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ABSTRACT

Background: North America has been in an unrelenting overdose crisis for almost a decade. British Columbia (BC), Canada declared a public health emergency due to overdoses in 2016. Risk Mitigation Guidance (RMG) for prescribing pharmaceutical opioids, stimulants and benzodiazepine alternatives to the toxic drug supply ("safer supply") was implemented in March 2020 in an attempt to reduce harms of COVID-19 and overdose deaths in BC during dual declared public health emergencies. Our objective was to describe early implementation of RMG among prescribers in BC.

Methods: We conducted a convergent mixed methods study drawing population-level linked administrative health data and qualitative interviews with 17 prescribers. The Consolidated Framework for Implementation Research (CFIR) informs our work. The study utilized seven linked databases, capturing the characteristics of prescribers for people with substance use disorder to describe the characteristics of those prescribing under the RMG using univariate summary statistics and logistic regression analysis. For the qualitative analysis, we drew on interpretative descriptive methodology to identify barriers and facilitators to implementation.

Results: Analysis of administrative databases demonstrated limited uptake of the intervention outside large urban centres and a highly specific profile of urban prescribers, with larger and more complex caseloads associated with RMG prescribing. Nurse practitioners were three times more likely to prescribe than general practitioners. Qualitatively, the study identified five themes related to the five CFIR domains: 1) RMG is helpful but controversial; 2) Motivations and challenges to prescribing; 3) New options and opportunities for care but not enough to 'win the arms race'; 4) Lack of implementation support and resources; 5) Limited infrastructure.

Conclusions: BC's implementation of RMG was limited in scope, prescriber uptake and geographic scale up. Systemic, organizational and individual barriers and facilitators point to the importance of engaging professional regulatory colleges, implementation planning and organizational infrastructure to ensure effective implementation and adaptation to context.

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1. Introduction

North America and Europe have seen rising and unprecedented rates of overdose deaths for more than a decade (Rudd et al., 2016). In Canada, >38,500 people died between January 2016 and March 2023 (Public Health Agency of Canada, 2023). In April 2016, following a rapid rise in overdose deaths, the province of British Columbia (BC), Canada declared a public health emergency (Government of British Columbia, 2016) which continues in 2024. Overdose deaths are the leading cause of unnatural death and second cause of life years lost in BC (British Columbia Coroners, 2022).

The Canadian Controlled Drugs and Substances Act legislates which substances are legal and those deemed illegal within a framework of prohibition (Government of Canada, 2023). This legislation is enforced through a set of regulatory controls including legal sales (e.g. alcohol and tobacco) to prescriptions of substances currently deemed illegal (e.g. heroin, fentanyl). The authority to prescribe is a mechanism for providing safer options to the current toxic and unregulated drug market within prohibition. Operating in a universal health care context, the BC and Canadian governments' initial emergency response to toxic drug overdoses involved reducing prescriber exemption requirements for opioid agonist therapy (OAT), scaling up distribution of naloxone, expanding supervised injection/overdose prevention services, introducing legal protections for those at overdose scenes (the Good Samaritan Act), and prospectively funding community-led initiatives (Government of British Columbia, 2017; Province of British Columbia, 2018; Toward The Heart, 2018; Tsang & MGC, 2021).

In 2018, opioid treatment prescribing standards were modified to include nurse practitioners, increasing the pool of OAT prescribers (Government, 2018). In 2019, a decline in rates of overdose deaths were reported for the first time and attributed to a combination of interventions (British Columbia, August 16, 2022; Irvine et al., 2019). However, with the advent of COVID-19, the rate of deaths rose again due to service restrictions and closures, and increasing toxicity of the unregulated drug supply (British Columbia Coroners Service, 2023a). In an attempt to reduce the harms of the dual public health emergencies, federal and provincial governments introduced a number of policies including permission for pharmacists to extend and renew prescriptions (College of Pharmacists of British Columbia, 2020a; Health Canada, 2020), temporary exemptions for OAT prescriptions and medication delivery (Health Canada, 2020; College of Pharmacists of British Columbia, 2020b) and use of telehealth (Doctors of BC, 2020; Kim & Tesmer, 2021). Further, on March 26, 2020, just weeks after the initial cases of COVID-19 were detected in North America, the BC Government announced new interim Risk Mitigation Guidance (RMG). RMG is a novel intervention to enable prescribing of pharmaceutical alternatives to the unregulated drug supply to prevent the spread of COVID-19 pandemic by allowing for physical distancing and self-isolation, and to reduce the harms of an unregulated and increasingly toxic drug supply (British Columbia Centre on Substance Use, 2020).

The BC Centre on Substance Use, a provincial organization specializing in addiction and substance use clinical guidelines, research, training and education, developed the RMG, (British Columbia Centre on Substance Use). Provincial regulatory colleges, government ministries, and the First Nations Health Authority reviewed the RMG (British Columbia Centre on Substance Use, 2020). This was a provincial initiative providing guidance to all prescribers in British Columbia (BC). Under the RMG, physicians and nurse practitioners could prescribe opioids, stimulants and benzodiazepines, medication alternatives to alcohol and nicotine use, and managed alcohol for persons who are at risk of or positive for COVID-19 infection, combined with a high likelihood of withdrawal, overdose, or other drug-related and systemic harms. RMG was framed as rapidly developed interim guidance as opposed to guidelines (British Columbia Centre on Substance Use, 2020).

Prescribed safer supply programs existed prior to the onset of the COVID-19 pandemic but rapidly expanded during the pandemic (Glegg et al., 2022). Prescribed safer supply programs provide prescription drug alternatives to the unregulated supply with a priority on meeting peoples' needs. Prescribed safer supply programs typically provide additional medications to OAT with more flexibility and in some cases with fewer program restrictions (Glegg et al., 2022; Government of Canada, 2022). However, the distinctions between OAT and prescribed safer supply are not always clear given that there is a history of providing oral and injectable opioids including heroin assisted therapy and injectable opioid agonist therapy to support people who use unregulated opioids to reduce overdose risk (Glegg et al., 2022; Ivsins et al., 2020a). CAPUD (Canadian Association of People who use Drugs), BC Coroners Service and others have called for a range of safer supply models including prescribed and-non prescribed (British Columbia Coroners Service, 2023a; Canadian Association of People who Use Drugs, 2019; Canadian Association of People who Use Drugs, 2019; Foreman-Mackey et al., 2022). Early findings of prescribed safer supply programs highlight positive outcomes, including reduced perceived overdose risk, decreased illicit drug use, improved engagement in care, quality of life, and autonomy in decision-making, and reduced hospitalizations (Gomes et al., 2022b; Ivsins et al., 2021; Lew et al., 2022).

The RMG is unique as it functions as a population-level intervention, providing guidance to all prescribers within the province. This distinguishes it from a local pilot program or regional program or policy. With adoption left up to individual prescribers within the population, there are important questions as to who, among eligible prescribers, adopted it and what factors influenced adoption. Such information is essential for understanding the effectiveness of RMG and associated prescribing practices with important insights for other jurisdictions considering similar guidance.

We conducted a convergent parallel mixed methods study of the implementation of RMG (e.g prescribing pharmaceutical alternatives to the unregulated drug supply), the characteristics of prescribers, and the factors influencing implementation (barriers and facilitators). We collected and analyzed quantitative population-level administrative health data and qualitative interview data with prescribers separately with the 'mixing' happening during interpretation (Creswell & Plano Clark, 2017). Thus, the findings from each data set elaborate and expand each other (complimentarily) providing a more comprehensive understanding of early implementation among prescribers.

2. Methods

2.1. Theoretical model

Barriers and facilitators to implementation of an intervention can arise at multiple levels, including individual, organization or sociopolitical levels (Stetler et al., 2008). As described in our protocol, (Nosyk et al., 2021) we used the Consolidated Framework for Implementation Research (CFIR) as our theoretical perspective on implementation. CFIR is a comprehensive implementation framework that "offers an overarching typology – a list of constructs to promote theory development and verification about what works where and why across multiple contexts" (p. 2) (Damschroder et al., 2009). The CFIR consists of five domains and related constructs: 1) characteristics of individuals (individual knowledge of the intervention, mindsets, norms, interests and affiliations); 2) intervention characteristics (e.g. evidence strength, complexity, core components, and adaptability); 3) implementation process (planning, engaging, reflecting and evaluating); 4) inner setting (organizational structure, networks and communication, culture, implementation climate); 5) outer setting (economic, social and political context of the organization) (Damschroder et al., 2009). For this study, we focused on selected constructs that illuminated barriers and facilitators within each of the five domains from the perspective of prescribers who implemented RMG.

