.[12]

While patient safety and infection prevention practices should remain a top priority, especially during a pandemic, these principles are not, and need not be, mutually exclusive with efforts to manage healthcare waste sustainably. One scalable solution is to move away from the current linear "take-make-waste" model of consumption where plastics are used once and discarded, and work towards a restorative circular economy where plastic materials recirculate in environmentally and financially sustainable closed loops.[13] This circular economy perspective is based on a multi-pronged approach targeting the three R's (reducing, reusing, recycling), as well as rethinking and researching.[14, 15] Of these strategies, the most important is waste reduction, as "the best waste is that which is not produced,"[16] followed by reuse and reprocessing to prolong the product life cycle. Recycling should be considered when 'reduction' and 'reuse' have been maximized.[5] Done effectively, recycling can decrease the volume of waste sent to landfills and provide an alternative material to virgin polymers.[17] Put into perspective, recycling one ton of mixed plastics is equivalent to saving 16.3 barrels of oil, 30 cubic yards of landfill, and enough energy to power an average household in the United States for six months.[18]

Although recycling may seem intuitive, it is a complicated process dictated by market demands. Ever since China, the world's largest importer of waste plastics, instated its National Sword policy in early 2018 and set strict contamination limits on the importation of recyclable plastics, the ripple effect in the global recycling industry has caused major pile-ups in our domestic recycling infrastructure.[19] Beyond market and infrastructure limitations, the following have been identified in the literature as the foremost barriers to implementing sustainable interventions: lack of strong hospital leadership to facilitate and create a culture of sustainability, fear of reprimand for inappropriate discarding of hazardous waste, concerns on the extra workload and complexity of sorting different types of plastics, and lack of knowledge on proper recycling practices.[20,21] A common misconception is that all items that come into contact with patients should be disposed of as infectious waste. A study has shown that up to 90% of nonhazardous medical waste in the OR is incorrectly sorted as hazardous medical waste and sent for unnecessary high-cost, high-energy treatments (e.g., autoclaving or incineration), which cause the release of heavy metals, dioxins, and furans into the atmosphere.[14]

Despite these challenges, physicians are embracing innovations and making important contributions to the recycling and repurposing of medical polyvinylchloride (PVC) plastics, such as oxygen masks, tubing, and intravenous fluid bags. For example, the 'PVC Recycling in Hospitals' program is an initiative that diverts medical PVC products from landfill to recycling and has been implemented in over 90 hospitals across Australia and New Zealand.[22] Inspired by the success of this program, a medical PVC recycling pilot, called PVC 123, was developed by the Vinyl Institute of Canada in partnership with Environment and Climate Change Canada, and launched at St. Joseph's Health Centre and Humber River Hospital in Toronto in September 2020. ORs were outfitted with receptacles to collect unsoiled PVC medical devices, with minimal additional workload for healthcare staff.[23,24] Several thousand pounds of PVC have since been diverted from landfills and recycled into new products, such as garden hoses, automotive parts, and highway sound barriers. As of March 2021, the program has expanded to six

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other hospitals in the Greater Toronto Area, with plans to expand to British Columbia.[7] All Canadian hospitals are strongly encouraged to join the PVC recycling partnership.

Moving forward, the transition to environmentally sustainable healthcare will depend on two further "Rs," namely rethinking and research, to find ways to reuse and recycle more medical supplies. To effectively reduce healthcare plastic waste and environmental pollution, we must all lead the charge on hospital "greening" efforts and urge our healthcare colleagues to get involved in this important initiative.

## Conflict of interest

SAAA was involved with the launch of a medical polyvinyl chloride (PVC) recycling pilot, called PVC123. The program was established in partnership with the Vinyl Institute of Canada and Environment and Climate Change Canada and aims to safely recycle medical PVC plastics. MZXX and VWSC declare no relevant or material financial interests that relate to the research described in this commentary.

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# HIV and SARS-CoV-2: A tale of two viruses

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## Abstract

As viral illnesses spread, so do associated social perceptions, stigma, and seeds of misinformation. Interesting parallels can be drawn between the ongoing HIV epidemic and the more recent SARS-CoV-2 health crisis. This commentary discusses the similarities in public discourse surrounding viral origin, language used to describe viruses, the role of discrimination in pandemic messaging, and treatment and prevention practices regarding HIV and SARS-CoV-2. Learning from these parallel pandemics is critical in shaping approaches that address both existing and future public health crises


