



Strategies to prevent long-term opioid use following trauma: a Canadian practice survey

Stratégies pour éviter l'utilisation à long terme des opioïdes après un traumatisme : enquête sur les pratiques canadiennes

Mélanie Bérubé, RN, PhD · Caroline Côté, NP, PhD (cand.) · Lynne Moore, PhD · Alexis F. Turgeon, MD, MSc · Étienne L. Belzile, MD · Andréane Richard-Denis, MD, MSc · Craig M. Dale, RN, PhD · Gregory Berry, MD, MEd · Manon Choinière, PhD · Gabrielle M. Pagé, PhD · Line Guénette, BPharm, PhD · Sébastien Dupuis, BPharm, MSc · Lorraine Tremblay, MD, PhD · Valérie Turcotte, NP, MA · Marc-Olivier Martel, PhD · Claude-Édouard Chatillon, MD · Kadija Perreault, PT, PhD · François Lauzier, MD, MSc

Received: 20 April 2022 / Revised: 10 June 2022 / Accepted: 7 July 2022 / Published online: 26 September 2022
© Canadian Anesthesiologists' Society 2022

Abstract

Purpose To evaluate how Canadian clinicians involved in trauma patient care and prescribing opioids perceive the use and effectiveness of strategies to prevent long-term opioid therapy following trauma. Barriers and facilitators

to the implementation of these strategies were also assessed.

Methods We conducted a web-based cross-sectional survey. Potential participants were identified by trauma program managers and directors of the targeted departments in three Canadian provinces. We designed our questionnaire using standard health survey research methods. The questionnaire was administered between April 2021 and November 2021.

Supplementary Information The online version contains supplementary material available at <https://doi.org/10.1007/s12630-022-02328-8>.

M. Bérubé, RN, PhD (✉)
Population Health and Optimal Practices Research Unit
Research Unit (Trauma – Emergency–Critical Care Medicine),
CHU de Québec-Université Laval Research Centre, 1401, 18e
rue, Quebec City, QC G1V 1Z4, Canada
e-mail: melanie.berube@fsi.ulaval.ca

Faculty of Nursing, Université Laval, Quebec City, QC, Canada

Quebec Pain Research Network, Sherbrooke, QC, Canada

C. Côté, NP, PhD (cand.)
Population Health and Optimal Practices Research Unit
Research Unit (Trauma – Emergency–Critical Care Medicine),
CHU de Québec-Université Laval Research Centre, 1401, 18e
rue, Quebec City, QC G1V 1Z4, Canada

Faculty of Nursing, Université Laval, Quebec City, QC, Canada

L. Moore, PhD
Population Health and Optimal Practices Research Unit
Research Unit (Trauma – Emergency–Critical Care Medicine),

CHU de Québec-Université Laval Research Centre, 1401, 18e
rue, Quebec City, QC G1V 1Z4, Canada

Department of Social Preventive Medicine, Université Laval,
Quebec City, QC, Canada

A. F. Turgeon, MD, MSc
Population Health and Optimal Practices Research Unit
Research Unit (Trauma – Emergency–Critical Care Medicine),
CHU de Québec-Université Laval Research Centre, 1401, 18e
rue, Quebec City, QC G1V 1Z4, Canada

Division of Critical Care Medicine, Department of
Anesthesiology and Critical Care Medicine, Université Laval,
Quebec City, QC, Canada

É. L. Belzile, MD
Division of Orthopedic Surgery, Department of Surgery, CHU
de Québec-Université Laval, Quebec City, QC, Canada

A. Richard-Denis, MD, MSc
Department of Medicine, Université de Montréal, Montreal,
Quebec, Canada

Results Our response rate was 47% (350/744), and 52% (181/350) of participants completed the entire survey. Most respondents (71%, 129/181) worked in teaching hospitals. Multimodal analgesia (93%, 240/257), nonsteroidal anti-inflammatory agents (77%, 198/257), and physical stimulation (75%, 193/257) were the strategies perceived to be the most frequently used. Several preventive strategies were perceived to be very effective by over 80% of respondents. Of these, some that were reported as not being frequently used were perceived to be among the most effective ones, including guidelines or protocols, assessing risk factors for opioid misuse, physical health follow-up by a professional, training for clinicians, patient education, and prescription monitoring systems. Staff shortages, time constraints, and organizational practices were identified as the main barriers to the implementation of the highest ranked preventive strategies.

Conclusions Several strategies to prevent long-term opioid therapy following trauma are perceived as being effective by those prescribing opioids in this population. Some of these strategies appear to be commonly used in everyday practice and others less so. Future research should focus on which preventive strategies should be given higher priority for implementation before assessing their effectiveness.

Résumé

Objectif Évaluer comment les cliniciens canadiens impliqués dans les soins aux patients traumatisés et prescrivant des opioïdes perçoivent l'utilisation et l'efficacité des stratégies visant à prévenir le traitement prolongé par opioïde après un traumatisme. Les obstacles

et facilitateurs de la mise en œuvre de ces stratégies ont aussi été analysés.

Méthodes Nous avons réalisé une enquête transversale via le Web. Les participants potentiels ont été identifiés par les gestionnaires et directeurs de programmes de traumatologie des départements ciblés dans trois provinces canadiennes. Nous avons conçu notre questionnaire en utilisant la méthodologie de recherche usuelle des enquêtes de santé. Le questionnaire a été administré entre avril 2021 et novembre 2021.

Résultats Notre taux de réponse a été de 47 % (350/744) et 52 % (181/350) des participants ont complété l'enquête dans sa totalité. La majorité des personnes interrogées (71 %, 129/181) travaillait dans des hôpitaux universitaires. L'analgesie multimodale (93 %, 240/257), les anti-inflammatoires non stéroïdiens (77 %, 198/257) et la stimulation physique (75 %, 193/257) étaient les stratégies perçues comme étant le plus fréquemment utilisées. Plusieurs stratégies préventives étaient perçues comme étant très efficaces par plus de 80 % des répondants. Parmi celles-ci, certaines étaient signalées comme n'étant pas utilisées très souvent, mais perçues comme étant les plus efficaces, notamment les lignes directrices et protocoles évaluant les facteurs de risque d'utilisation abusive des opioïdes, le suivi de la santé physique par un professionnel, la formation des cliniciens, l'éducation des patients et les systèmes de suivi des prescriptions. La pénurie de personnels, les contraintes de temps et les pratiques de l'établissement ont été identifiées comme étant les principaux obstacles à la mise en place des stratégies préventives classées parmi les premières.

