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Lessons learned from Canadian family physicians deprescribing medications in older adults – a five-year retrospective review of medico-legal cases

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Abstract

Background Medication-related safety incidents are more common in older adults than in younger populations. Medication review and optimization, including deprescribing, are essential components of strategies to reduce medication-related harm. Deprescribing aims to minimize therapeutic burden by reducing medications that no longer provide net clinical benefit or by substituting safer alternatives. Herein we sought to use a national pan-Canadian repository of medico-legal cases to identify opportunities for improving deprescribing practices in primary care for older adults.

Methods We conducted a five-year retrospective review (2018–2022) of closed Canadian medico-legal cases relating to deprescribing involving family medicine physicians and patients age 65 or older. We analysed cases related to deprescribing and created composite case examples to illustrate both areas for improvement and examples of appropriate care despite the receipt of a complaint or civil legal action (collectively, medico-legal cases).

Results We identified 31 medico-legal cases, of which 29 had undergone expert review. Experts identified areas of improvement related to deprescribing including conducting assessments to determine appropriateness of deprescribing, using a multidisciplinary approach to create a safe tapering plan that includes monitoring and follow-up, establishing clear communication with patients and their authorized substitute decision-makers, and documenting clearly and appropriately. Although experts often explicitly identified these elements as present, they were critical of the deprescribing-related care in half of cases.

Conclusions Medico-legal cases highlight several key areas for improving deprescribing in primary care, particularly around comprehensive patient assessment to inform deprescribing decision-making and clear communication of treatment plans with relevant decision-makers. The cases also demonstrate that the process of deprescribing and the patient-physician relationship is complex and that complaints can occur even when physicians are safely deprescribing.

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Background

The population of people 65 years or older living in Canada continues to increase year over year and was estimated to be 7.8 million in 2024 [1]. While the rate of living with two or more chronic conditions in this demographic has been relatively stable in recent years there are still significant numbers of older adults who regularly use five or more medications or who were prescribed potentially inappropriate medications [2–4]. Further, older adults living in long-term care facilities are particularly at risk of polypharmacy and have a three to eight times greater likelihood of being prescribed high risk medications such as benzodiazepines and antipsychotics when compared to community-dwelling older adults [5].

In 2021, up to 1 in 4 older adults in Canada were taking 10 or more different classes of medication each year [2, 3]. This is of concern because polypharmacy of 10 or more medications increases the risk of drug-drug interactions by eight times compared to 2 prescribed medications [6]. Prudent prescribing habits and deprescribing when appropriate may reduce polypharmacy and its associated risks [7–10]. Prescribing habits can be influenced by updated clinical practice guidelines, but also policy changes, promotion and marketing based on commercial interests, or changes in economics [11, 12]. Guidelines generally focus on the conditions to be treated and when to initiate treatment in a stepwise fashion, often in isolation of context of the whole person [13]. This can engender additional medication being prescribed. Use of medications for treating diabetes has increased from 20.1% to 21.4% (2017 to 2021) and may relate to updated clinical practice guidelines published in 2020 by Diabetes Canada that included new recommendations for SGLT-2 inhibitors [5]. Conversely, guideline-triggered reductions in use of high-risk medications can also take place. For example, following the release of the Canadian Guideline for Opioids for Chronic Non-Cancer Pain in 2017 [5], opioid use among older adults in Canada decreased from 17.3% in 2017 to 14.9% in 2021.

Polypharmacy and the use of high-risk medications can be reduced through deprescribing while still addressing the often complex health needs of older adults. Notably deprescribing aligns with the Geriatrics 5Ms (Mobility, Mind, Medications, Multicomplexity, and Matters Most) [14]. Successful deprescribing may be viewed as a total reduction in medications taken, a reduction in dosages, or substitution of medications with fewer risks. The process of deprescribing ideally involves a careful plan developed in coordination with multiple healthcare professionals and close monitoring and follow-up of the impact of the prescribing change.