2.2. Quantitative data sources and measures

2.2.1. Linked administrative health data

The study conducted the quantitative analysis through a linkage of seven provincial administrative health databases to capture all prescribing physicians and nurse practitioners and their clients diagnosed with a non-opioid substance use disorder (SUD) or opioid use disorder (OUD). Linked databases included BC PharmaNet (capturing medication dispensations) (British Columbia Ministry of Health [creator] [2018d]: PharmaNet. British Columbia Ministry of Health [publisher]. Data Extract. MOH (2018). http://www.health.gov.bc.ca/data/.), Discharge Abstract Database (DAD; records of hospitalizations) (British Columbia Ministry of Health [creator] [2018a]: Discharge Abstract Database (Hospital Separations). British Columbia Ministry of Health [publisher]. Data Extract. MOH (2018). http://www.health.gov.bc.ca/data/.), Medical Services Plan (MSP; billing records for medical care) (British Columbia Ministry of Health [creator] [2018b]: Medical Services Plan (MSP) Payment Information File. British Columbia Ministry of Health [publisher]. Data Extract. MOH (2018). http://www.health.gov.bc.ca/data/.), BC Vital Statistics (capturing deaths and their underlying cause) (BC Vital Statistics Agency [creator], 2018: Vital Statistics Deaths. British Columbia Ministry of Health [publisher]. Data Extract. MOH (2018). http://www.health.gov.bc.ca/data/.), BC Provincial Corrections (records of entry into incarcerations and releases to community) (Ministry of Public Safety and Solicitor General (PSSG) [cre: BC Corrections Dataset. British Columbia Ministry of Health [publisher]. Data Extract. MOH (2018). http://www.health.gov.bc.ca/data/.), Perinatal Care Database (capturing maternal/infant care and outcomes), (Perinatal Services BC [creator] (2018): British Columbia Perinatal Data Registry. British Columbia Ministry of Health [publisher]. Data Extract. MOH (2018). http://www.health.gov.bc.ca/data/.) and the National Ambulatory Care Reporting System (NACRS; capturing emergency department [ED] visits) (British Columbia Ministry of Health [creator] [2018c]: National Ambulatory Care Reporting System (NACRS). British Columbia Ministry of Health [publisher]. Data Extract. MOH (2018). http://www.health.gov.bc.ca/data/.).

The study identified prescribers through their documented history of prescribing to clients with an indication of SUD or OUD, which entailed records of any non-opioid SUD-related perinatal care, hospitalization or ED visits or at least 3 non-opioid SUD-related physicians billing codes (Piske et al., 2020). OUD was indicated if individuals had received at least one OAT dispensation, had any OUD-related perinatal care, hospitalization or ED visits or at least 3 OUD-related physician billing codes (Piske et al., 2020). We identified RMG prescribers through drug dispensation records that linked them to at least one RMG dispensation within the initial 6 months of implementation (Nosyk et al., 2021). We considered opioid, benzodiazepine and stimulant RMG dispensations.

2.2.2. Quantitative measures

We constructed a range of covariates (aligned with CFIR domains) capturing the characteristics of prescribers and their practices, including their prescribing history (individual characteristics), characteristics of their SUD client load (inner context), and the health outcomes of their clients. Prescribing history included measures of the RMG formulations dispensed, any prior OAT dispensations, years of OAT prescribing experience, cumulative patient-months of OAT care, experience in caring for people with SUD (measured in years since their first billing records for an OUD or SUD client and cumulative patient-months of care for clients with OUD or SUD). The study identified SUD and OUD client load by summing all SUD or OUD clients prescribed to in the two years prior to March 26, 2020 and identified OAT client load by summing all clients with OAT dispensations in the two years prior to March 26, 2020, when the prescriber provided the majority of OAT prescriptions.

Measures related to the CFIR domain of intervention at the provider level included: RMG prescription, benzodiazepine prescription, clients Charlson comorbidity index (CCI) (Charlson et al., 1987), clients Clark chronic disease score (CDS) (Clark et al., 1995), prescriptions from pharmacies located in the Downtown Eastside neighbourhood of Vancouver (measured by local health authority), care provided in a community health centre (indicated by the absence of fee-for-service claims in MSP records, as prescribers working with clients in these settings are reimbursed through the provincial alternative payment plan) (Government of British Columbia, 2018), clients with a correctional history from the provincial corrections system, rates of minimum effective dosage for OAT (60 mg/day for methadone, 16 mg/day for buprenorphine/naloxone (British Columbia Centre on Substance Use & British Columbia Ministry of Health, 2017), OAT prescribing and dosing guidelines followed by the prescriber (Table A1), and 3/6/12-month OAT retention rates. Practice characteristics included location of primary practice (by regional health authority), practice speciality and an indicator of past billing records from a hospital (inner context).

2.2.3. Statistical analysis

We first provide summary statistics on the prescribers identified, stratified by their RMG prescribing status. We then plot RMG uptake for prescribers over the study period of March 26, 2020 to September 30, 2020. We hypothesized prescribers with larger caseloads and those practicing in Vancouver Coastal Health (VCH) and Island Health (VIHA) would be more likely to prescribe, adjusting for other factors. To estimate determinants of prescribing as part of the RMG, we modelled RMG uptake during the initial 6 months of its implementation using logistic regression analysis (Table 2). Providence Health Care Institute and the Simon Fraser University Office of Research Ethics determined an exemption from research ethics as per Article 2.5 of the Tri-Council Policy Statement: Ethical Conduct for Review involving Humans (Canadian Institutes of Health Research, Natural Sciences and Engineering Research Council of Canada, and Social Sciences, & Humanities Research Council of Canada, 2022).

2.3. Qualitative methods

We drew on interpretative description (ID) as our methodological approach (Thorne, 2016). ID is useful in applied research with the practical aim of generating knowledge for policy and practice. It was developed within nursing as a means of understanding human experiences and to move beyond theory generation to practical applications (Thorne et al., 1997), and is now being used across disciplines including medicine to generate evidence-based knowledge for practice (Thompson Burdine et al., 2021). The interview guide was informed by the CFIR and questions were framed to address key constructs within the five domains and relevant to implementation of RMG. The Research Ethics Board of the University of Victoria and regional health authorities provided ethical approval (#H20-01125).

We conducted qualitative semi-structured interviews with 17 prescribers (12 physicians and 5 nurse practitioners) from September 2020 to April 2021. We recruited individuals through health authority contacts, social media and provincial networks of prescribers. Participants had to be over 19, in BC, and involved in prescribing RMG to support PWUD. Three authors conducted the interviews (BP, JK, and CM). Interviews lasted from 30 to 60 min, were audio recorded and transcribed by a trained transcriptionist and entered into NVIVO.

An inductive approach to qualitative analysis informed by Braun and Clark (Braun & Clarke, 2006) guided development of a set of themes characterizing facilitators and barriers to implementation from the perspective of prescribers. Three authors (BP, JK, JM) read initial transcripts and developed an initial coding framework drawing on the five domains of CFIR as an organizing structure. As they read and reviewed transcripts, they refined ‘child’ and ‘grandchild’ nodes in NVIVO within each CFIR domain. We coded all interviews with codes capturing barriers and facilitators to RMG implementation.

3. Results

3.1. Population-based summary statistics

A total of 13,672 physicians and nurse practitioners had prescribed to OUD or SUD clients for any health-related concern in the 2 years prior to March 26, 2020 (Table 1). Of those, 612 prescribed RMG medications and 3152 prescribed OAT within the first 6 months of RMG implementation. An additional 1009 had a history of prescribing OAT but were not active OAT prescribers during the study period. Prescribers were stratified based on prescribing practices for OAT and RMG, of which 10,384 had no OAT or RMG prescriptions, 476 had both OAT and RMG, 2676 were only OAT prescribers, and 136 were only RMG prescribers. RMG prescribers were more often practicing within Vancouver Coastal Health authority (Only OAT: 27.3 % in VCH; OAT and RMG: 50.4 %; only RMG: 45.6 %). General practitioners primarily provided RMG prescriptions, though a higher percentage of nurse practitioners participated in the program compared to other specialties. Those prescribing both OAT and RMG medications included more nurse practitioners (13.2 %), and those prescribing only RMG medications included more physicians specialized in psychiatry (15.4 %); however, the majority of physicians were general practitioners in all groups (Only OAT: 85.5 %; OAT and RMG: 76.9 %; only RMG: 52.2 %). Among physicians who prescribed RMG medications, those also prescribing OAT mostly prescribed opioids under RMG (76.3 %) and those who did not prescribe OAT had benzodiazepine RMG medications as the highest prescribed type of RMG drug (45.6 %).

3.2. Quantitative analysis of RMG prescriber characteristics

We executed multiple logistic regression models to identify prescriber characteristics associated with RMG prescription within the first 6 months of the program's implementation (Table 2). In considering the effects of the outer context, prescribers in the Vancouver Coastal (adjusted odds ratio: 3.16; (95 % confidence interval: 2.28, 4.38) and Vancouver Island Health Authorities (2.27 (1.61, 3.21)) were more likely to prescribe under RMG compared to those in other parts of the province. When compared to physicians working in general practice, nurse practitioners had 3.19 greater odds of prescribing under RMG (95 % CI: 2.19, 4.64), while psychiatrists had lower adjusted odds of opioid RMG prescription (0.37 (0.20, 0.69)) and those with other specialties also had lower odds of RMG prescription (0.46 (0.30, 0.71). Regarding individual characteristics, prescribers with over 22.3 years of experience treating SUD clients had 34 % lower odds of prescribing under RMG (0.66 (0.49, 0.89)) compared to those with 4.1 years or less experience with SUD clients. Having a history of OAT prescribing was associated with a >3-fold increase in the adjusted odds of prescribing under RMG (3.34 (2.62, 4.23). Regarding the inner context, prescribers with higher SUD client loads were more likely to prescribe under RMG (over 72 clients: 6.89 (3.42, 13.91) compared to those with 10 or fewer clients with SUD). Finally, having a third or more of their client load accessing social assistance in 2019 was associated with a prescriber having 2.59 greater odds of prescribing under RMG (95 % CI: 1.91, 3.50).