Conclusions Plusieurs stratégies de prévention du traitement par opioïdes à long terme après un

Research Centre of the CIUSSS du Nord-de-l'île-de-Montréal, Montreal, QC, Canada

C. M. Dale, RN, PhD
Lawrence S. Bloomberg Faculty of Nursing, University of Toronto, Toronto, ON, Canada

University of Toronto Centre for the Study of Pain (UTCSP), Toronto, ON, Canada

G. Berry, MD, MEd
Department of Orthopaedic Surgery, McGill University Health Centre, Montreal, QC, Canada

M. Choinière, PhD · G. M. Pagé, PhD
Quebec Pain Research Network, Sherbrooke, QC, Canada

Research Center of the Centre hospitalier de l'Université de Montréal, Montreal, QC, Canada

Department of Anesthesiology and Pain Medicine, Faculty of Medicine, Université de Montréal, Montreal, QC, Canada

L. Guénette, BPharm, PhD
Population Health and Optimal Practices Research Unit
Research Unit (Trauma – Emergency–Critical Care Medicine),
CHU de Québec-Université Laval Research Centre, 1401, 18e
rue, Quebec City, QC G1V 1Z4, Canada

Quebec Pain Research Network, Sherbrooke, QC, Canada

Faculty of Pharmacy, Université Laval, Quebec City, QC,
Canada

S. Dupuis, BPharm, MSc
Department of Pharmacy, CIUSSS du Nord-de-l'île-de-
Montréal, Montreal, QC, Canada

L. Tremblay, MD, PhD
Department of Surgery, Sunnybrook Health Sciences Centre,
Toronto, ON, Canada

V. Turcotte, NP, MA
Department of Nursing, CIUSSS du Nord-de-l'île-de-Montréal,
Montreal, QC, Canada

traumatisme sont perçues comme efficaces par ceux qui les prescrivent à cette population de patients. Certaines de ces stratégies apparaissent comme couramment utilisées dans la pratique quotidienne et d'autres moins souvent. La recherche future devrait se concentrer sur la détermination des stratégies préventives auxquelles il faudrait accorder la plus grande priorité de mise en œuvre avant d'évaluer leur efficacité.

Keywords injuries · opioids · prevention · survey

Traumatic injuries and their surgical management often result in high-intensity pain,^{1–12} usually requiring opioids for pain relief.^{13, 14} Nevertheless, up to 20% of patients with traumatic injuries become long-term opioid users (\geq three months)^{15–19} and this percentage may climb to 60% in those with risk factors such as mental health problems, a history of substance use problems, or living with chronic pain.^{13, 17–21} These numbers are alarming considering that inappropriate long-term opioid use can lead to significant negative impacts. When compared with opioid-naïve patients, long-term opioid users experience more psychological distress, functional impairment, and have a poorer quality of life. Moreover, a large proportion of these patients do not achieve significant pain relief.^{16, 21–24} Long-term therapy can also lead to opioid use for reasons other than their medical purpose, regardless of the resulting adverse events reported in 30% of cases.^{25, 26} Opioid misuse can ultimately lead patients to illicitly purchase opioids or their derivatives,^{27–29} contributing to drug diversion, opioid-related overdoses, and death.^{30, 31}

Given these issues, strategies to prevent long-term opioid use in trauma patients while also providing adequate pain relief are needed. A recent scoping review identified strategies that may limit long-term opioid therapy.³² Nonsteroidal anti-inflammatory drugs

(NSAIDs), personalized opioid tapering protocols, educational strategies for patients and professionals, and multimodal and psychological strategies seem to have the greatest potential. Nevertheless, most of these strategies are supported by low-level evidence. Of note, very little is known about the practices and beliefs of many Canadian clinicians involved in the care trajectory of trauma patients (i.e., from acute care to community-based services) regarding preventive strategies. Gathering information on these issues could further our understanding of any gaps in practice and help guide future research. Therefore, the aim of our study was to evaluate the perceived use and effectiveness of strategies to prevent long-term opioid therapy following trauma, as well as the barriers and facilitators to their implementation.

Methods

We conducted a self-administered cross-sectional survey of Canadian clinicians involved in trauma patient care and overseeing opioid prescriptions. We followed a standardized approach for the design and conduct of surveys for clinicians.³³ Our practice survey is reported according to the Consensus-Based Checklist for Reporting of Survey Studies³⁴ (Electronic Supplementary Material [ESM] eAppendix 1). The study population consisted of physicians, nurse practitioners (NPs), and pharmacists. Our questionnaire is part of a comprehensive research program on the judicious use of opioids in trauma patients throughout their care trajectory. The study was approved by the Research Ethics Committee of the CHU de Québec-Université Laval (# 2021-5486, 2021).

Population and sample size

We targeted physicians, NPs, and pharmacists working in trauma centers admitting a significant number of trauma

M.-O. Martel, PhD
Quebec Pain Research Network, Sherbrooke, QC, Canada

Faculty of Medicine & Dentistry, McGill University, Montreal, QC, Canada

Claude-Édouard Chatillon, MD
Division of Neurosurgery, CIUSSS de la Mauricie-et-du-Centre-du-Québec, Trois-Rivières, QC, Canada

K. Perreault, PT, PhD
Quebec Pain Research Network, Sherbrooke, QC, Canada

Centre interdisciplinaire de recherche en réadaptation et intégration sociale (Cirris), CIUSSS de la Capitale-Nationale, Quebec City, QC, Canada

F. Lauzier, MD, MSc
Population Health and Optimal Practices Research Unit
Research Unit (Trauma – Emergency–Critical Care Medicine),
CHU de Québec-Université Laval Research Centre, 1401, 18e
rue, Quebec City, QC G1V 1Z4, Canada

Division of Critical Care Medicine, Department of
Anesthesiology and Critical Care Medicine, Université Laval,
Quebec City, QC, Canada