In this study, we sought to understand the real-world challenges and successes of deprescribing in practice from medico-legal cases in Canada using the Canadian Medical Protective Association (CMPA) national repository of medico-legal cases. The CMPA national repository offers a source of peer-reviewed cases involving people receiving care in all areas of Canada, as opposed to many studies which review and investigate prescribing habits in a single care setting or geographic area that may typically be in an urban teaching hospital. Our primary objective was to describe expert opinion from medico-legal cases related to deprescribing care provided by family medicine physicians in Canada. Our secondary objective was to identify the most commonly deprescribed medications and the associated medical conditions being treated by those medications in the included medico-legal cases.

Methods

We conducted a 5-year retrospective review of civil legal cases and medical regulatory authority complaints from the CMPA national repository closed between January 1, 2018 to December 31, 2022. The repository relies on physician members to voluntarily contact the CMPA and submit materials when seeking advice or support for medico-legal matters. Research ethics approval was obtained from the Advarra (Canada) Institutional Review Board (PRO00020829) in compliance with Canada's Tri-Council Policy Statement on the Ethical Conduct for Research Involving Humans (TCPS 2).

Case selection

Civil legal cases and medical regulatory authority complaints, collectively termed cases, were eligible regardless of clinical setting or geographical region in Canada. For brevity, civil legal cases are also referred to as complaints. For civil legal cases in this study, the tort-based legal system and processes in Canada are nearly identical to the systems and processes in many other common law countries, including the United States, England and Australia. Medical regulatory authorities provide instructions on how a patient or third party may submit a complaint for review of the treatment or care provided by a physician. Different from a civil legal case, medical regulatory authorities in Canada do not adjudicate claims for financial compensation. Cases were eligible if they involved at least one practicing family medicine or general practice physician responsible for deprescribing, had at least

one patient aged 65 years or older (termed older adult herein), and at least one medication deprescribed.

We used the definition of deprescribing from Deprescribing.org [15] which defines deprescribing as, "the planned and supervised process of dose reduction or stopping of medication that might be causing harm, or no longer be of benefit." We also considered deprescribing to be when a medication was substituted with another medication with the intention of lowering the risk of drug-related harm [16].

We separately included cases where deprescribing was requested by a patient or planned by the physician but did not occur, and where experts criticized a physician for not deprescribing when there was a reason to do so. Medications could be of any type including prescription, over-the-counter, and natural health products.

We excluded cases where medications were changed in the context of (1) the terminal stages of palliation, (2) routine dose titration and therapeutic monitoring of a single medication, and (3) medication susceptibility testing (e.g. antibiotics).

Data collection

We performed text analytics using previously described methods on cases involving older adult patients identified from CMPA medico-legal repository to generate a list of cases to be manually reviewed for inclusion [17, 18]. The authors (CAS, JYL, CB, GMC, KEL, PJF, GEG, JDS) reviewed de-identified cases in a group discussion to reach consensus regarding inclusion. The authors' expertise included family and geriatric medicine, pharmacy, and nursing. One author (JDS) abstracted case information: complainant allegations, expert opinion, medications, and patient conditions. Abstraction of complainant allegations and expert opinion included Contributing Factor Framework codes that are routinely coded for closed CMPA medico-legal cases (see Additional file 1 for codes and definitions) [19]. For brevity, plaintiff allegations from civil legal cases are also labelled complainant allegations. In medico-legal cases, the role of an expert is to provide an impartial, objective and credible professional assessment without advocating for the party who retained them. An expert must have the requisite experience, qualifications and knowledge to assist on the specific issue on which they are being asked to comment. For example, an expert may be a physician with similar qualifications. A Medical Analyst from CMPA validated abstraction for a subset of cases that involved more than one medication being deprescribed. Physician years of practice, healthcare setting, patient age, and patient gender were abstracted and aggregated using Statistical Analysis Software (SAS) Enterprise Guide version 8.3 (SAS Institute Inc., Cary, NC). Data was stored on a secure network drive requiring multiple factor authentication.

Data analysis

We calculated frequencies for aggregate data, including patient conditions, and medications. Medications were classified as a potentially inappropriate medication if appearing in the 2023 American Geriatric Society Beers Criteria by name or class of a medication [4]. Contributing Factor Framework codes associated with patient allegations and expert criticism were grouped into themes (see Additional file 1 for themes and their associated codes). We categorized and counted themes according to whether the theme in each case was solely associated with a patient allegation, a peer expert criticism, or were aligned. Themes were counted as aligned when the theme was present as both a complainant allegation and an expert criticism for the same patient care event.