In 1981 and 2019, two small clusters of what were thought to be pneumonia cases,[1,2] drew attention to what would soon be recognized as two of the most notable public health crises in modern history. The first was the pandemic caused by the Human Immunodeficiency Virus (HIV), an RNA retrovirus,[3] and the latter by the Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2), an RNA coronavirus.[4] While these viruses differ in transmission and symptomatology, they share many sociomedical aspects, namely, uncertainty and fear related to viral origin, globalization, associated stigma, as well as approaches to testing, treatment, and prevention.[1,5]

While the initial signs of HIV and SARS-CoV-2 infection seemed unremarkable, the rate of viral transmission was exacerbated in both pandemics by globalization and uncertainty. International travel and blood banks became hubs for HIV transmission in the early 1980s,[6] allowing HIV to spread to every region of the world by 1985.[1] In 1981, five cases of severe immune deficiency were discovered in young, healthy, gay men in the USA; by 1987, the total national AIDS case count had risen to 50,280.[7] Similarly, international travel facilitated the rapid spread of SARS-CoV-2, causing the declaration of a global pandemic only three months after the initial cluster of cases in China.[2] The World Health Organization reported that the global number of SARS-CoV-2 infections had surpassed 500,000 in March 2020.[8] Despite the implementation of travel restrictions and social distancing guidelines, global case counts continue to rise with >242,000,000 cases as of October 2021.[9] Globalization has connected the modern world, and in doing so, has facilitated viral transmission.

As both viruses began to spread, fear of the route of transmission and origin of the virus emerged, creating stigma and discrimination. With HIV, the unknown disease seemed to impact specific demographics, leading to harmful and ignorant attempts at describing risk groups, such as the so-called four H's of HIV, "homosexuals, heroin users, haemophiliacs, and Haitians".[6] Likewise, prior to coining the term "AIDS", stigmatizing terms such as "gay-related immune deficiency" abounded.[10] Not only was this label harmful to the gay community, but it also gave the wrongful impression that other groups (e.g., women and men who do not have sex with men) were not at risk for acquiring HIV.[11] These archaic labels continue to influence societal perceptions of HIV, as demonstrated in an article by Beaulieu and colleagues describing the correlation between homophobia and HIV-related stigma.[12] Similarly, SARS-CoV-2 was subject to discriminatory and misleading labels, such as the "China virus", drawing international criticisms as the purported origin of the virus.[13,14] This exacerbated anti-Asian discrimination,[15] with the Asian Pacific Policy and Planning Council of the United States reporting 3,795 acts of SARS-CoV-2-related discrimination in the first year of the pandemic alone.[16] Reported attacks included barring Asian Americans from establishments, being coughed/spat upon, verbal and physical harassment, and other forms of violence.[16] Meanwhile, focusing the rhetoric around China erroneously gave the impression that those outside of Asia were at lower risk. Of course, North America and Europe were deeply impacted by the COVID-19 pandemic, irrespective of where the virus originated.[9] Although the World Health Organization released guidelines in 2015 urging against naming viruses by geographic origin,[17] it is disappointing to see that this practice was not adopted earlier in the pandemic.

Language further scaffolds societal perception by categorizing people as "innocent" and "guilty". With HIV, those who acquired the virus through vertical transmission and blood products were considered "innocent victims", thus implying that people who contracted HIV from sex or drug use were deserving of the infection.[18] Similarly, public discourse surrounding both the acquisition and spread of SARS-CoV-2 often focuses on blame and shame.[19] While identifying behaviours for infection is undoubtedly important, instilling blame and guilt perpetuates stigma and discourages testing.[20] For both viruses, harm reduction measures exist that are far more effective than shaming. With SARS-CoV-2, these include hand hygiene, physical distancing, and wearing masks.[21] For HIV, harm reduction strategies include safer sex practices and needle exchange services.[22] In both cases, these approaches are typically preferable over outright abstinence.[23]

Similarities and differences are evident in the testing and treatment of SARS-CoV-2 and HIV. While anyone can acquire these viruses, people may choose not to get tested to avoid potential discrimination and blame due to the stigma associated with both viruses. Someone who tests positive for SARS-CoV-2 may be blamed for not following physical distancing precautions.[24,25] Similarly with HIV, someone may be accused of engaging in "risky" health behaviours and be discriminated against in healthcare and personal settings.[26-28] Furthermore, although testing for both viruses is free of charge in British Columbia (B.C.), Canada, structural barriers related to time, cost, and travel limit access to testing globally.[28,29] Reduced testing as a result of these barriers may then lead to increased transmission of both viruses by individuals unaware of their infection.[30] Testing for HIV is critical, as treatment has greatly advanced such that daily antiretroviral medication can suppress the virus and prevent transmission to sex or drug partners, while greatly improving the longevity of people living with HIV.[31-34] However, in the 20 years that it