Department of Medicine, Université Laval, Quebec City, QC,
Canada

patients (level 1 and level 2),³⁵ trauma patient rehabilitation centers, and family medicine clinics. The study population was chosen to cover the entire care pathway during which interventions can be implemented to prevent long-term opioid use. We targeted clinicians from three Canadian provinces with low (Quebec) and high (Ontario and British Columbia [BC]) rates of opioid-related overdoses and deaths,³⁶ considering that these issues may be influenced by practices aimed at reducing long-term opioid use but also by public awareness. The list of trauma centers was provided by the Trauma Association of Canada (TAC) and provincial health ministries, and the list of rehabilitation centers from trauma program managers in the targeted provinces (ESM eAppendix 2). To improve feasibility and because of the difficulties involved when trying to reach all the clinicians working in medical clinics, which are not integrated into any organized Canadian trauma systems, we only targeted clinics affiliated to the Quebec Practice-Based Research Network. These include six Quebec urban and rural administrative regions.³⁷ The Quebec Practice-Based Research Network was created to strengthen the capacity for primary care research by facilitating the recruitment of primary healthcare professionals.³⁷ Hence, clinicians working in medical clinics in Ontario and BC were not targeted. Clinicians were invited to complete the survey if they were regularly prescribing or deprescribing opioids in trauma patients. The latter were defined in the introductory message of the survey as patients with major or minor injuries. Based on the number of clinicians in the targeted centers and family medicine clinics, the *a priori* estimate for the total number of potential respondents was 1,000. Based on a 95% confidence level with a maximum 5% margin of error for a specific proportion (percentage), a minimum of 300 respondents were needed. This is consistent with previous studies conducted in similar populations.^{38–40}

Survey design

We used a modified Delphi approach to guide the study steering committee (i.e., researchers with expertise in survey design and pain management, physicians, NPs, pharmacists, patient partners) in the selection of survey domains and questions.³³ During this process, various domains and items were generated and then narrowed down or reformulated to include only those considered most relevant to address the study objectives. The questionnaire included four main question categories: 1) how clinicians evaluate their use of strategies to prevent long-term opioid therapy according to organizational, multimodal, and educational domains; 2) clinicians' views on the effectiveness of these strategies according

to the same domains; 3) identification and ranking of the 10 strategies considered most effective; and 4) perceived barriers and facilitators to the implementation of the strategies considered as most effective according to the Grading of Recommendations, Assessment, Development, and Evaluations (GRADE) Evidence to Decision framework.⁴¹ We used five-point Likert scales for questions on the perceived use and effectiveness, and a 0–10 ranking scale to determine priority. The estimated proportion of patients at long-term risk of opioid use treated by the respondents was also collected. The questionnaire was initially designed in French and translated to English using a double forward–backward method in collaboration with a language specialist.⁴² The French and English versions of the questionnaire are available in ESM eAppendix 3 and 4, respectively.

Survey pretesting

An interdisciplinary team of clinicians treating trauma patients and directly involved in pain management (physicians, nurses, pharmacists), and experts in practice survey methodology pretested the French and English surveys for relevance, content validity, clarity, comprehensiveness, and redundancy. After adjusting the wording and order of some of the questions (perceived use and effectiveness), the questionnaire was pretested in trainees (12 medical residents, NP students, and pharmacy residents) to assess its clarity, format, and ease of use. This led to further clarification of a few items. Although initially planned, the test-retest reliability assessment could not be completed due to the third wave of the COVID-19 pandemic.

Survey administration

Potential respondents were identified by trauma program medical directors/managers and the heads of the orthopedic, neurosurgery, and physiatry (physical medicine and rehabilitation) departments. These stakeholders were identified using the TAC and the websites of the targeted organizations. The survey was distributed by email to the identified stakeholders. The Quebec Practice-Based Research Network was in charge of contacting clinicians in family medicine clinics. The emails held a link to the web format of the French or English survey created with LimeSurvey (LimeSurvey GmbH, Hamburg, Germany). Participants who completed the questionnaire only partially received an automated message in their mailbox with an invitation to finish the survey. Potential respondents were sent reminders two, four, and eight weeks after the initial invitation. Survey participants did not receive any financial compensation for

taking part in this survey but CAD 10 was allocated to United Way Centraide Canada for each completed questionnaire. This nonprofit organization helps meet the basic needs of the most vulnerable populations in Canada.⁴³

Data analysis

We analyzed the questionnaires according to question categories. Therefore, data were included in the analysis when 100% of the questions were completed for each category.⁴⁴ Survey answers are reported as counts and percentages. IBM SPSS Statistics for Windows, Version 28.0 (IBM Corp., Armonk, NY, USA) was used for data analyses. After consultation with the steering committee, we classified barriers and facilitators to the implementation of strategies as very important when identified by at least 30% of respondents, important when identified by 10–29% of respondents, and as unimportant when identified by less than 10% of respondents. We estimated that when 30% or more of participants identified a barrier, it had the potential to significantly impede strategy implementation, whereas the identification of a facilitator by 30% or more significantly increased the possibility of implementing the strategy. Descriptive analyses were computed all together and then stratified by province and by respondent's practice setting, profession, gender, work setting, and whether they estimated that a significant proportion ($\geq 30\%$) of their patients were at risk of long-term opioid therapy. There was no stratification of barriers and facilitators given the limited number of answers provided and the fact that respondents' answers were very similar. Subgroup analyses were performed only to assess trends in differences—i.e., no tests of statistical significance were performed considering that the study was not sufficiently powered to accurately assess differences between groups.