To protect patient and physician privacy, examples presented in this study are illustrative representations of real cases and expert opinions. Allegations, expert opinion, and physician rationale for deprescribing were summarized in composite examples. An approach described in narrative inquiry by Gubrium and Holstein [20] was used to generate composite examples as in previously published research [21, 22].

Results

We identified a total of 38 cases; 31 cases involved deprescribing at least one medication, and 7 cases involved deprescribing having been requested by a patient or planned by a physician but did not occur. The set of 31 cases contained 32 older adult patients who received deprescribing care from a primary care physician – one case involved two patients. These patients received care predominantly in the outpatient setting (n = 22, 67%), and were evenly divided between male and female gender (patient demographics and care settings are summarized in Table 1). No virtual care encounters were reported in the cases. The majority of cases (n = 19, 61%) involved physicians with more than 20 years of practice experience (Table 2), and deprescribing most often involved only one medication (n = 22, 69%, range 1 to 7). The most common medications deprescribed were analgesics and benzodiazepines, and most common conditions treated involved pain, mood and anxiety disorders (Table 3). Two-thirds (66%, 38 of 58) of medications deprescribed were those listed as potentially inappropriate in the 2023 American Geriatric Society Beers Criteria [4].

Breaking down the 31 cases by type and expert opinion, twenty-seven were medical regulatory complaints and four were civil legal cases. Fifteen cases (n = 16 patients) contained expert criticism of deprescribing related to at least one medication. Of the 15 cases, two cases (n = 2

Table 1 Patient characteristics, $N=32$ patients

Characteristics	No. (%) of patients
Demographic	
Age (yr), median (IQR)[a]	78 (70–86)
Age (yr)	
≥ 65 to 69	8 (25)
≥ 70 to 75	3 (9)
≥ 75 to 80	6 (19)
≥ 80 to 90	8 (25)
≥ 90	6 (19)
Unknown	1 (3)
Gender	
Female	17 (53)
Male	15 (47)
Unknown	0 (0)
Care Setting, Location[b]	
Outpatient	22 (69)
Doctor's Office	20 (63)
Emergency (less than 24 h)	1 (3)
Private Home	1 (3)
Inpatient	11 (34)
Ward	10 (31)
Chronic Care	1 (3)

IQR Interquartile range

[a]Based on 31 patients with known age

[b]Care settings and locations sum to greater than the number of patients because patients may have received care in more than one setting associated with the medico-legal issue, complaint or investigation

Table 2 Years of practice of family physicians, $N=31$ physicians[a]

Characteristics	No. (%) of physicians
Years practicing in Canada as a physician with family physician specialty[b]	
< 5	3 (10)
6–10	3 (10)
11–20	6 (19)
21–30	8 (26)
30+	11 (35)

CMPA Canadian Medical Protective Association

[a]In one case, one physician provided care to two patients

[b]Calculated as years of CMPA membership after residency. Years of practice outside of Canada and when the physician was not a member of the CMPA are not included

patients) contained only criticism of legibility and appropriateness of documentation, but otherwise the opinion of clinical care was supportive. Eleven cases ($n=11$ patients) contained expert opinion that was supportive of deprescribing in the context of those cases. In three cases ($n=3$ patients) there was neither an allegation nor expert opinion related to deprescribing. Two cases ($n=2$ patients) did not contain expert opinion and patient allegations were unrelated to deprescribing.

Themes summarizing complainant allegations and expert criticism are provided in Fig. 1. Complainant allegations were most often related to decision-making such as the complainant's belief that a medication should not have been deprescribed or that the way deprescribing occurred was inappropriate. Only one-third of these allegations were aligned with expert opinion.

The theme of decision-making was the most common criticism from experts (Fig. 1). In some cases, this was not associated with the complainant allegations, but independently identified by experts during their review of the patient care. Issues with legibility and completeness of documentation was the second most common expert criticism of care related to deprescribing, however, none of the complaints included specific allegations related to documentation.