3.3. Qualitative interview findings

Prescribers in the qualitative sample ranged in age from 34 to 58 years of age. There were participants from each of the five regional health authorities in BC. Eleven identified as woman and the rest as men. They had been in their current job role from 1 to 9 years. Nine had some form of specialized addiction training while the rest did not. Five themes were identified capturing facilitators and barriers from the perspectives of prescribers: 1) RMG is helpful but controversial (outer context); 2) Motivations and challenges to prescribing (individual characteristics); 3) New options and opportunities for care but not enough to 'win the arms race' (intervention); 4) Lack of support for implementation

Table 1
Summary statistics on clinicians treating clients with SUD.

	No OAT or RMG (n = 10,384)	Only OAT (n = 2676)	OAT and RMG (n = 476)	Only RMG (n = 136)
Practice characteristics				
Primary HA practice				
Interior	1489 (14.3 %)	537 (20.1 %)	50 (10.5 %)	12 (8.8 %)
Fraser	2704 (26.0 %)	540 (20.2 %)	60 (12.6 %)	25 (18.4 %)
Vancouver Coastal	4020 (38.7 %)	730 (27.3 %)	240 (50.4 %)	62 (45.6 %)
Vancouver Island	1735 (16.7 %)	641 (24.0 %)	102 (21.4 %)	27 (19.9 %)
Northern	436 (4.2 %)	228 (8.5 %)	24 (5.0 %)	10 (7.4 %)
Clients used pharmacies located near DTES[a]	2875 (27.7 %)	870 (32.5 %)	346 (72.7 %)	72 (52.9 %)
Most recently listed physician speciality				
Nurse practitioner	407 (3.9 %)	73 (2.7 %)	63 (13.2 %)	< 10
General practice	5147 (49.6 %)	2289 (85.5 %)	366 (76.9 %)	71 (52.2 %)
Psychiatry	522 (5.0 %)	72 (2.7 %)	16 (3.4 %)	21 (15.4 %)
Unknown	1055 (10.2 %)	76 (2.8 %)	14 (2.9 %)	24 (17.7 %)
Other specialties	3253 (31.3 %)	166 (6.2 %)	17 (3.6 %)	12 (8.8 %)
Percentage of clients obtaining care in a CHC (if physician) (median, IQR)	12.7 (4.3–100)	10.9 (5.5–35.3)	22.1 (7.1–80.2)	16.1 (7.0–100)
Practiced in hospital	3656 (35.2 %)	1161 (43.4 %)	142 (29.8 %)	41 (30.2 %)
SUD prescribing history				
Ever prescribed OAT	995 (9.6 %)	2676 (100 %)	476 (100 %)	14 (10.3 %)
Years since first OAT dispensation (median, IQR)	14.5 (3.2–20.1)	1.8 (0.9–3.2)	3.0 (1.7–9.2)	8.8 (3.3–20.2)
Years since first billing record for a client with SUD/OUD (median, IQR)	10.5 (3.7–22.2)	11.6 (5.0–23.0)	8.4 (3.6–18.2)	7.6 (3.1–20.2)
Total patients-months of care for clients with SUD/OUD (median, IQR)	677 (96–1781)	1721 (622–3788)	3162 (980–7438)	1330 (165–4903)
Type of RMG prescription provided				
Opioids	–	–	363 (76.3 %)	54 (39.7 %)
Benzodiazepines	–	–	149 (31.3 %)	62 (45.6 %)
Stimulants	–	–	304 (63.9 %)	45 (33.1 %)
SUD caseload				
SUD and OUD client load (median, IQR)	21 (7–47)	71 (39–131)	248 (119–459)	68 (26–147)
OAT client load (median, IQR)	–	2 (1–3)	96 (18–280)	–
RMG client load (median, IQR)	–	–	3 (1–14)	1 (1–1)
Clients with a CCI over 1; % (median, IQR)	7.6 (0–16.0)	8.0 (5.0–12.0)	7.9 (5.5–10.4)	7.7 (5.2–13.2)

(continued on next page)

Table 1 (*continued*)

	No OAT or RMG (n = 10,384)	Only OAT (n = 2676)	OAT and RMG (n = 476)	Only RMG (n = 136)
Clients with a CDS over 4; % (median, IQR)	0 (0–2.6)	1.3 (0–2.8)	1.9 (0.9–3.2)	1.6 (0–4.3)
Clients with corrections history past 12-months; % (median, IQR)	0 (0–0)	1.0 (0–2.7)	3.2 (1.8–5.0)	0.8 (0–2.9)
Prescribing characteristics				
Percentage of clients receiving benzodiazepines (median, IQR)	35.8 (26.7–47.5)	37.2 (30.3–43.7)	28.5 (22.1–36.4)	38.0 (39.9–46.3)
Percentage of OAT clients on the minimum effective dose (median, IQR)	–	66.7 (0–100)	66.4 (58.3–73.2)	–
Percentage of OAT guidelines followed (median, IQR)	–	50.0 (36.3–72.0)	76.1 (66.7–80.4)	–
OAT client retention				
3-Month retention (median, IQR)	–	56.8 (12.5–100)	60.0 (49.7–69.9)	–
6-Month retention (median, IQR)	–	40.0 (0–100)	48.6 (37.0–58.9)	–
12-Month retention (median, IQR)	–	10.3 (0–50.0)	33.0 (22.3–42.8)	–

All continuous variables are presented as median (1st quartile – 3rd quartile). Abbreviations: DTES: Downtown Eastside.

[a] Measured by the Local Health Area number that contains the DTES (LHA 322 - Vancouver - Centre North).

(implementation process); 5) Limited infrastructure (inner context). Within each theme, we provide insight into facilitators and barriers to prescribing RMG medications (Table 3).

3.3.1. *RMG is helpful but controversial (outer context)*

The clinical guidance document was identified as a facilitator for RMG prescribing as it had an impact on the outer context. One participant described,

> Without a document like that and some sort of official guidance, it wouldn't have happened because essentially what we were doing as clinicians was we were doing something that maybe as many of us might have wanted to do earlier, but we would have felt was professionally kind of contraindicated, right? Like no one is going to prescribe a benzodiazepine and an opioid together without some sort of official approval or providing OAT with short-acting opioids, right? And maybe that's something we had considered doing before to facilitate up-titration of OAT, but we never would have done it because, you know, everything from the College [regulatory association for physicians or nurse practitioners] would say that that was not allowable, really. So that was a big facilitator, I think. Just having something like the BCCSU, having them endorse it, all the training they did to support us in doing it was a facilitator.
>
> – Participant SPRMG34

This participant identified that introduction of the guidance along with training was helpful given the lack of guidelines in this area of prescribing. Publication though the BCCSU, a centre specializing in substance use treatment, provided further legitimacy and support. However, other participants described feeling they were out of the loop and that the guidance was developed without their input.

> I think, there are a lot of community providers that really felt like they were out of the loop in something like this because this was largely done by the BCCSU and a small cohort of physicians and people with lived experience and stuff but there was really no consultation with the addictions medicine cohort as a whole.
>
> – Participant SPRMG

The BCCSU and the provincial government had developed and released RMG in a significantly expedited manner as an "extraordinary measure" for the pandemic (British Columbia Centre on Substance Use, 2020). This rapid and condensed development had ramifications for prescriber uptake as well as the suitability of the intervention for a range of settings particularly in northern, rural, and remote parts of the province.

The release of the guidance sparked controversy and differences in opinion among prescribers acting as a barrier to uptake and spread of the intervention.

> A lot of the angst was borne more out of the provincial-wide prescriber discussions where there's a lot of back and forth, and there's a lot of people who are very against it, there's a lot of people who are very for it. Colleagues who trained me who I really respect were against it, which then made me feel like "should I be prescribing this thing that people that I trust and respect are not?" But then equally and opposite, people who trained me who I respect who were for it.
>
> – Participant SPRMG6

Participants highlighted a key barrier to prescribing was the contradiction to previous opioid prescribing guidelines.

> You'll hear a narrative that doctors are opposed to this. I think there's certainly some doctors who are, you know, opposed to this in principle, but I think the vast majority – the biggest holdup in terms of more widespread adoption is a genuine [sighs] discomfort…You know, we're a conservative profession, we are all trying to practice by the best available evidence, and when an intervention comes along that is in direct opposition to what we're conventionally taught, shortly after a period in medicine where, rightly or wrongly, physicians have been blamed outspokenly for, being drivers of overprescribing and of the overdose crisis; and then to have that sudden 180 without any real new evidence to say that this should be the way forward, I think people are, are genuinely concerned and afraid.
>
> – Participant SPRMG17

As noted by this participant, historical concerns about prescribers being blamed for over-prescribing as a cause of overdoses was identified as factor impacting prescribers' uptake of RMG. As the next participant highlights these concerns are rooted in punitive approaches to opioid prescribing.