Results

Respondents

We contacted 776 potential respondents between April 2021 and November 2021. Among these, 32 did not meet the inclusion criteria and were excluded. The response rate was 47% (350/744), of which 73% (257/350) answered more than one question and 52% (181/350) completed the entire survey (Fig. 1). The lowest response rates were for questions on barriers and facilitators (186/350) and sociodemographic data (181/350). Given the significant changes in the work organization of the family medicine clinics during the COVID-19 pandemic, it was not possible for the Quebec Practice-Based Research Network to

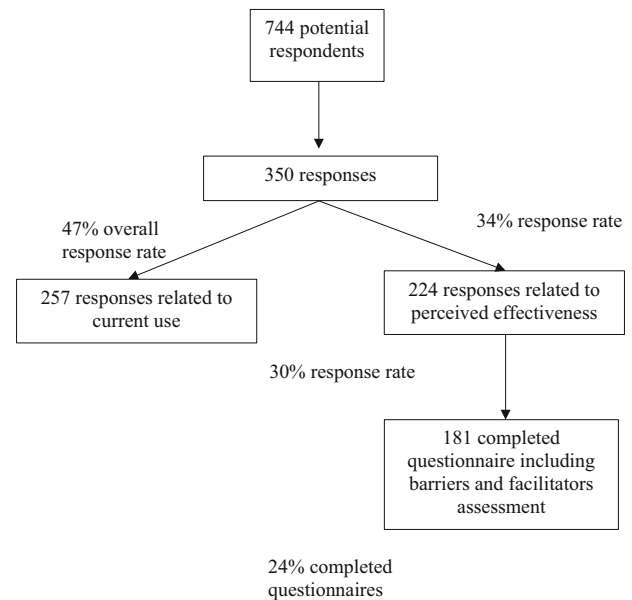


Fig. 1 Flow diagram of participants

distribute the survey to potential respondents in these clinics as planned. Consequently, clinicians working in the community were only represented if they were involved in the outpatient rehabilitation or patient recovery phases.

Among respondents, 77% (140/181) worked in the province of Quebec, 12% (23/181) in BC, and 10% (18/181) in Ontario (Table 1). The majority (71%, 129/181) worked in teaching hospitals and practiced as medical specialists (62%, 113/181), including surgeons and physiatrists. Nearly half (48%, 87/181) of respondents reported caring for over 100 trauma patients yearly, while more than two-thirds (68%, 240/350) reported seeing less than 30% of patients estimated at risk of long-term opioid use.

Perceived use of preventive strategies

Figure 2 shows the results on the perceived use of preventive strategies. Respondents reported that the following preventive strategies were the most frequently applied (i.e., often to always) in clinical practice: (93%, 240/257), NSAIDs (77%, 198/257), physical stimulation including physical therapy, exercise programs and/or setting goals for a return to activities of daily living (75%, 193/257), downward adjustment of opioid consumption based on patient's recovery (70%, 181/257), and cryotherapy (61%, 157/257). Pharmacists perceived that the following strategies were applied less frequently: NSAIDs (often to always: 46%, 12/23), physical stimulation (61%, 14/23), downward adjustment of opioid consumption based on patient's recovery (57%, 13/23), and cryotherapy (30%, 7/23) (ESM eAppendix 5).

Table 1 Sociodemographic data of respondents

Characteristic	Data, <i>n</i> /total <i>N</i> (%) [*]
Age (yr)	
20–29	25/181 (14%)
30–39	62/181 (34%)
40–49	57/181 (32%)
50–59	22/181 (12%)
≥ 60	15/181 (8%)
Gender	
Male	101/181 (56%)
Female	78/181 (43%)
Nonbinary	2/181 (1%)
Province	
Quebec	140/181 (77%)
British Columbia	23/181 (13%)
Ontario	18/181 (10%)
Employment title	
Specialist physician	113/181 (62%)
General surgeon	27/181 (28%)
Orthopedic surgeon	44/181 (45%)
Neurosurgeon	7/181 (9%)
Physiatrist	18/181 (18%)
Anesthesiologist	2/181 (2%)
General practitioner	12/181 (7%)
Adult nurse practitioner	8/181 (4%)
Primary care nurse practitioner	25/181 (14%)
Pharmacist	23/181 (13%)
Number of years of practice	
< 1	19/181 (11%)
1–5	47/181 (26%)
6–10	42/181 (23%)
11–20	41/181 (23%)
> 20	32/181 (18%)
Number of patients treated per year	
< 20	22/181 (12%)
20–50	31/181 (17%)
51–100	41/181 (23%)
101–200	28/181 (16%)
> 200	59/181 (33%)
Practice setting	
Academic hospital	129/181 (71%)
Nonacademic hospital	8/181 (4%)
Inpatient rehabilitation center	7/181 (4%)
Outpatient rehabilitation—recovery support	37/181 (21%)

Data were calculated according to complete responses to sociodemographic questions

Gabapentinoids for neuropathic pain were reported as more often used by those involved in the rehabilitation phase, and by NPs and pharmacists (often to always ≥ 80% *vs*

< 60% for the other subgroups). There were no major differences in the strategies perceived to be the most often used based on the province where clinicians practiced.

The strategies reported as being the least commonly used were cannabinoids (5%, 14/257); alternative pain management strategies such as acupuncture (5%, 13/257); massage therapy (11%, 27/257); transcutaneous electrical nerve stimulation (TENS) (12%, 31/257); mental health approaches for pain management (13%, 33/257); professional follow-up in mental health to guide patients in the gradual reduction of opioid use (9%, 24/257); and pre-established communication mechanisms between professionals outside the practice setting to optimize the follow-up of patients using opioids (10%, 26/257). Respondents from Quebec reported using prescription monitoring systems less frequently than those from BC and Ontario (17%, 23/140 *vs* 44%, 15/41) (ESM eAppendix 5).