We describe three composite examples of cases below with the associated expert opinion, both critical and supportive of the care of the physicians regarding deprescribing:

Table 3 Medications and conditions related to medications deprescribed, *N* = 32 patients

Medication and Conditions	No. (%) of patients
Number of medications deprescribed	
1	22 (69)
2	4 (13)
3	2 (6)
4	2 (6)
5	0 (0)
6	0 (0)
7	2 (6)
Medication deprescribed	
Analgesics	
Acetaminophen	2
Fentanyl*	2
Gabapentin*	3
Hydromorphone*	2
Morphine*	3
Oxycocet*	1
Oxycodone HCL*	2
Pregabalin*	1
Sufentanil*	1
Antidepressants	
Citalopram	1
Paroxetine*	1
Trazodone	1
Venlafaxine	1
Hypoglycemic agents	
Gliclazide*	2
Metformin	2
Repaglinide	1
Antiepileptics	
Phenytoin*	1
Antiemetics	
Dimenhydrinate*	1
Antiplatelets	
Acetylsalicylic acid	1
Antipsychotics and mood stabilizers	
Aripiprazole*	1
Olanzapine*	1
Lithium*	1
Periciazine†	1
Quetiapine*	2
Risperidone*	1
Benzodiazepines and muscle relaxants	
Alprazolam*	1
Benzodiazepine (unspecified)*	1
Clonazepam*	1
Cyclobenzaprine*	1
Midazolam*	1
Lorazepam*	5
Cardiovascular	
Bisoprolol	1
Furosemide	1
Nitroglycerin spray	1
Rosuvastatin	1

Table 3 (continued)

Medication and Conditions	No. (%) of patients
Hormones and steroids	
Levothyroxine	1
Prednisone	1
Laxatives	
Lactulose	1
Minerals and supplements	
Calcium	1
Ferrous fumarate	1
Proton pump inhibitors	
Pantoprazole*	1
Urinary retention medications	
Dutasteride	1
Tamsulosin	1
Condition	
Cardiovascular	
Angina	1
Congestive heart failure	2
Heart disease	1
Endocrine	
Diabetes	3
Hypothyroidism	1
Gastrointestinal	
Constipation	1
Nausea	1
Hematologic	
Anemia	1
Psychiatric	
Agitation	4
Anxiety	6
Mood disorder	4
Personality disorder	1
Sleep disorders	2
Rheumatologic and musculoskeletal	
Autoimmune disorder	1
Muscle spasms	1
Osteoporosis	1
Pain associated with other conditions	16
Neurologic	
Seizures	1
Genitourinary	
Benign prostatic hyperplasia	1

* Potentially inappropriate medication in the American Geriatric Society Beers Criteria

† Periciazine is not marketed in the United States and is considered anticholinergic. While it does not explicitly appear in the American Geriatric Society Beers Criteria, the criteria indicate that anticholinergic medications should be avoided and thus has been counted as a potentially inappropriate medication in accordance with the criteria

Case 1

A patient experiencing polypharmacy of over 10 medications underwent a medication review as part of the routine practice of a physician who had taken over care. The physician discussed weaning off medications with the authorized substitute decision-maker, but the physician did not clearly communicate which medications were to be weaned. Numerous medications were safely deprescribed, however, two urinary retention medications that were being used to treat an enlarged prostate were deprescribed at the same time because the physician was concerned about an increased risk of falls. The physician did not schedule follow-up over the following two months. Following discontinuation, the symptoms of the condition relapsed and the patient presented back to the physician. After investigations, the two medications