> I think some of the hesitation from prescribers obviously comes down from the sort of punitive approach to opioid prescribing in recent years. So that's definitely had an impact on prescribers being unwilling or hesitant to prescribe it. There's also, there's been a lot of back and forth or questions about whether our College is supportive or not.
>
> – Participant SPRMG27

Given a history of punitive approaches to over-prescribing by professional regulatory colleges, participants were unsure how the professional regulatory college would respond to such a shift in opioid prescribing.

Participants expressed frustration and confusion regarding the role of the regulatory college: "it was so frustrating to be told through this provincial document and by the Ministry 'Please prescribe this way,' and then sort of in the next moment to be audited for prescribing in that way." This participant went on to say, "And it is a real disincentive to provide this care. – Participant SPRMG20. These participants succinctly

Table 2
RMG uptake odds among prescribers who treated SUD in 2 years prior to RMG.

Model outcome	No. (%)	Any RMG ($n = 612$)		Opioid RMG ($n = 417$)	Non-opioid RMG ($n = 473$)
		Unadjusted odds ratio (95 % CI)	Adjusted[a] odds ratio (95 % CI)		
Practice characteristics					
Primary HA of practice					
Interior	2088 (15.3 %)	Reference	Reference	Reference	Reference
Fraser	3329 (24.4 %)	0.86 (0.61, 1.19)	0.80 (0.55, 1.16)	0.50 (0.30, 0.84)	1.15 (0.75, 1.77)
Vancouver Coastal	5052 (37.0 %)	2.08 (1.57, 2.74)	3.16 (2.28, 4.38)	4.01 (2.64, 6.08)	4.08 (2.78, 5.99)
Vancouver Island	2505 (18.3 %)	1.77 (1.30, 2.42)	2.27 (1.61, 3.21)	2.52 (1.61, 3.94)	2.75 (1.83, 4.13)
Northern	698 (5.1 %)	1.67 (1.09, 2.57)	0.87 (0.54, 1.39)	1.12 (0.64, 1.96)	0.78 (0.44, 1.39)
Practice located in a rural area	1208 (8.8 %)	1.16 (0.89, 1.52)	0.97 (0.70, 1.33)	0.94 (0.62, 1.41)	0.96 (0.66, 1.38)
Physician speciality					
General practice	7783 (57.6 %)	Reference	Reference	Reference	Reference
Nurse practitioner	551 (4.0 %)	2.52 (1.93, 3.29)	3.18 (2.18, 4.64)	2.95 (1.90, 4.59)	2.33 (1.55, 3.51)
Psychiatry	631 (4.6 %)	1.06 (0.75, 1.50)	0.85 (0.57, 1.27)	0.37 (0.20, 0.69)	0.87 (0.56, 1.34)
Known but other specialties	3448 (25.2 %)	0.14 (0.10, 0.21)	0.46 (0.30, 0.71)	0.39 (0.23, 0.68)	0.38 (0.23, 0.64)
Undetermined speciality (physician)	1169 (8.6 %)	0.57 (0.41, 0.80)	2.26 (1.40, 3.64)	2.33 (1.29, 4.22)	2.16 (1.25, 3.73)
SUD prescribing history					
Ever prescribed OAT	4161 (30.4 %)	10.27 (8.39, 12.57)	3.34 (2.63, 4.24)	5.37 (3.78, 7.62)	3.33 (2.54, 4.37)
Years since first billing record for a client with SUD					
1st quartile (≤4.1 years)	3433 (25.3 %)	Reference	Reference	Reference	Reference
2nd quartile (>4.1 to 10.6 years)	3381 (24.7 %)	1.11 (0.89, 1.37)	0.90 (0.69, 1.18)	0.79 (0.57, 1.09)	0.95 (0.71, 1.27)
3rd quartile (>10.6 to 22.3 years)	3432 (25.1 %)	0.88 (0.70, 1.11)	0.84 (0.63, 1.11)	0.68 (0.48, 0.97)	0.84 (0.62, 1.14)
4th quartile (>22.3 years)	3426 (25.1 %)	0.69 (0.54, 0.87)	0.66 (0.49, 0.89)	0.52 (0.36, 0.76)	0.60 (0.43, 0.84)
SUD caseload					
Total number of clients with SUD					
1st quartile (≤10 clients)	3434 (25.1 %)	Reference	Reference	Reference	Reference
2nd quartile (11 to 30 clients)	3445 (25.2 %)	3.40 (1.83, 6.33)	1.50 (0.76, 2.94)	1.09 (0.45, 2.64)	1.63 (0.70, 3.79)
3rd quartile (31 to 72 clients)	3460 (25.3 %)	5.99 (3.32, 10.8)	2.12 (1.06, 4.25)	1.31 (0.52, 3.3)	2.42 (1.03, 5.68)
4th quartile (≥73 clients)	3333 (24.4 %)	44.05 (25.33, 76.58)	6.95 (3.44, 14.03)	5.14 (2.04, 12.98)	8.72 (3.68, 20.64)
SUD client load characteristics					
Aged 40 or over					
< 66.7 % of clients	6907 (50.5 %)	Reference	Reference	Reference	Reference
66.7 % or more clients (Median or higher)	6765 (49.5 %)	0.43 (0.36, 0.51)	0.80 (0.64, 1.01)	0.81 (0.61, 1.08)	0.76 (0.59, 0.98)
A CCI of at least 1					
1st quartile (≤2.1 % of clients)	3410 (24.9 %)	Reference	Reference	Reference	Reference
2nd quartile (>2.1 % to 7.6 % of clients)	3439 (25.2 %)	8.70 (6.01, 12.60)	1.52 (0.99, 2.33)	1.74 (0.95, 3.17)	1.38 (0.85, 2.24)
3rd quartile (>7.6 % to 14.3 % of clients)	3462 (25.3 %)	8.00 (5.52, 11.60)	1.37 (0.89, 2.1)	1.5 (0.82, 2.75)	1.47 (0.9, 2.38)
4th quartile (>14.3 % of clients)	3361 (24.6 %)	2.38 (1.57, 3.61)	1.31 (0.81, 2.12)	1.5 (0.78, 2.87)	1.27 (0.73, 2.2)
Incarceration, past 12 m					
< 1.7 % clients	10,173 (74.4 %)	Reference	Reference	Reference	Reference
≥1.7 % clients (3rd quartile or higher)	3499 (25.6 %)	7.44 (6.24, 8.88)	1.68 (1.35, 2.09)	1.94 (1.45, 2.59)	1.66 (1.30, 2.13)
Prescribed benzodiazepines					
No clients	4581 (33.5 %)	Reference	Reference	Reference	Reference
At least 1 client	9091 (66.5 %)	13.13 (8.72, 19.78)	2.33 (1.43, 3.8)	1.91 (1.03, 3.55)	2.41 (1.32, 4.38)
Accessed social assistance, past 12 m					
< 33.3 % of clients	6732 (49.2 %)	Reference	Reference	Reference	Reference
≥ 33.3 % clients (Median or higher)	6940 (50.8 %)	9.61 (7.34, 12.57)	2.57 (1.9, 3.48)	6.65 (3.71, 11.92)	2.12 (1.52, 2.96)
Overdose in the past 12 months					
< 3.4 % clients	10,269 (75.1 %)	Reference	Reference	Reference	Reference
≥ 3.4 % or more of clients (3rd quartile or higher)	3403 (24.9 %)	7.39 (6.20, 8.81)	2.98 (2.39, 3.72)	4.49 (3.34, 6.03)	2.66 (2.08, 3.42)

[a] Adjusted odds ratios are conditional on all other covariates listed above.

and clearly highlight barriers to RMG prescribing including historical blaming of prescribers for overprescribing, lack of support/clarification from the regulatory colleges about the shift in prescribing, and concerns about audits as disincentives.

3.3.2. Motivations and challenges to prescribing (individual characteristics)

Within the outer context described above, motivation to prescribe was based on participants' assessment of the current context, their clients' needs, and previous experiences and knowledge. In particular, individual participant understandings of the intersection of COVID-19 and the escalating overdose emergency was a key motivator for prescribing. As one participant said "*In a pandemic you reach for what you can*" (participant SPRMG5). Another described:

> We're early adopters who have taken this on, and until there's more evidence of benefit and lack of harm, you're not going to see that middle population start to pick this up, much like you would with any other new medication that's coming on market. The difference being that we're in a public health emergency, so waiting that conventional, you know, 5 to 10 years between when something is first rolled out and becomes mainstream, which is what happens with most cardiac medications, that's just not an option.
>
> – Participant SPRMG17

Participants pointed to the declaration of dual public health emergencies as an important motivator to shift practice.

Within the context of public health emergencies, participants spoke about concern for their patients and the desire to implement something that might benefit their patients. One participant describes:

> As soon as there was a guideline and I could see that this was something that might be beneficial to people and patients were asking for it, then I, there was no way I couldn't offer it. Like it just had to happen.
>
> – Participant SPRMG18

In some cases, prescribers described both high risk of harms to their patients and observed benefits as important motivators.

Table 3
Qualitative thematic results.