Perceived effectiveness of preventive strategies

Figure 3 shows the results on the perceived effectiveness of the strategies. Three quarters of preventive strategies (16/22) were perceived as being very effective (probably effective to definitely effective) by over 80% (> 180/224) of respondents. Strategies perceived as less effective were adjuvant analgesic treatments such as cannabinoids, and alternative therapies such as TENS, massage, and acupuncture. Except for cannabinoids, at least 80% of respondents involved in the rehabilitation phase of trauma patients perceived the latter strategies as very effective. There were no important differences in the strategies perceived as most or least effective according to geographical location (ESM eAppendix 6). Of all the potential strategies, the ten ranked as most likely to be effective (Table 2) were as follows: 1) multimodal analgesia (92%, 186/203); 2) guidelines or protocols about judicious opioid prescribing (69%, 140/203); 3) downward adjustment of opioid consumption based on patient's recovery (68%, 138/203); 4) assessment of risk factors for opioid misuse (68%, 137/203); 5) systematic limitation of the amount of opioids prescribed (65%, 131/203); 6) follow-up by a professional in physical health (e.g., physician, NP, pharmacist) (62%, 125/203); 7) physical stimulation (58%, 118/203); 8) training offered to professionals (58%, 118/203); 9) standardized educational intervention for patients about the proper use of opioids (55%, 112/203); and 10) prescription monitoring systems (51%, 104/203). Respondents from BC and Ontario included NSAIDs and pre-established communication mechanisms between professionals outside the practice setting among the ten strategies most likely to be effective (rank 4: 59%, 24/44 and rank 10:

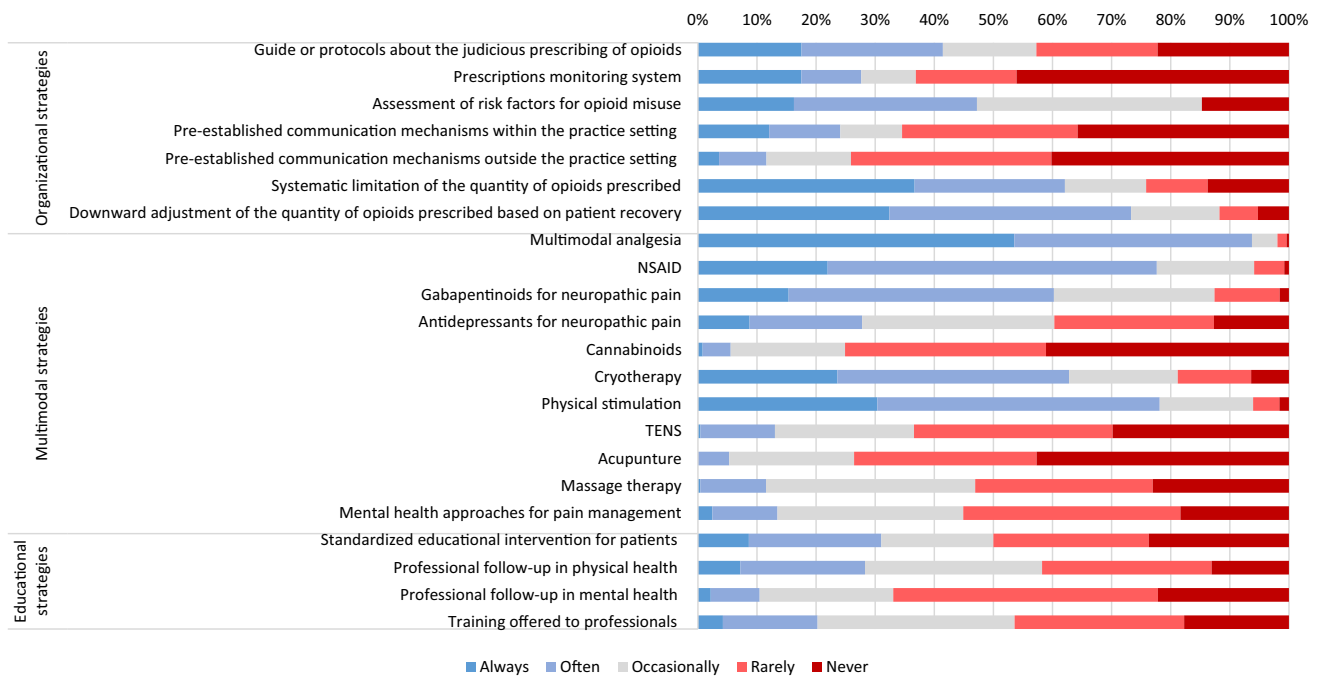


Fig. 2 Perceived use of preventive strategies

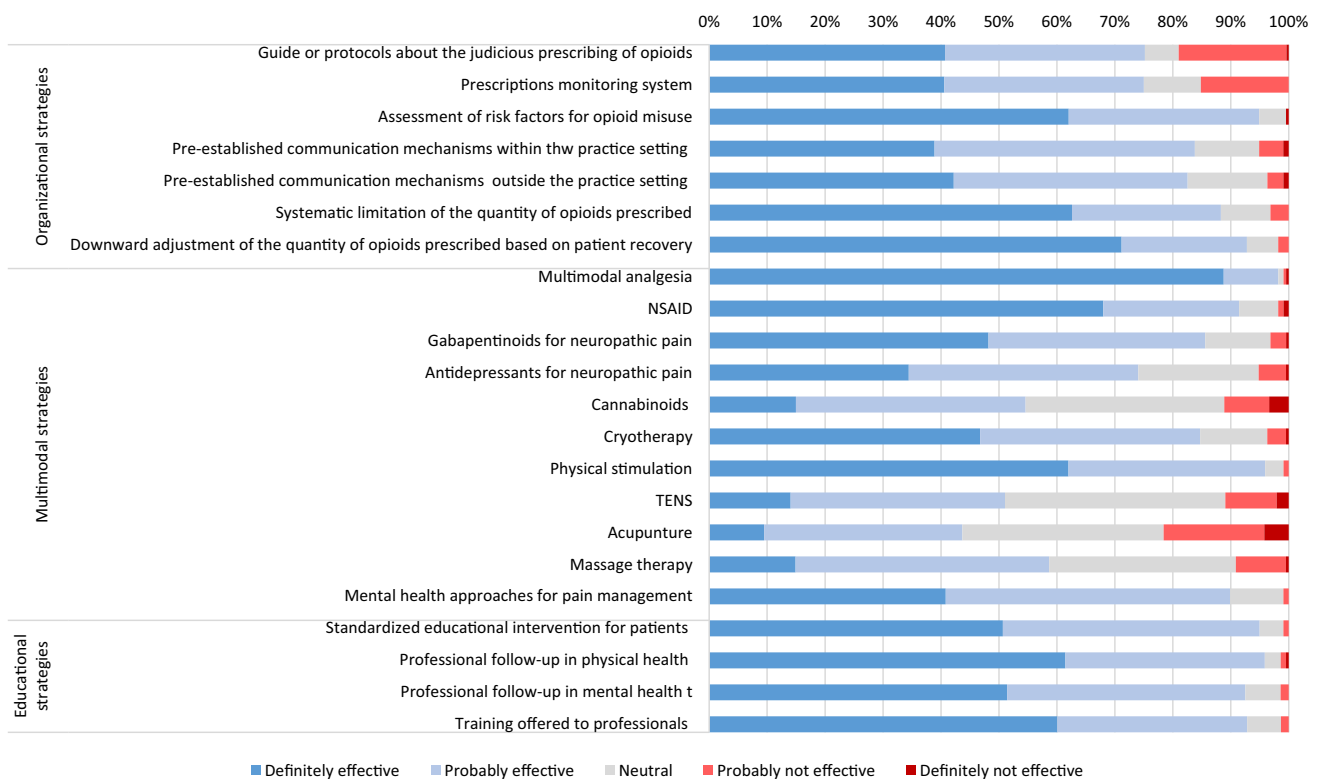


Fig. 3 Perceived effectiveness of preventive strategies

Table 2 Ranks of preventive strategies according to their perceived effectiveness

Strategies	Number of votes as the top strategies to be prioritized, <i>n</i> /total <i>N</i> (%)	Rank based on the number of votes
Guide or protocols about the judicious prescribing of opioids	140/203 (69%)	2
Prescriptions monitoring system	104/203 (51%)	10
Assessment of risk factors for opioid misuse	137/203 (68%)	4
Pre-established communication mechanisms between professionals within your practice setting to optimize the follow-up of patients using opioids	86/203 (42%)	13
Pre-established communication mechanisms between professionals outside your practice setting to optimize the follow-up of patients using opioids	74/203 (37%)	15
Systematic limitation of the quantity of opioids prescribed	131/203 (65%)	5
Downward adjustment of the quantity of opioids prescribed based on patient recovery	138/203 (68%)	3
Multimodal analgesia	186/203 (92%)	1
NSAIDs	92/203 (45%)	12
Gabapentinoids for neuropathic pain	68/203 (34%)	16
Antidepressants for neuropathic pain	46/203 (23%)	17
Cannabinoids for pain management	16/203 (8%)	19
Cryotherapy	46/203 (23%)	17
Physical stimulation	118/203 (58%)	7
TENS	12/203 (6%)	20
Acupuncture	9/203 (4%)	21
Massage therapy	17/203 (8%)	18
Mental health approaches to pain management	99/203 (49%)	11
Standardized educational intervention for patients about the risk and proper use of opioids	112/203 (55%)	8
Professional follow-up in physical health to guide patients in the gradual reduction of opioid use	125/203 (62%)	6
Professional follow-up in mental health to guide patients in the gradual reduction of opioid use	79/203 (39%)	14
Training offered to professionals on the risks of opioids and how to prescribe them	118/203 (58%)	7

NSAIDs = nonsteroidal anti-inflammatory drugs; TENS = transcutaneous electrical nerve stimulation

34%, 14/41) (ESM eAppendix 6). The same was true for pre-established communication mechanisms between professionals outside the practice setting for NPs and pharmacists (rank 6: 57%, 13/23; and rank 9: 39%, 9/23) and for those treating a large proportion of patients at risk of long-term therapy (rank 9: 58%, 118/203).

Perceived barriers and facilitators

Figures 4 and 5 illustrate the barriers and facilitators to the ten strategies identified as most likely to be effective. Staff shortages and time constraints were identified as barriers by more than one-third of respondents with respect to the following strategies: assessment of risk factors for opioid misuse (30% and 48%, respectively); physical health follow-up by a professional (75% and 49%); physical stimulation (51% and 27%); training offered to

professionals (33% and 64%); standardized educational intervention for patients (51% and 47%); and prescription monitoring systems (44% and 31%) (Fig. 4). Organizational practices were also reported as a barrier by a similar proportion of respondents for all these strategies, with the exception of risk factor assessment for opioid misuse and physical stimulation, which were selected by fewer respondents. With respect to facilitators, one-third or more of respondents agreed that multimodal analgesia (52%), guidelines or protocols about judicious opioid prescribing (36%), and training offered to professionals (32%) are associated with a high level of evidence. The same was true regarding the safety of multimodal analgesia (30%), downward adjustment of opioid consumption based on patient's recovery (36%), systematic limitation of opioids prescribed (32%), and prescription monitoring systems (30%) (Fig. 5).

Strategy	Low level of evidence	Availability of human resources	Time needed	Organizational practices	Poor safety	High costs	Poor adherence from patients
Multimodal analgesia	●	●	●	●	●	●	●
Guide or protocols about the judicious prescribing of opioids	●	●	●	●	●	●	●
Downward adjustment of the amount of opioids based on patient recovery	●	●	●	●	●	●	●
Assessment of risk factors for opioid misuse	●	●	●	●	●	●	●
Systematic limitation of the amount of opioids prescribed	●	●	●	●	●	●	●
Professional follow-up in physical health	●	●	●	●	●	●	●
Physical stimulation	●	●	●	●	●	●	●
Training offered to professionals on the risks of opioids and how to prescribe them	●	●	●	●	●	●	●
Standardized educational intervention for patients about the proper use of opioids	●	●	●	●	●	●	●
Prescription monitoring system	●	●	●	●	●	●	●

Red: barrier identified by >30%; Yellow: barrier identified by 10 to 29%; Green: barrier identified by <10%

Fig. 4 Barriers to implementing the strategies considered most effective

Strategy	High level of evidence	Availability of human resources	Time needed	Organizational practices	High safety	Low costs	Good adherence from patients
Multimodal analgesia	●	●	●	●	●	●	●
Guide or protocols about the judicious prescribing of opioids	●	●	●	●	●	●	●
Downward adjustment of the amount of opioids based on patient recovery	●	●	●	●	●	●	●
Assessment of risk factors for opioid misuse	●	●	●	●	●	●	●
Systematic limitation of the amount of opioids prescribed	●	●	●	●	●	●	●
Professional follow-up in physical health	●	●	●	●	●	●	●
Physical stimulation	●	●	●	●	●	●	●
Training offered to professionals on the risks of opioids and how to prescribe them	●	●	●	●	●	●	●
Standardized educational intervention for patients about the proper use of opioids	●	●	●	●	●	●	●
Prescription monitoring system	●	●	●	●	●	●	●