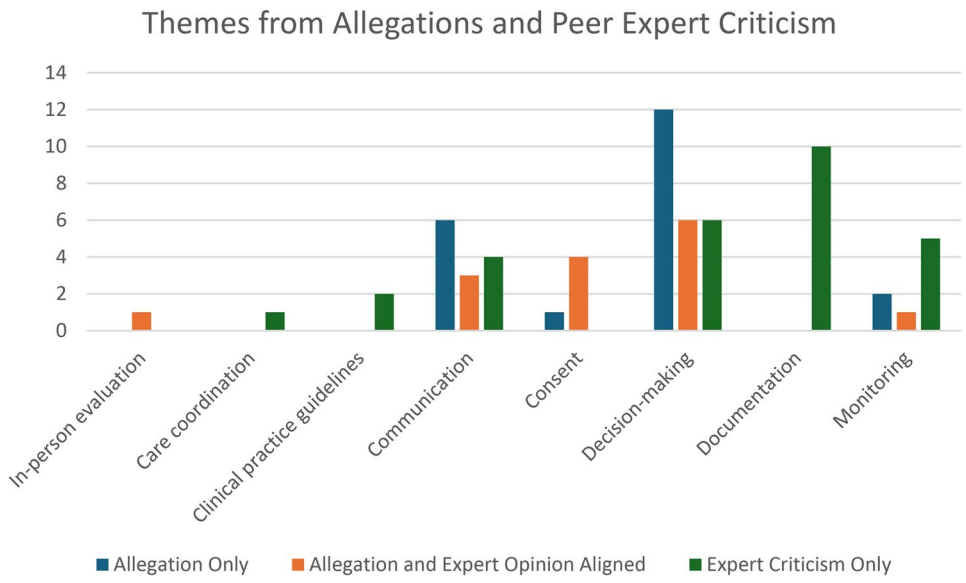

Fig. 1 Summary of complainant allegations and expert criticism related to deprescribing represented as themes. *N* = 32 patients (64 coded units, 8 themes)

were added back to the patient's regimen. The substitute decision-maker questioned why both medications were stopped because they believed the relapse was an obvious outcome of stopping the medications. Experts were critical that the physician did not perform follow-up to monitor for the condition after deprescribing, and for not evaluating discontinuing one of the two medications to determine which, if any, were contributing most to risk of a fall. Experts were otherwise supportive of the other deprescribed medications.

Case 2

A physician took on the care of a frail older adult patient who had been discharged from hospital following a few months-long stay. The physician performed a medication review with the patient and their authorized substitute decision-maker. The substitute decision-maker was able to provide additional details about the patient's medications given that the information received from the hospital was limited and medical records were not otherwise available. The physician discontinued levothyroxine and other medications. Later, the substitute decision-maker left a message expressing concerns of not being informed that levothyroxine was discontinued. The physician did not find any medical records to support its continued use, and due to an overly busy schedule did not follow-up with the substitute decision-maker on the matter. Experts were critical that the physician did not perform appropriate assessments or follow-up testing to inform the discontinuation of levothyroxine, which would have identified that the patient had hypothyroidism.

Case 3

A patient was hospitalized following a fall. Blood work from the hospital stay provided to the physician post-discharge noted concerns about an antiseizure medication being supratherapeutic. The physician considered whether the medication may have contributed to the fall and hospitalization given its adverse effect profile and potential for drug interactions. In consideration of the patient's medical history and ongoing care needs, the physician communicated to the authorized substitute decision-maker that the medication provided little to no benefit for the patient compared to the risks it posed and its contribution to the patient's significant polypharmacy. Shortly following discontinuation of the medication, the patient experienced a seizure, which led the substitute decision-maker to believe that deprescribing the antiseizure medication was a wrong decision. While experts noted room for improved documentation of the medication discussions with the substitute decision-maker and were understanding of the perspective of the substitute decision-maker, the experts opined that the care provided by the physician was thoughtful and appropriate given the patient's numerous morbidities, polypharmacy and drug interactions, and age-related factors. For example, experts noted that the care followed established guidelines, used referrals for psychiatric care appropriately, emphasized attempting non-pharmacological therapy, and the physician's care was clearly and appropriately documented.

Seven additional medical regulatory authority cases were identified where deprescribing did not occur. The main issues from five cases are described in brief below. In one case, multiple physicians providing care to one

patient through walk-in clinic visits were criticized by experts for not recognizing opportunities to deprescribe an opioid, a benzodiazepine, and an anticonvulsant. This occurred in part due to insufficient effort to reconcile medications, and not identifying if the patient had a primary care provider who was managing their medications despite recommending to the patient to follow-up with their primary care provider. In two cases, despite some effort to reduce opioid prescribing, the physicians were criticized for overprescribing for a long period of time and not making a concerted effort to deprescribe. Particularly, issues were identified where patients were not provided referrals for alternatives to pharmacotherapy or where there was limited effort to follow-up with patients who did not attend referrals. In the fourth case, a patient unintentionally continued to receive a medication as a result of a physician not using an appropriate form to communicate the deprescribing of an antiplatelet medication in a patient with bleeding concerns.