CFIR Domain	Facilitators	Barriers
3.3.1: RMG is helpful but controversial (outer context)	-Release of the RMG by BCCSU -Training for Prescribers	-Lack of input and consultation on the RMG -Controversy among prescribers -Contradiction to previous clinical guidelines -Lack of new evidence to support shift in prescribing given history of concerns related to overprescribing of opioids. -Lack of support or endorsement from professional regulatory colleges -Concerns re Audits
3.3.2: Motivations and Challenges to Prescribing (Individual Characteristics)	-Declaration of dual public health emergencies. -Assessment of Patient Needs, Risks, and Benefits -Previous experience with OAT	-Lower caseloads of people with SUD -Lack of experience with OAT
3.3.3: New Options and Opportunity for Care but not Enough to Win the 'Arms' Race (Intervention)	-New options for medications including stimulants and M-Eslon. -Adjunct to OAT initiation -Engage people in care and address unmet medical needs	-Drugs and dosages inadequate to replace street drug supply -Potential for Diversion -Limits of a prescriber driven intervention to address a population issue.
3.3.4: Lack of Support for Implementation (Implementation Process)		-Lack of implementation planning at provincial level -Confusion re eligibility and administration —No additional funding or infrastructure support
3.3.5: Limited Organizational Infrastructure (Inner Context)	-Development of clinical protocols -Organizational champions -Organizational infrastructure such as community clinics and housing -Supportive colleagues -Supportive community organizations	-Lack of organizational infrastructure such as community clinics and housing -Unsupportive colleagues -Unsupportive community organizations

> We have 5 people […] that are on injectable either mood stabilizers or antipsychotics that continue to use drugs that are stabilized right now on…because of the risk mitigation guidelines.
>
> – Participant SPRMG12

This prescriber described a situation in which one person who had been overdosing once a week had not been in emergency for an overdose since starting on RMG medications. Another participant observed,

> …like there's so many markers of success from my patients. Right? It's not just reduction of use. Sometimes it's really like, their physical health, their admissions to hospital, as I mentioned before and just kind of improvement in their quality of life, I think, would be a big part of that too.
>
> –Participant SPRMG31

As this participant describes, there are multiple makers of success observed in clinical practice influencing individual decisions about prescribing.

As noted in the quantitative findings, RMG prescribers often had high caseloads of people with SUD, clients on low incomes and experience with OAT. Qualitatively, participants worked with a population of people using drugs who were at high risk of overdose and used their previous experience with multiple forms of OAT to inform decisions to prescribe.

> We had had so much experience [with OAT] that we felt that this would be a reasonable next step for interventions for our clinical team. So it wasn't actually that much of a leap for us just to change our prescribing to be community pharmacy-based and all to go.
>
> – Participant SPRMG20

Indeed, some participants identified that prescribing would be a big leap without previous OAT experience. The prescriber below highlights that there is no step-by-step guide:

> I've been doing this for a few years now and I have a comfort level in it. Um, but for someone who like is just graduating and is like really keen to do harm reduction like, how in the world will they ever figure it out? 'Cause there's no step-by-step guide for this.
>
> – Participant SPRMG22

Individual practitioners' expertise and knowledge of their patients as well as previous experience with OAT were important individual characteristics influencing decisions to prescribe. The decision to roll out RMG through primary care (i.e., via general practitioners) meant that theoretically more people could access a prescriber but as highlighted by these participants many general practitioners would not have experience with this type of prescribing.

3.3.3. New options and opportunities for care but not enough to 'win the arms race' (intervention)

A key facilitator from the perspectives of prescribers was that RMG provided new options for medications (e.g., stimulants and shorter acting opioids).

> …it has been a door opener for some patients who otherwise may have felt that there was nothing available to them in the healthcare system; that another conversation with a doctor or a nurse wasn't going to help them, there was nothing new or nothing different we could offer them and they'd had offered to them before. Now suddenly there was something new that, you know, could be an option
>
> – Participant SPRMG2

The added option of stimulants was generally viewed by participants as helpful for untreated, suspected, or diagnosed attention deficit hyperactivity disorder (ADHD). One prescriber stated,

> And so for those patients, I would say some of them, particularly those who shared with me a history of having childhood ADHD, benefitted to some extent in terms of increased sort of functionality, ability to complete tasks. Some were able to kind of reorganize pieces of their lives and relationships to feel more healthy for themselves. So for that subset of people on stimulant RMG, I think there was some outcome there that was positive for some people
>
> – Participant SPRMG2

Another provider made the following observation regarding M-Eslon (morphine), a shorter acting opioid that was introduced with RMG.

> for a while there Kadian [sustained release morphine, 24 hour] was short or backordered in BC, and so we had to switch everyone over to M-Eslon [sustained release morphine, 12 hour], and a lot of our clients found that that's really…it's more helpful for them […] People really seem to understand the 12 hour mechanism and finding that helpful.
>
> – Participant SPRMG12

Other participants spoke to the value of RMG opioids as a useful adjunct to OAT initiation and titration.

> We often start them on a dose of agonist therapy and supplement them with hydromorphone while we titrate their agonist therapy, which is a very, very effective tool, ah, at helping to retain people during the titration phase of agonist therapy, which traditionally is a period where we lose a lot of patients.
>
> – Participant SPRMG17

As this prescriber observes, hydromorphone is useful as a tool to help retain people in OAT care. As noted by other participants, patients were re-engaged or retained in care with the potential benefit of addressing other unmet medical needs.

> People come for an intervention who have not been attached to medicine before. So they're off their antiretroviral, and so then you're like "Oh, okay. Let's kind of try to get your HIV bloodwork, let's do your resistances, let's get you restarted on our ARVs [antiretrovirals]." Like "Oh, you had osteomyelitis, like let's…" You know, like that you're just when people who have been homeless and injecting and not been at all attached to primary care and then they hear that you're prescribing in this way and come to your clinic for an intake, often they have many unmet medical needs
>
> – Participant SPRMG20

In summary, participants identified benefits that facilitated implementation of RMG including new medication options for SUD, as an adjunct to OAT initiation and retention, engagement in care, and opportunities to address unmet medical needs.

While seeing the benefits of RMG as a facilitator to prescribing, a key barrier was that shifting street drug markets meant that often hydromorphone and available stimulants were not always adequate replacement for currently illicit drugs and an increasingly toxic drug supply.

> We're trying our best to fight against a toxic drug supply that is completely out of control. The drugs that we have at our disposal to be able to try to offer pharmacological alternatives are proving to be less effective than we or the users were hopeful that they would be. And during the time of the risk mitigation guidance, we've seen the toxicity of the drug supply increase exponentially, simultaneously with the intervention that we're carrying out.
>
> – Participant SPRMG4

As the participant below highlights, it is difficult to replace fentanyl and benzodiazepines and that the available medications are not adequate replacements.

> I think it's hard to fight, you know, carfentanil, etizolam, bromazepam, like all the contaminated fentanyl with […] like I always tell patients it's like fighting a fire with a tiny little water gun. Right? Like, Dilaudid [hydromorphone] is really not comparable. Our prescription opiates are not comparable to what's there on the street in terms of what patients are trying to achieve with their illicit use, right? Even their tolerance, like we can't meet their tolerance with the medications that we have.
>
> –Participant SPRMG31

Another participant described it as an '*arms race'* that in order to win would require higher dosages. While some participants indicated that people may be using less, patients are still at risk of overdose because the available medications were not always adequate in terms of type, dose, or format of dispensation.

> I think that we've learned that people who are prescribed RMG are still using if not the same, maybe a little less fentanyl or stimulants, and continue to have the same number of overdoses because of how toxic the drug supply is; and that some people just don't find it helpful so they're having to divert
>
> – Participant SPRMG35

Participants observed that one outcome of inadequate dosing and medications was the potential and reality of diversion. The following prescriber describes the discomfort and high stakes involved *"where I don't know what they were doing with those [hydromorphone] tablets."* This prescriber highlighted that there are many possibilities including prescriptions being stolen, clients selling prescriptions to buy food or drugs or benefits of reducing sex work alongside worries about violence to patients and others if prescriptions were cut off. They stated, *"But how can I as a clinician continue to prescribe something if it's a negative urine drug test? And so you just felt like in a terrible position" Participant SPRMG20*. This participant and others highlighted the difficult balancing of benefits and harms to patients, others and self-associated with RMG prescribing when medications and dosages are not aligned with client needs.

Overwhelmingly, participants pointed out that the growing rate of overdose deaths was not one that individual providers alone could address and that given the toxicity of the unregulated drug supply, a prescriber-driven intervention was limited, notwithstanding the benefits identified above.

> Well, it's a great ambition to be able to try and, fix a societal harm. But recognizing that over the past year, we have seen the apparent futility of our actions and realized that this needs to be not a prescriber-driven intervention. This needs to be society fixing it. That we, it is overly ambitious and almost hubristic on our part to believe that the healthcare system can fix this; that individual care providers can save people from the harms of this poison that just keeps getting stronger and stronger. And people's tolerance just keeps getting higher and higher.
>
> – Participant SPRMG4

The participant above highlights the limitations of prescriber models to address the root issues of an unregulated drug supply driven by prohibition. Regardless, many participants cautioned against stopping RMG.