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took to develop effective HIV treatment, speculative, ineffective, or even dangerous treatments circulated.[35,36] For instance, herbal remedies have been marketed as "cures", such that individuals may take those instead of their antiretroviral medication.[35,36] Similarly, throughout the SARS-CoV-2 pandemic, unsafe or ineffectual medications have been suggested, such as veterinary anthelmintics and bleaching agents.[36,37] Conversely to HIV, an effective SARS-CoV-2 treatment is not yet widely available; although interestingly HIV medications have been suggested to reduce symptoms and severity of SARS-CoV-2, due to the similarity of the viral proteases.[38,39]

Fortunately, effective prevention strategies exist for both viruses, though different owing to their distinct routes of transmission and pathogenesis.[3,4,21,34,40] Physical preventative measures for HIV include condoms and sterile needles,[40] whereas physical distancing, wearing masks, and hand washing are effective for preventing SARS-CoV-2 infection.[21] In regards to pharmaceutical preventions for HIV, a daily pre-exposure prophylactic medication regimen is recommended and free-of-cost for people who regularly engage in acquisition risk behaviours in B.C.[41] For 40 years researchers have been working on creating an HIV vaccine; however, they have not yet been successful due to the complexity of the retrovirus.[42] Remarkably, HIV vaccination research has informed techniques that allowed for SARS-CoV-2 mRNA vaccine research to advance rapidly, with SARS-CoV-2 vaccines now being distributed for prevention globally.[43-45] Though the SARS-CoV-2 vaccines are built upon decades of research and have proven to be effective and safe,[46] many people are skeptical of receiving the vaccine for various reasons, often related to misinformation and conspiracy theories circulating on social media, as well as mistrust of factual information from governments and scientists.[5,47-49] Effective knowledge translation efforts utilized for HIV treatment and prevention can inform public discourse surrounding SARS-CoV-2, ideally improving global vaccine uptake.

Clearly, many lessons can be gleaned from the HIV and SARS-CoV-2 pandemics, including the importance of mindful language when speaking about emerging pandemics, combating discrimination, and promoting evidence-based treatment and prevention. These lessons should be applied to the ongoing HIV and SARS-CoV-2 crises, as well as in future infectious disease pandemics.

## Conflict of interest

No conflicts of interest to declare.

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# COVID-19 catalyzes paradigm shift in telemedicine and at-home patient monitoring

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## Abstract

The COVID-19 pandemic catalyzed the mass adoption of telemedicine and at-home patient monitoring programs across Canada. This article explores why, where, and how the mass-adoption of telemedicine and at-home patient monitoring occurred. Furthermore, the impact that this dramatic change in healthcare delivery has had on patients is discussed. This commentary article is informed by interviews with two leading Canadian physicians with expertise in these domains. The conclusion summarizes lessons learned during the COVID-19 pandemic and makes recommendations for policies that will help to ensure that telemedicine and at-home patient monitoring is part of making the Canadian healthcare system ready for the future.


## Introduction

The coronavirus disease (COVID-19) is an infectious disease caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2).[1] This article provides commentary about the implications and opportunities associated with wide-scale adoption of telemedicine and at-home patient monitoring in Canada during the COVID-19 pandemic.

At-home patient monitoring is a form of telemedicine that can be defined as using "digital technologies to collect health data from individuals in one location, such as a patient's home, and electronically transmit the information to healthcare providers in a different location for assessment and recommendations."[2] A patient in these programs may be monitored by a variety of technologies such as phone check-in calls or messages, blood oximeters, weight scales, or wearables.[3] These tools facilitate patient self-monitoring, relay health information in real-time for provider assessment, and improve clinical decision-making from home.[4]

## 1. Increased Adoption of Telemedicine and At-Home Patient Monitoring During COVID-19

During the COVID-19 pandemic, there was mass adoption of telemedicine and at-home patient monitoring programs across Canada.[5] For example, in Ontario between the second quarter of 2019 to the second quarter of 2020, there was approximately a 55-fold increase in telemedicine usage in ambulatory visits in just one year, from 1.6% to 70.6%.[6] Furthermore, within that same time, the number of physicians who provided virtual care increased over 10-fold, from 7.0% to 85.9%.[3] Additionally, at-home patient monitoring programs were deployed for COVID-19 patients. For example, in British Columbia, Ontario and Nova Scotia, programs were set up to enable home monitoring of the temperature and oxygen saturation levels of patients with mild COVID-19 symptoms (i.e., fever, cough, malaise or other non-specific symptoms but not having shortness of breath, dyspnea, or abnormal chest imaging).[7,8] In Nova Scotia the COVID Community Virtual Care Program was an at-home monitoring program developed to provide COVID-19 patients with take-home oximeters and guidelines based on oxygen saturation measurements, for when the patient should return to the hospital. It was originally designed for high-risk patients with lung disease and/or with compromised immune systems. However, due to its effectiveness and popularity, the program was made available to all COVID-19 patients.