In the remaining three cases, all care provided by the physicians were supported by expert opinion. A physician who took over care of a patient received a complaint that the patient's opioid medications would be reduced without consent, however, experts identified that the care had been exceptional due to clear documentation of discussions surrounding the risk and benefits and a clear plan of when and how medications would be reduced pending further assessments. Similarly, a patient sought care from a different physician after the patient disagreed with a physician's plan to wean the patient off a benzodiazepine; the decision to deprescribe was wholly supported by experts. Lastly, experts were supportive of a physician's medication decision-making in one case where a complainant alleged that multiple medications should have been deprescribed. In this case the physician understood that the medications had been prescribed recently by specialists and the symptoms the patient was experiencing were not a side effect of the medications.

Discussion

In this review of medico-legal cases in Canada, we found that there is an opportunity to improve medication use and deprescribing care for older adults in primary care. Where opinion on deprescribing was available, experts were critical of deprescribing care received by 16 of 27 patients. In cases with criticism, areas for improvement were predominantly associated with decision-making for and documentation of therapy plans, planning and implementing monitoring and follow-up when deprescribing, and communicating with patients, their authorized substitute decision-makers, and other healthcare professionals. Cases with expert opinion that supported the care of the physician are evidence that complaints can still occur despite the care provided being thoughtful and appropriate. Lastly, medications were most often those identified in the American Geriatric Society Beers Criteria which were commonly prescribed for psychiatric conditions as well as pain management.

Specifically, the findings of this study highlight the importance and need to focus on the 'how' to deprescribe. Now more than two decades since the first English academic literature publication using the term 'deprescribing', organizations such as Institute for Safe Medication Practices Canada, Deprescribing.org, Canadian Medication Appropriateness and Deprescribing Network, and Choosing Wisely Canada have published and continue to develop and disseminate tools to support the practice of deprescribing [6, 16, 23]. Yet, not all tools are validated and only 58% of 80 guidelines reviewed by Langford and colleagues [24] included guidance on 'how' to deprescribe, while most included 'what', 'when' or 'why' to deprescribe. Select deprescribing algorithms for medications commonly deprescribed in our study such as benzodiazepines, antipsychotics, and opioids explicitly include guidance for decision-making, ensuring communication about medication changes and consent, and appropriate timing for monitoring and follow-up [6, 25–29]. These components of the algorithms were the most common areas of needed improvement according to expert opinion in our cases. Therefore, the issues identified by experts are not new or unknown, but continue to occur in practice. Indeed, these issues were also routinely identified in two recent reviews of barriers or enablers to deprescribing [30, 31].

Through a deprescribing and polypharmacy researcher workshop, Thompson and colleagues [32] identified priorities for future deprescribing research. One priority included a need for drug-specific medication withdrawal studies. A similar call to action for deprescribing targeted medications was reported by Desai and colleagues [33] who provide a scoping review of deprescribing practices in Canada. Based on the prevalence of medications related to pain management in our cases, our study also suggests that analgesics should be a priority for deprescribing initiatives. Opioids, in particular, appear to be a priority medication class to study. Indeed, since Thompson's report, there have been studies to develop opioid deprescribing frameworks for uptake of deprescribing guidelines and additional insights into barriers to opioid deprescribing [34, 35].

In cases where deprescribing was done well, we observed themes consistent with enablers reported in the reviews of Robinson and colleagues [30] and Okeowo et al. [31]. In these reviews, key enablers to performing deprescribing involved recognizing deprescribing opportunities, performing regular medication reviews, improving communication, education of both patients and clinicians, and a multidisciplinary approach towards

patient care. Our cases included elements where a physician was reactive to information about medications that triggered an opportunity to perform a medication review; where a physician educated a patient and their caregiver about the risks of medication and how deprescribing may provide a better overall quality of life; and where a physician coordinated care closely with a pharmacist and pain specialist to ensure the deprescribing plan was safe and tailored to the patient's specific context.