> Well, I certainly don't want it to be cut off. You know what I mean? Like I don't want risk mitigation prescribing to have a full stop. Because I think that that would miss all the subtleties of people who may have benefitted from it across BC, but I think to like double-down on this as our solution to the overdose crisis is the wrong thing because it hasn't worked that well enough. Like the drugs are too low potency; the systems and infrastructure are not in place to deliver them in a safe way that they're being hammered through physicians who are really not keen to continue to do this work.
>
> Participant SPRMG20

The participant goes on to say:

> So I can see still a clinical application for hydromorphone, but just it's not a solution to a systems issue
>
> – Participant SPRMG20

As the above participant and others observe, while RMG has benefits, risk mitigation prescribing is not the sole solution to the unregulated drug emergency given the limits of the intervention and the lack of prescribers and infrastructure to implement. Further, prescribing alone is an inadequate response to a systems issue, namely prohibition and an unregulated, unsafe supply of drugs.

3.3.4. Lack of implementation support and resources (implementation process)

Participants pointed to the lack of a provincial implementation plan as a barrier to implementation especially given the controversies and differences in opinions about RMG described above.

> And I don't know that I can describe the implementation plan cause it has been a little bit, you know, how can we do this in a way that's not going to rock too many boats. Like I think the idea of doing OAT was ground-breaking enough to try to get our allied health team to wrap their heads around […] Like I think people maybe don't have a

full understanding of what we're doing. They just sort of understand that it's all OAT.

– Participant SPRMG26

Further, prescribers pointed to the lack of guidance for implementation and confusion related to implementation including eligibility and dosing. One participant stated,

So there was confusion amongst prescribers because different ones of us maybe had different ideas over who should or should not qualify because the inclusion criteria in the documents are extremely broad. We had very different ideas of how you should titrate because, again, there is no guidance for titration, and so, you know, how to be safe in our prescribing. We were all doing different things in the beginning, sometimes wildly different things. Again, no precedent here anywhere in the world to build off of.

– Participant SPRMG17

In addition to lack of an implementation plan and clarity of the clinical guidance, participants highlighted that there was no additional funding or support to implement RMG.

So that was one of the things I wanted to talk about with the safe supply was that doctors were unsupported I think to roll this out. Like it was unfunded and unsupported work that we did just in a panic out of worry for our patients' lives.

– Participant SPRMG20

Many participants described a lack of provincial and regional infrastructure to support the roll-out of RMG and compared it to the infrastructure for the other public health emergency, COVID-19.

Like we actually need staff to do this work. And everybody acknowledges that it's a public health crisis but public health wants no ownership at all, of it. So [Health Authority] has a very robust public health system that we saw during COVID-19 but they want nothing to do with overdoses, drug use, harm reduction. It's completely separate. It's not what we do. O-Okay well then who does it? Because if it's not public health, you need to resource that, not just send out a newsletter that it says people are dying. It's infuriating.

– Participant SPRMG26

This participant and others spoke to the fact that both overdoses and COVID-19 were public health emergencies, with COVID-19 exacerbating the pre-existing overdose emergency. Yet, overdoses did not get a similar public health response. Importantly, RMG was not implemented through the public health system. Instead, implementation was meant to be through primary care and/or addiction medicine and at the discretion of medical prescribers –who often raised concerns about a lack of implementation support – within a medical system.

3.3.5. Organizational infrastructure and networks (inner context)

Given the challenges associated with the outer context, the intervention and implementation process, participants described important features of the inner (organizational) context such as clinical protocols, champions and organizational infrastructure that facilitated implementation. In order to implement, participants described creating protocols as part of figuring out how to implement RMG.

We, I think, rapidly figured out that, that the way we started doing it wasn't working and took steps to correct that and developed a system that worked. And I've even talked to a number of other clinics as an educator where I've really strongly suggested they do something similar; make sure that they all get on the same page and ensure that their practice patterns align closely.

– Participant SPRMG17

In essence as the participant above highlights, developing clinical protocols for RMG prescribing facilitated implementation.

Where implementation occurred, another key facilitator was organizational champions willing to take on the work.

In many ways I think the only reason that it worked was because of the tireless hours that were put in by people who are passionate about this work – … not because we had all of our ducks in a row right from the beginning. There were kinks, as with any new program. But there were a lot of really, really passionate, intelligent people who just put tons of time in to figure out what those kinks were and making it work.

– Participant SPRMG6

It is important to note that many non-prescribers acted as champions.

[Nurse lead], has been a champion for all things safer supply and harm reduction right from the beginning. And definitely a very wise voice as far as recognizing prescriber viewpoints and then rectifying that with what we're hearing from clients and what nurses are able to roll out, right? Like [they] just got a really balanced – and right from the beginning, that, [their] opinion was super, super critical.

– Participant SPRMG6

Frequently, nurses and peers (people with lived or living experience of drug use) were identified as important champions in advocating for implementation of RMG and then making it work, as described above.

Where supportive organizational infrastructure existed, implementation was facilitated. One participant describes supportive infrastructure in housing-based care:

And I think that's the part of it that's a challenge is that, you know, its history of where RMG came from was around sort of housing-based care. And so that's the model where it's made the most sense; where there's a daily delivery pharmacy that's doing daily dispensing, where there's embedded physician and nursing support, outreaching for those UDSs [urine drug screens], et cetera, et cetera. Like that's the place that it really has worked the best and where there's been the most access for people. Because the system is there to support it.

– Participant SPRMG2

Additionally, this participant highlights the value of interdisciplinary care in either a housing or clinic setting as supportive. In contrast, participants in more rural and remote settings highlighted the challenges of implementing RMG where there is a lack of resources and infrastructure.

…we've had to cap that program at [number of people] because we just simply can't sustain it. There's such a great need. We have people hitchhiking […] to get to our program because it's the only one in our area, but we've had to cap it.

– Participant SPRMG12

I mean, there's quite a few people here without cell phones, telephones, places to live. Sometimes they're living in a hotel, sometimes they don't have transportation. That's an issue. Sometimes people's lifestyles are just so that they're up all night, and our pharmacy is only open from 9 to 5 Monday to Friday.

– Participant SPRMG18

Thus, it is not surprising that implementation was more likely in large urban versus rural areas of the province.

Regardless of organizational setting, participants highlighted the importance of networks of colleagues and the impact of these networks on implementation of RMG. In the following example, the participant highlights a growing network of colleagues and community organizations as a facilitator.

Probably among the big drivers of it in [city] is that we have a very emerging network of [prescribers], and we're quite well connected with each other. And then man – some of us are connected with … [city]. I think honestly that was probably the biggest push factor for

> [name of city] […] there was a willingness, early in the pandemic especially, to do a fair bit of interdisciplinary work. Like for the first time, you know, clinicians were working quite closely with like [non-profit], [drug user organization], and harm reduction organizations. So I think those factors were enablers for sure.
>
> – Participant SPRMG34

This participant points to the importance of working with community non-profit organizations including drug user organizations as a facilitator of implementation. Conversely, the next participant describes how lack of supportive colleagues and community organizations acted as a barrier.

> Well the most obvious barrier here is the atmosphere and the other practitioners, like the other […]practitioners. Like, in detox and the hospital and in the community. Like all of them. […] They're so against it."
>
> – Participant SPRMG22

In some cases, participants described outright systemic bullying and lateral violence contributing to prescribers' decisions not to prescribe or to discontinue prescribing.

> We had a third prescriber, but because of the lateral violence that was happening, [they] withdrew [their] support because [they were] afraid that [they were] going to lose [their] license"
>
> – Participant SPRMG12

Further, participants such as the one below highlighted stigma as a barrier particularly rural and remote areas of the province.

> These are very, very conservative little townships or cities that, like, some of them don't even want to have an overdose prevention site. Like there's a lot of stigmatization of substance use in these locations and so we have actually enhanced access to risk mitigation to these communities through [Name of Virtual Clinic].
>
> – Participant SPRMG31

In the situation above, the participant specifically notes virtual care as enhancing access as a facilitator in rural and remote areas. Participants faced significant challenges in their ability to implement RMG where there was a lack of supportive networks of colleagues, community organizations, organizational infrastructure and resources for implementation. Simply put, primary care was not resourced or supported to implement RMG. Facilitators of implementation in the organizational context included development of clinical protocols, organizational champions, supportive colleagues and community organizations, with infrastructure such as virtual care in rural and remote areas, community clinics and housing sites in urban settings.

4. Discussion

This mixed methods evaluation of the initial implementation of RMG in BC reveals that risk mitigation prescribing was concentrated primarily in urban centers and not scaled up across BC. Individual characteristics of prescribers highlighted that nurse practitioners were three times more likely to prescribe than physicians who were in general practice. Specifically, nurse practitioners and other non-specialists practicing in Vancouver or Victoria, BC, who were OAT prescribers with larger SUD caseloads, higher disease severity, greater numbers of patients on social assistance and previous experience with OAT were more likely to engage in RMG prescribing. Qualitatively, prescribers most likely to take up the RMG were those with already heavy caseloads of clients with SUD who had firsthand experience with those impacted by the harms of the unregulated market. Facilitators included experience with OAT prescribing, observing benefits for clients, supportive colleagues and networks, developing clinical protocols, organizational infrastructure, organizational champions and virtual prescribing. Barriers to prescribing included concerns about overprescribing and audits, limits of the intervention (e.g. potency), potential diversion, unsupportive colleagues, implementation resources and organizational infrastructure. In the discussion, we examine further the outer and inner context, the intervention and implementation process influencing implementation of risk mitigation prescribing.