## 2. The practical perspective from Canadian physicians with expertise in digital health about telemedicine and at-home patient monitoring

To better understand the practical perspective and lived experience of the use of telemedicine and at-home patient monitoring to care for COVID-19 patients, we interviewed two Canadian physicians, Dr. Ashley Miller and Dr. Kendall Ho, who are leaders in the field of digital health with extensive experience in caring for COVID-19 patients. Dr. Miller is the chief medical information officer for Nova Scotia Health and IWK Health and a general internal medicine physician. Dr. Ho is the lead of the Digital Emergency Medicine Unit at the University of British Columbia, evaluation lead of Real-Time Virtual Support, medical director of HealthLink 8-1-1 Virtual Physician service, and an emergency medicine physician.

In her interview, Dr. Miller discusses the development of the COVID Virtual Care Program in Nova Scotia. She considers the program a success and describes it as a program that "empowers patients" and is a "novel application for remote monitoring".[9] She explains that prior to the COVID-19 pandemic, at-home monitoring programs were primarily used in Nova Scotia for the management of patients with chronic disease and not for patients with acute conditions such as COVID-19. Dr. Miller emphasizes patients "felt so reassured" with the ability to check their blood oxygen levels at night and this reassurance likely decreased hospital visits. Furthermore, there was "tremendous feedback from patients who felt empowered because they were active participants in their own care".[9]

Building on the theme of patient empowerment, in his interview, Dr. Ho highlights that home health programs offer "co-monitoring and self-management of patients and their families", fostering better patient outcomes and minimizing hospital visits.[10] Dr. Ho predicts at-home remote patient monitoring technologies will augment care provided through telemedicine. Furthermore, he makes four policy recommendations he believes will accelerate the adoption rate and increase the benefits of telemedicine and at-home patient monitoring:

1. Patients and caregivers must see the benefit of adopting telemedicine and at-home patient monitoring.
2. It must be easy to integrate management of at-home patient monitoring technology into the existing workflows and medical records of health professionals.
3. There must be clear medical standards established for the type and quality of data generated by at-home patient monitoring technology.

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4. There must be rules and best practices for storage of at-home patient monitoring health data.

## 3. Future Opportunities for At-Home Patient Monitoring and Telemedicine

The global wearable technology market is predicted to grow at a rate of 20% annually between 2020 to 2028.[11] The accelerated growth rate reflects the demand for at-home patient monitoring technology.[12] Two examples of particularly innovative and paradigm-shifting future applications of at-home patient monitoring are described below:

*i. At-home patient monitoring for post-surgical recovery.*

A recent randomized controlled trial of 900 patients provided half with a Cloud DX Connected Health Kit while the control group received standard care (Kitchener, Ontario, Canada). The kit enabled patients to track their own blood pressure, heart rate, respiratory rate, oxygen levels, body weight, and temperature.[13] Relative to the control group, the study showed no significant difference in the primary outcome of days alive at home during 31 days of follow-up but demonstrated improvement in secondary outcomes such as the requirement for acute hospital care, drug error detection rates, and pain.[13]

*ii. At-home patient monitoring of heart failure using at-home ultrasound.*

Butterfly Network (Connecticut, USA) and the American College of Cardiology recently announced a collaboration in which they will give heart failure patients Butterfly iQ+ ultrasound probes to monitor heart failure status at home via artificial intelligence-guided lung scans.[14] This at-home monitoring could directly impact treatment decisions made by remote physicians and reduce the need for hospital visits. As point-of-care ultrasound gains traction in primary care and urgent care settings, more applications in which patients are sent home with ultrasound probes to monitor their condition will be explored.[14]

## Conclusion

The COVID-19 pandemic catalyzed mass adoption of telemedicine and at-home patient monitoring across Canada.[15] The COVID Community Virtual Care Program in Nova Scotia is an example of this phenomenon. Dr. Ashley Miller and Dr. Kendall Ho are frontline doctors who have developed and used at-home patient monitoring programs. Their expert opinion is that telemedicine and at-home patient monitoring programs have improved patient care during the COVID-19 pandemic and have the potential to be more widely deployed in the near future. To help these technologies reach their full potential, we must imagine novel applications for at-home patient monitoring and develop policies supporting telemedicine and at-home patient monitoring. We recommend the development of policies that facilitate the integration of at-home patient monitoring into existing clinical workflows and clarify data standards. Furthermore, we believe the ongoing adoption of telemedicine and at-home patient monitoring technology will help Canada meet the challenges of the future, resulting in better and more equitable healthcare for Canadians.