So, if care was done well, then why did a complaint still occur? While we did not endeavor to detail the reasons for a complaint despite care being deemed adequate by experts, previous research has suggested that patient perceptions can drive complaints [36]. For example, perceived negligence was a subtheme of perceived quality of care described in Mostafapour and colleagues' [36] thematic analysis of patient's reasons for complaints. It might be plausible to infer in the case presented herein where being informed about risks and benefits of stopping antiseizure medications, agreeing to a deprescribing plan, then the patient experiencing a seizure within a short period of time would reasonably elicit discourse from the patient or their authorized substitute decision-maker of the appropriateness of the decision and comprehensiveness of the information they received from the physician to have agreed with the deprescribing plan. In another case, in discussion with the patient, the physician understood that the patient would prefer to continue their current medication, but the physician used their professional judgment to choose to deprescribe or substitute the medication for another that has a safer overall profile. In this case, the elements of active listening or perceived dismissive communication could have been a factor.

Deprescribing is innately a process that when done well is patient-centred. This is a mindset that strives to include and understand patients and their authorized substitute decision-makers [37, 38]. Particularly, patient-centred communication is an integral component from start to finish. Some examples of good practices relevant to allegations and expert opinion identified in our cases would include using communication to clarify what are a patient's goals (e.g., to have relief from pain and discomfort); using language that is accommodating of a patient's level of health literacy; and, using active listening in processes such as consent discussions [39].

Limitations

In CMPA medico-legal cases expert opinions are typically related to elements of the physician's personal work practice deduced from medical records and other evidence from the physician and complainant. There are other healthcare professional-related factors that can be associated with the healthcare professional receiving a complaint [40]. Additionally, deprescribing involves collaboration with not just the patient and their authorized substitute decision-makers, but may involve a team of healthcare professionals such as pharmacists, nurses, and other specialists [30]. Therefore, we recognize the cases and context presented here are strongly physician work practice focused but nonetheless represent valuable information about challenges and successes in deprescribing in the Canadian healthcare context.

Conclusion

Our study evaluated medico-legal complaints related to deprescribing in an older adult patient population. The thematic overview of the allegations and expert criticism highlights the important role of a thorough patient assessment in guiding deprescribing decisions and ensuring transparent communication of treatment plans with all relevant stakeholders. Addressing these issues in similar patient care scenarios could reduce a physician's risk of receiving a complaint and improve patient care.

Abbreviations

CMPA	Canadian Medical Protective Association
IQR	Interquartile range
SAS	Statistical Analysis Software

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s12877-025-06894-6.

Additional file 1.

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Authors' contributions

Significant study conception and design was contributed by CAS, JYL, GMC, GEG, PJF, CB, and JDS. Substantial contributions to data collection, data cleaning, and analysis were performed by CB, PJF, CZ, and JDS. Significant interpretation was performed by all authors, with specific family medicine expertise provided by KEL, geriatric medicine expertise by GMC and JYL, and pharmaceutical expertise by CAS. The first draft of the manuscript was written by JDS and all authors commented on previous versions of the manuscript. All authors read and approved the final submitted manuscript.

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Data availability

The datasets analysed during the current study are not available due to privacy restrictions.

Declarations

Ethics approval and consent to participate

Research ethics approval was obtained from the Advarra (Canada) Institutional Review Board (PRO00020829) in compliance with Canada's Tri-Council Policy Statement on the Ethical Conduct for Research Involving Humans (TCPS 2). The Board waived the need for participant consent for this study.

Consent for publication

Not applicable.

Competing interests

CB, CZ, GEG, KEL, PJF, and JDS are employees of CMPA, a not-for-profit mutual defense organization for Canadian physicians, at the time of this study. CAS is a member of the CADeN Research Committee, Health care professional committee, and Indigenous Working Group. JYL is co-Chair of the CADeN Research Committee and co-Chair of the Canadian Geriatrics Society Deprescribing and Medication Optimization Special Interest Group. No other competing interests were declared.

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