RMG was introduced into a historical and ongoing outer context of criminalization and prohibition – that is, a context in which drugs and the people who use them are criminalized. The first half of the 20th century in Canada emphasized prohibition and increasing criminalization of heroin and other substances beginning with the 1908 Opium Act (Boyd, 2021). In part, this was driven by the temperance movement and moral reformers who advocated for punitive drug laws and abstinence rooted in white supremacy contributing to constructions of the criminal addict (a term generally applied to poor and racialized people) (Boyd, 2021). Mid 20th century, attempts to prescribe narcotics for the treatment of addiction were introduced with a shift to ideas of the medical addict (Boyd, 2021; Fischer, 2000). In a context of prohibition, prescriptions provide a means for provision of regulated pharmaceuticals as an alternative to an unregulated drug supply often meeting opposition, heavy regulation, and lack of scale up. Methadone was introduced in the 1960's, initially as a federal program, with increasing regulation in the following decade (Fischer, 2000). Recommendations to introduce heroin prescription by several task forces from the 70's to the 90's were summarily rejected by politicians (Boyd, 2021). The Vancouver Crosstown program, initially set up as a research project, demonstrated effectiveness of heroin prescribing (Oviedo-Joekes et al., 2010; Oviedo-Joekes et al., 2016), but without scale up.

In a related study, we found that decision-makers and health planners in BC viewed the delivery of "safer supply" through prescriptions as being the most efficient option, given the context of prohibition and two intersecting public health emergencies (COVID-19 and overdoses) (Macevicius et al., 2023). However, in a climate of prohibition, RMG was controversial with limited implementation outside of urban centres creating divides among prescribers with some prescribers subject to systemic criticism and bullying. In spite of progressive harm reduction policy in BC and the introduction of supervised consumption sites and other harm reduction services (Wild et al., 2017), Canadian drug policy remains squarely on prohibition impacting the introduction of prescribed opioids during a provincial public health emergency.

In this study, prescribers expressed worries about the history of overprescribing of opioids and overdose deaths as a barrier to prescribing RMG. In both Canada and the United States, early waves of overdose deaths (1999–2015) were linked with prescription opioids (Fischer and Robinson, n.d; Manchikanti et al., 2022). Early concerns about overprescribing led to responses such as clinical prescribing guidelines and drug monitoring programs. Lim et al. (2021) observes that the goal of the 2016 College of Physician and Surgeons of BC (CPSBC) *Safe Prescribing of Drugs with Potential for Misuse/Diversion* was to encourage more conservative and judicious prescribing of opioids to reduce the supply and thereby prevent prescription misuse, overprescribing, and overdose deaths. While these responses were effective in decreasing prescribing, rates of overdose deaths continued to rise (Fischer and Robinson, n.d; Manchikanti et al., 2022).

Manchikanti and colleagues (Manchikanti et al., 2022) highlight how the fourth wave of the U.S. overdose epidemic is driven by multiple factors including COVID-19, increased availability of illicit drugs, forced tapering of prescriptions, and misapplication of prescribing guidelines. These and other authors (Dasgupta et al., 2018) identify overprescribing in the U.S as one of multiple drivers of overdose deaths pointing to the social and economic factors in the production of pain and trauma. Importantly in BC, overdose deaths due to prescribed opioids have been lower than in other parts of Canada with fentanyl being the primary driver of rising rates of overdose deaths (Belzak & Halverson, 2018; British Columbia Coroners Service, 2022; Crabtree et al., 2020; Lim et al., 2021).

Study participants related concerns about the position of

professional colleges on RMG prescribing. In particular, they highlighted concerns about potential audits. This is consistent with earlier research related to safer supply with other service providers raising similar concerns about audits and implications for licensure (Foreman-Mackey et al., 2022; McMurchy & Palmer, 2022). In 2020, the Ontario College of Physicians and Surgeons did release advice on prescribing safer supply (The College of Physicians and Surgeons, 2020) but similar advice was not released in BC. In a 2022 update, CPSBC (College of Physicians and Surgeons of British Columbia, 2022) stated that clinical guidelines related to opioids and sedatives do not apply to those with OUD, instead referring prescribers to BCCSU guidelines.

The CPSBC has a Prescription Review Panel to review prescribing of controlled medications (e.g., opioids and stimulants). The CPSBC noted in their 2020/2021 committee report that "the [Prescription Review Panel] has also reached out to many prescribers during the pandemic to ensure that they have followed the pandemic prescribing risk mitigation guidelines, where possible, and that they have considered an exit strategy for this prescribing post-pandemic" (College of Physicians and Surgeons of British Columbia, 2020/2021) (p. 15). We do not know the scope or extent of these review activities. Regardless, prescribers identified a fear of audits as a barrier to prescribing.

Of note, the CPSBC has revised clinical guidelines with increased emphasis on gradual tapering and discontinuation with different patient profiles to reduce withdrawal (Lim et al., 2021). However, it remains that discontinuation (deprescribing) of opioids can increase risk of using unregulated opioids and overdose deaths (Agnoli et al., 2021; Binswanger et al., 2020; Fenton et al., 2022). Thus, the role of the College is critical to support shifts in prescribing practices related to opioids and other drugs in a context of prohibition and a history of clinical guidelines meant to reduce overprescribing. Further research regarding trends and impacts of deprescribing are needed.

While some participants were looking for new evidence to support RMG, others spoke about the public health emergency as evidence of the need to act. Rhodes and Lancaster (Rhodes & Lancaster, 2019) in their conceptualization of evidence-making intervention (EMI) distinguish between evidence that drives introduction of interventions and how intervening produces evidence. Some prescribers pointed to declared public health emergencies as evidence of the need for intervention. This aligns with the Rhodes and Lancaster's call for emergent and adaptive evidence making during public health emergencies (Lancaster et al., 2020). Further, it is important to recognize that new innovations are often introduced in the context of an emergency with evidence being generated in conjunction with implementation. For example, supervised consumption services (SCS) were implemented alongside protocols for evaluation to address the public health crisis of HIV in the 1990s (Kerr et al., 2006; Marshall et al., n.d). Similarly, a robust protocol for evaluation of RMG was initiated alongside the introduction of the guidance (Nosyk et al., 2021). Slaunwhite et al., in reporting on the initial outcomes of the provincial RMG, found that overdoses were reduced by 55–89 % in the week following receipt of a opioid prescription for those with an OUD compared to those who did not receive a prescription (Slaunwhite et al., 2024).

The implementation of RMG guidance was intended to be through primary care throughout the province. As demonstrated by the administrative data, uptake was by a small number of general practitioners mainly in urban centres. With regard to the inner context, pre-existing organizational infrastructure such as integrated community clinics or location of teams in housing sites were identified as positive factors in promoting implementation. We would highlight that there are shortages of general practitioners (primary care) in BC (Watson, 2022) and a lack of integrated team-based care in community clinics and housing creating implementation challenges outside of urban centres. Some have pointed to the need for non-prescriber based models implemented within a public health framework such as that suggested in a recent death panel review by the BC Coroners Service (British Columbia Coroners Service, 2023a). As a public health approach, this would allow for regulated access to legal substances provided through a provincial distribution centre without a prescription at centres that meet established criteria.

As noted in the quantitative findings, 76 % of the RMG medications prescribed were opioids for those prescribed OAT. Qualitatively, participants highlighted that as an intervention, the guidance provided new medication options and opportunities for engagement in care. While some prescribers spoke to successes with RMG, others highlighted the difficulties of matching the unregulated supply. For example, it is important to note the need forstimulant replacements and substances suitable for smoking (Xavier et al., 2023). These findings are consistent with those of others, who point to the need for a reliable source of substances that are comparable to or can replace the unregulated drug market (Foreman-Mackey et al., 2022; Ivsins et al., 2020b). Given the finding, that implementation occurred primarily in larger urban centres, the findings related to strength and potency may reflect urban drug markets.

Importantly, drug markets vary locally with differences in strength and availability of substances highlighting the need to tailor interventions in local contexts. Rhodes and Lancaster (Rhodes & Lancaster, 2019) point out that that interventions come to matter locally and that what they come to be happens through their implementation. RMG, as a provincial initiative, was implemented within different settings and ultimately, there are a multiple and varied programs. Of particular interest for future research is implementation and outcomes of different programs across the province.

Concerns about diversion are a barrier to implementation. For prescribers, diversion puts them at risk of professional sanctions and scrutiny in the context of public concerns about increasing exposure to addictive substances, addiction and overdose deaths, particularly among youth. Other research conducted in Canada during the COVID 19 pandemic highlighted that take-home doses of OAT lower the risk of overdoses, treatment discontinuation and interruptions (Gomes et al., 2022a). Take home doses introduced in a Swiss heroin program during COVID were associated with improvements in quality of life for participants with no evidence of increased overdoses or diversion (Meyer et al., 2022). In other research, participants report that diversion is often to help keep others safe, to generate money to purchase food and needed medications (including street drugs) as forms of harm reduction practice (Bardwell et al., 2021a; Bardwell et al., 2021b; Kolla & Strike, 2020). Since 2020, when RMG was introduced, illicit fentanyl has been detected in 83 to 87 % of overdose deaths. (British Columbia Coroners Service, 2021). Hydromorphone has been implicated in <4 % of overdose deaths in BC (Slaunwhite et al., 2021). Similarly for youth, risk mitigation prescribing has not contributed to overdose deaths (British Columbia Coroners Service, 2023b), and no observed increase in rates of addiction among youth to date (British Columbia Center for Disease Control, n.d). However, we recognize the needs for ongoing monitoring of diversion and addiction rates.