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## Conflict of interest

There are no conflicts of interest.

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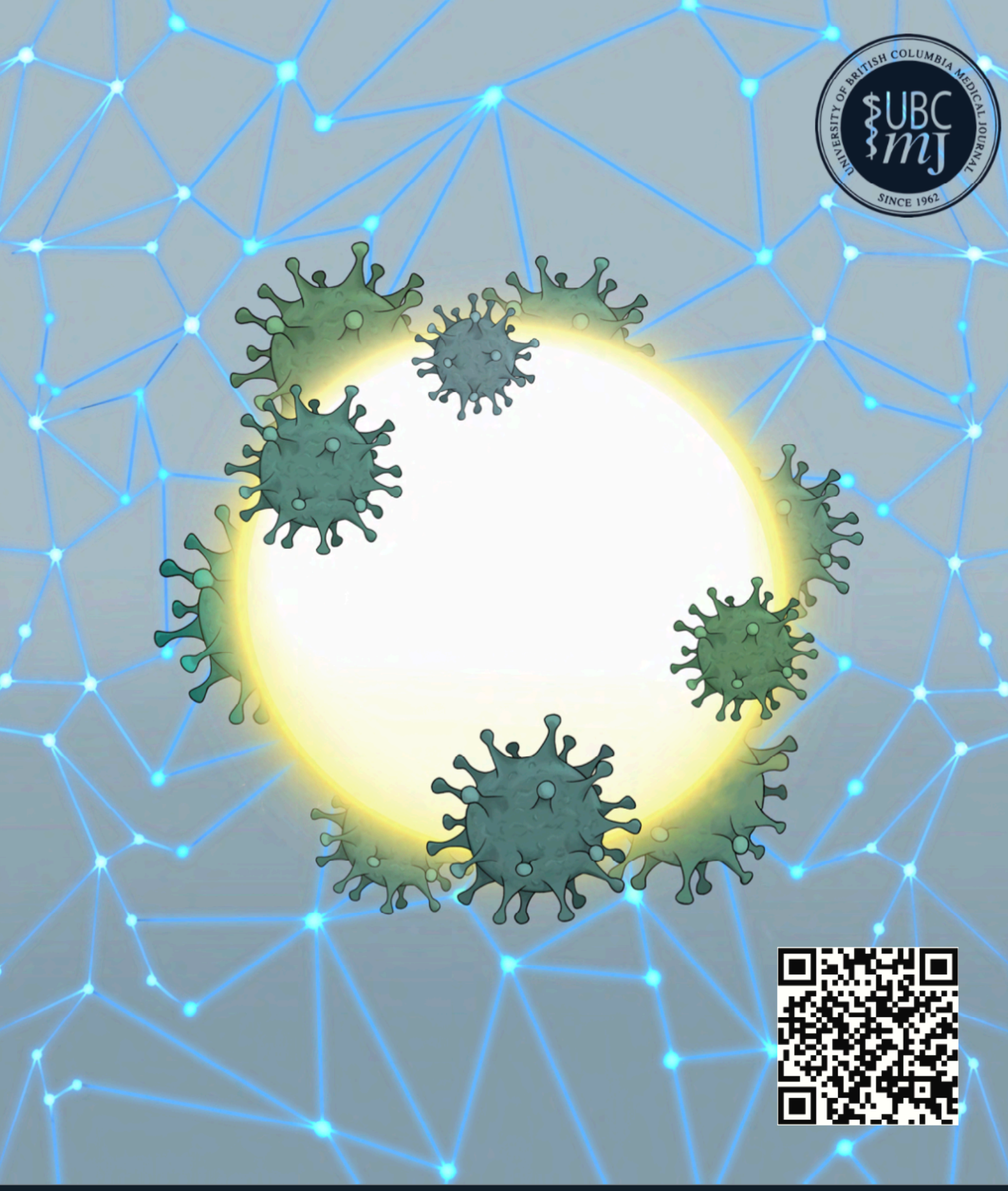


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