Red: facilitators identified by < 10%; Yellow : facilitator identified by 10 to 29%; Green: facilitator identified by > 30%

Fig. 5 Facilitators to implementing the strategies considered most effective

Discussion

Our survey of Canadian clinicians involved in trauma patient care gives an overview of perceived practices to prevent long-term opioid use in traumatic injury patients for three Canadian provinces. Several of these strategies, which are readily accessible and easy to implement, were reported to be the most often used during the care pathway. Nevertheless, among the strategies perceived as being the

most effective, some were identified as not often used. Resources, time, and organizational practices were mentioned as the main barriers to the use of these prevention strategies. Which stage of the recovery pathway the respondents were involved in and their role in pharmacological and patient follow-up influenced the perceived use and effectiveness of the different strategies. The same was true for the province where the clinicians worked, with those from Ontario and BC promoting

strategies related to communication mechanisms between care settings about patients' opioid use more than their Quebec counterparts. In addition to seeing more patients with substance use disorders, these clinicians may have integrated these strategies more effectively into their practice, given the many government initiatives to limit the opioid crisis in these provinces.^{45–48}

To date, most healthcare professional surveys about opioid use have focused on prescribing practices, attitudes, and knowledge.^{49–66} Thus, our survey provides a new perspective in terms of what key stakeholders perceive as important to optimize practices in the prevention of long-term opioid therapy. Many of the strategies perceived to be frequently used and most effective are those associated with significant decreases in opioid long-term use following trauma or recommended in several practice guidelines, as shown in a recent scoping review.³² These include multimodal analgesia, guidelines and protocols, training for clinicians, educational strategies for patients with or without support for opioid tapering, and prescription monitoring systems. Guidelines and education are strategies fostering knowledge, decision processes, awareness of consequences and reinforcement, which are the underpinnings of the capacity and motivation to adopt the desired behavior,⁶⁷ including those aimed at alleviating pain and reducing opioid use. Nevertheless, although a recent survey found that 70% of respondents changed their practice to meet guideline recommendations for opioid therapy in the context of chronic pain,⁶⁸ mixed findings have been reported on practice guidelines to promote the adoption of best practices. Some studies showed favorable outcomes, while others reported only limited effects.^{69–71} In this regard, various strategies to promote high-quality clinical practice guideline implementation and dissemination have been evaluated. The most consistently effective are educational interventions, clinical reminders, and supportive organizational culture (e.g., organizations and teamwork that facilitate the implementation of best practices and lead opinions).⁷¹

Two preventive strategies rated as likely to be highly effective following traumatic injury by our survey respondents—i.e., physical stimulation and establishing communication mechanisms between professionals to optimize the follow-up of patients using opioids—have been studied little to date.³² Rehabilitation strategies, including physical therapy, have been associated with reduced opioid use in patients with chronic noncancer pain when integrated into multimodal approaches, but studies on their effect as a stand-alone treatment are still limited.⁷² Nevertheless, a systematic review of studies, mostly in primary care, showed that interprofessional collaboration was a promising strategy to improve appropriate opioid use

and reduce opioid use disorder.⁷³ Having a tool to identify patients at high risk for opioid misuse could potentially facilitate communication mechanisms between professionals regarding patients requiring increased monitoring or support in opioid tapering. Nevertheless, very few validated and reliable tools to identify the risk of nonjudicious opioid use in the general population, such as the Alcohol, Smoking and Substance Involvement Screening Test⁷⁴ and the Opioid Risk Tool,^{75, 76} have been proposed for trauma. In a recent study on injured patient screening for opioid misuse, the combination of post-traumatic syndrome distress-related symptoms, impaired pain coping, poor social support, and hospitalization > six days were found to be associated with a very good discriminative ability to predict opioid misuse and addiction.⁷⁷ Hence, these predictors could potentially guide risk assessment among trauma patients.

Strengths and limitations

Our survey was informed by the latest evidence and was rigorously developed following standardized methods. Although not optimal, our response rate was good compared with surveys of similar populations. Nonetheless, certain limitations must also be acknowledged. During the questionnaire design phase, we were unable to conduct the planned test-retest evaluation. Nevertheless, we performed content and construct validity assessments, making it possible to undertake comprehensive adjustments. It is also possible that survey answers were influenced by clinicians' exposure to patients with different risk levels of long-term opioid use. Nevertheless, except for the need to improve communication across practice settings for patients at greater risk of long-term use, stratification by estimated risk did not show significant differences in responses. Furthermore, the low response rate, particularly from Ontario and BC clinicians, may have impacted the reliability of the data. Indeed, our findings may be more representative of clinicians from Quebec since they represented close to 80% of the respondents. Nevertheless, subgroup analyses identified some important differences between provinces. Finally, clinicians involved with trauma patients in the community were under-represented in our study.

Conclusions

Our survey provides information on how clinicians involved in the different steps of the care pathway perceive practices regarding the prevention of long-term opioid therapy after traumatic injury. The most promising

strategies aim to guide healthcare professionals and patients in the use of opioids and pain management approaches and to optimize communication and follow-up mechanisms to support higher-risk patients in tapering off opioids over time. Future research should focus on identifying the strategies that should be prioritized for implementation by trauma stakeholders (i.e., interdisciplinary team members, patient partners, and decision makers) and further evaluation of their effectiveness in trauma care systems.

Author contributions *Mélanie Bérubé* secured funding for the project was responsible for conception and design and did most of the data analysis and interpretation. She drafted the manuscript, and revised it multiple times. *Caroline Côté* contributed to the survey design, pretesting, and administration as well as to data analysis. *Lynne Moore* contributed to the survey design, data analysis, and data interpretation. *Alexis F. Turgeon* oversaw the survey design, data analysis, and data interpretation. *Étienne L. Belzile*, *Andréane Richard-Denis*, *Craig M. Dale*, and *Gregory Berry* contributed to the survey design and administration, and data interpretation. *Manon Choinière* and *Gabrielle M. Pagé* contributed to the survey design and pretesting. *Line Guénette*, *Sebastien Dupuis*, and *Lorraine Tremblay* contributed to the survey design and administration. *Valérie Turcotte* contributed to the survey pretesting and administration. *Marc-Olivier Martel* contributed to the survey design and data interpretation. *Kadija Perreault* contributed to the survey design and administration. *Claude-Edouard Chatillon* contributed to the survey administration and data interpretation. *François Lauzier* helped draft the survey and contributed to its pretesting, data analysis, and data interpretation. All authors critically revised the manuscript and agreed to act as guarantors of the work.