Our findings point to a dearth of implementation planning at a provincial or regional level, as well as limited efforts to coordinate communications with other provincial agencies involved in clinical care critical to support uptake among eligible prescribers. While this lack of implementation planning can be understood as taking place at the time of dual public emergencies, our participants highlighted the lack of implementation planning for the 'other' declared public health emergency predated COVID-19. We contrast the introduction of RMG with the implementation of overdose prevention sites, where the provincial government issued a Ministerial Order under the public health emergency to establish sites that were community developed and driven (Wallace et al., 2019). Given the findings regarding the inner context and the importance of organizational infrastructure, supportive colleagues and community partners as facilitators, safer supply programs, like overdose prevention sites, could be resourced at the community level in response to community needs (Foreman-Mackey et al., 2022).

Similar to Foreman Mackey et al. (Foreman-Mackey et al., 2022), we identified that prescribers were more likely to prescribe if they had the

support of colleagues. Conversely, unsupportive colleagues made it difficult for prescribers to take up initiatives particularly in the absence of communication from the professional regulatory colleges and the spectre of audits. Provincial bodies and regional health authorities have an important role to play in addressing issues related to inter professional relationships identified as harassing and bullying.

We note several limitations in the quantitative and qualitative analyses. For the former, while BC maintains among the most comprehensive linked administrative database systems worldwide, there is relatively limited information available on the characteristics of prescribers – notably their demographic information, years of practice, origin of training and further details on medical specialties. The regression analysis was otherwise subject to the potential for unmeasured confounding, as is typical in non-experimental settings.

For the qualitative findings, the sample included primarily those who had embraced prescribing. The strength of this is that they are at the centre of debates and controversies. However, while we have their perspectives on dissenting views and barriers, it is likely that more barriers and challenges would have surfaced from interviews with prescribers who were not prescribing. Further, we recruited, on balance, more physician than nurse practitioner participants. Differences in the perspectives of prescribers are important to explore further, particularly since nurse practitioners were more likely to prescribe. Additionally, we did not explore gender differences between prescribers, which would be relevant in future research. Three interviewers conducted study interviews online, one of whom was known provincially as an established researcher while the other two were graduate students new to the field. This may have resulted in differences in the amount that participants felt comfortable sharing. Finally, we collected limited demographics for participants. This study is therefore limited in identifying potential differences across factors such as race or Indigeneity.

5. Conclusion

BC's implementation of RMG at the onset of the COVID-19 pandemic was limited in scope, attracting a narrow profile of prescribers in limited geographic regions who had heavy SUD caseloads. Release of clinical guidance, experience with OAT, observations of RMG need and benefits, creating clinical protocols, clinical champions, supportive colleagues and organizational infrastructure facilitated implementation. At the same time, discordance and conflict between colleagues over prescribing, lack of implementation resources (e.g. program funding and infrastructure), and organizational infrastructure acted as barriers. Prescribers noted a range of concerns in the outer context affecting implementation including a history of blaming prescribers for overprescribing as a cause of overdose deaths, concerns related to response from professional colleges and fear of audits. There were missed opportunities for provincial level coordination and ministerial directives to support implementation. These findings highlight the need for public health measures in response to a public health emergency, recognition of the importance of regulatory bodies in supporting such measures as well as provincial level implementation plans and organizational infrastructure to facilitate implementation. Further, these findings point to the limitations of delivering prescribed safer supply in a context of prohibition and ongoing criminalization.

Abbreviations

ADHD	attention deficit hyperactivity disorder
AUD	alcohol use disorder
BC	British Columbia
BCCSU	British Columbia Centre on Substance Use
BNX	buprenorphine/naloxone
CCI	Charlson comorbidity index
CDS	Clark chronic disease score
CFIR	Consolidated Framework for Implementation Research
CNS	central nervous system
DAD	Discharge Abstract Database
DTES	Downtown Eastside
ED	emergency department
HA	health authority
IQR	interquartile range
LHA	local health area
OAT	opioid agonist therapy
OUD	opioid use disorder
MET	methadone
NACRS	National Ambulatory Care Reporting System
RMG	risk mitigation guidance
SCS	supervised consumption services
SROM	slow-release oral morphine
SUD	substance use disorder
VCH	Vancouver Coastal Health
VIHA	Island Health

Ethics approval and consent to participate

We received ethical approval from the Research Ethics Board of the University of Victoria and regional health authorities (#H20–01125) to conduct the qualitative work in this study.

We received an exemption from research ethics as per Article 2.5 of the Tri-Council Policy Statement: Ethical Conduct for Review involving Humans (Canadian Institutes of Health Research, Natural Sciences and Engineering Research Council of Canada, and Social Sciences, & Humanities Research Council of Canada, 2022) by Providence Health Care Institute and the Simon Fraser University Office of Research Ethics for the quantitative work in this study.

Consent for publication

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CRediT authorship contribution statement

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Declaration of competing interest

The authors declare that they have no competing interests.

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Our research took place on the traditional, unceded, and continually occupied lands of the over 200 First Nations in what is colonially known as British Columbia.

Table A1
OAT clinical guideline compliance measures.

Guideline name	Guideline compliance conditions
BNX initiation	OAT episode initiated with a BNX dose ≤12 mg/3 mg/day unless the client has ever been diagnosed with AUD or received a CNS depressant dispensation within past 14 days in which case the initial dosage must be ≤4 mg/1 mg/day.
MET initiation	OAT episode initiated with a MET dose ≤30 mg/day unless the client has ever been diagnosed with AUD, received a CNS depressants dispensation within the past 14 days, or has no prior OAT experience in which case the initial dosage must be ≤20 mg/day.
SROM initiation	OAT episode initiated with a SROM dosage ≤60 mg.
Total initiation guideline compliance	Sum of total initiation guidelines complied with divided by the total number of episodes initiated.
BNX titration	BNX episode with dose increased by ≤4 mg/1 mg at a time within 12 weeks, unless the client has ever been diagnosed with AUD or received a CNS depressant dispensation within the past 14 days in which case the dose is increased by ≤2 mg/0.5 mg at a time. For all clients, dosage on day 2 is ≤16 mg/4 mg.
MET titration	MET episode with dose increased by ≤10 mg at a time, ≥5 days apart within 12 weeks. If client has ever been diagnosed with AUD, received a CNS depressants dispensation within past 14 days, or is >55 years old, the dosage is only increased by ≤5 mg at a time.
SROM titration	SROM episode with dose increased ≥2 days apart within 12 weeks.
Total titration guideline compliance	Sum of total titration guidelines complied with divided by the total number of episodes prescribed to during the titration phase.
BNX maintenance	BNX episode with 12 mg/3 mg–24 mg/6 mg per day during a minimum of 4 weeks of stable dosing period.
MET maintenance	MET episode with ≥60 mg/day during a minimum of 4 weeks of stable dosing period.
SROM maintenance	SROM episode with ≥235 mg/day during a minimum of 4 weeks of stable dosing period.
Total maintenance guideline compliance	Sum of total maintenance guidelines complied with divided by the total number of assigned episodes to reach the maintenance stage.
BNX missed dose	Incidence of missed dose of BNX ≤5 days and restarted BNX at a dose same as the previous one.
MET missed dose	1–2 days of MET missed: no change in dose. 3–4 days of MET missed: restart at the same dose if previous dose is 30 mg, restart at 30 mg if previous dose is between 31 and 60 mg, and restart at 50 % of previous dose if previous dose is >60 mg, while titrating up by ≤10 mg/day.
SROM missed dose	1 day missed SROM: the same as previous dose. 2 days of SROM missed: 40 % reduction. 3 days of SROM missed: 60 % reduction. 4 days of SROM missed: 80 % reduction or 60 mg, whichever is higher.
Total missed dose guideline compliance	Sum of total missed dose guidelines complied with divided by the total number of times a prescription was dispensed after missed dosages.
BNX take-home dose	BNX episode with at least one take-home dose with all take-home doses of ≤2 weeks' worth of medication at a time.
MET take-home dose	MET episode with at least one take-home dose with all take-home doses of <1 weeks' worth of medication at a time.
SROM take-home dose	SROM episodes with at least one take-home dose, where the first week has 2 days' worth of medication and all weeks afterwards have <1 week's worth of medication at a time.
Total take-home guideline compliance	Sum of total take home dose guidelines complied with divided by the total number of episodes prescribed to that received take home dosages.

The guidelines were aggregated into a final measure of total guidelines complied to, as some prescribers did not have clients who reached the take-home dose, or maintenance phase, or never started a client's episode, and thus, never had an opportunity to comply with those guidelines or not.

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