Acknowledgments We would like to thank Marc-Aurèle Gagnon for his support in designing the survey and the figures presented in this article.

Disclosures None to declare related to the content of this manuscript.

Funding statement This study was funded by a research grant from the Canadian Institutes of Health Research (no. 451722), the Fonds de Recherche du Québec – Santé (FRQS) (no. 295668), and from the Quebec Pain Research Network (no number provided). Dr. Bérubé is the recipient of salary support awards from the FRQS and the Strategy for Patient-Oriented Research (SPOR)-Quebec. Dr. Moore, Dr. Lauzier, and Dr. Pagé are recipients of salary support awards from the FRQS. Dr. Martel is the Chairholder of the Canada Research Chair in Chronic Pain, Mental Health, and Opioid Use. Dr. Turgeon is the Chairholder of the Canada Research Chair in Critical Neurology and Trauma. Funding bodies had no role in the design of the study and collection, analysis, and interpretation of data and writing the manuscript.

Editorial responsibility This submission was handled by Dr. Stephan K. W. Schwarz, Editor-in-Chief, *Canadian Journal of Anesthesia/Journal canadien d'anesthésie*.

References

1. Rivara FP, Mackenzie EJ, Jurkovich GJ, Nathens AB, Wang J, Scharfstein DO. Prevalence of pain in patients 1 year after major trauma. *Arch Surg* 2008; 143: 282–7. <https://doi.org/10.1001/archsurg.2007.61>
2. Dijkers M, Bryce T, Zanca J. Prevalence of chronic pain after traumatic spinal cord injury: a systematic review. *J Rehabil Res Dev* 2009; 46: 13–29.
3. Dobscha SK, Clark ME, Morasco BJ, Freeman M, Campbell R, Helfand M. Systematic review of the literature on pain in patients with polytrauma including traumatic brain injury. *Pain Med* 2009; 10: 1200–17. <https://doi.org/10.1111/j.1526-4637.2009.00721.x>
4. Fabricant L, Ham B, Mullins R, Mayberry J. Prolonged pain and disability are common after rib fractures. *Am J Surg* 2013; 205: 511–5. <https://doi.org/10.1016/j.amjsurg.2012.12.007>
5. Hunt C, Moman R, Peterson A, et al. Prevalence of chronic pain after spinal cord injury: a systematic review and meta-analysis. *Reg Anesth Pain Med* 2021; 46: 328–36. <https://doi.org/10.1136/rapm-2020-101960>
6. Moreno P, Von Allmen M, Haltmeier T, Candinas D, Schnüriger B. Long-term follow-up after non-operative management of blunt splenic and liver injuries: a questionnaire-based survey. *World J Surg* 2018; 42: 1358–63. <https://doi.org/10.1007/s00268-017-4336-5>
7. Nampiaparampil DE. Prevalence of chronic pain after traumatic brain injury: a systematic review. *JAMA* 2008; 300: 711–9. <https://doi.org/10.1001/jama.300.6.711>
8. Powelson EB, Mills B, Henderson-Drager W, Boyd M, Vavilala MS, Curatolo M. Predicting chronic pain after major traumatic injury. *Scand J Pain* 2019; 19: 453–64. <https://doi.org/10.1515/sjpain-2019-0040>
9. Rosenbloom BN, Khan S, McCartney C, Katz J. Systematic review of persistent pain and psychological outcomes following traumatic musculoskeletal injury. *J Pain Res* 2013; 6: 39–51. <https://doi.org/10.2147/JPR.S38878>
10. Sawyer K, Bell KR, Ehde DM, et al. Longitudinal study of headache trajectories in the year after mild traumatic brain injury: relation to posttraumatic stress disorder symptoms. *Arch Phys Med Rehabil* 2015; 96: 2000–6. <https://doi.org/10.1016/j.apmr.2015.07.006>
11. van Gorp S, Kessels AG, Joosten EA, van Kleef M, Patijn J. Pain prevalence and its determinants after spinal cord injury: a systematic review. *Eur J Pain* 2015; 19: 5–14. <https://doi.org/10.1002/ejp.522>
12. Bérubé M, Gélinas C, Feeley N, et al. Feasibility of a hybrid web-based and in-person self-management intervention aimed at preventing acute to chronic pain transition after major lower extremity trauma (iPACT-E-Trauma): a pilot randomized controlled trial. *Pain Med* 2019; 20: 2018–32. <https://doi.org/10.1093/pm/pnz008>
13. Pagé MG, Kudrina I, Zomahoun HT, et al. A systematic review of the relative frequency and risk factors for prolonged opioid prescription following surgery and trauma among adults. *Ann Surg* 2020; 271: 845–54. <https://doi.org/10.1097/SLA.0000000000003403>
14. Bérubé M, Dupuis S, Leduc S, et al. Tapering opioid prescription program for high-risk trauma patients: a pilot randomized controlled trial. *Pain Manag Nurs* 2022; 23: 142–50. <https://doi.org/10.1016/j.pmn.2021.08.001>
15. Andersen KV, Nikolajsen L, Daugaard H, Andersen NT, Haraldsted V, Søballe K. Local infiltration analgesia is not improved by postoperative intra-articular bolus injections for pain

- after total hip arthroplasty. *Acta Orthop* 2015; 86: 647–53. <https://doi.org/10.3109/17453674.2015.1081340>
16. Trevino CM, deRoos-Cassini T, Brasel K. Does opiate use in traumatically injured individuals worsen pain and psychological outcomes? *J Pain* 2013; 14: 424–30. <https://doi.org/10.1016/j.jpain.2012.12.016>
 17. Holman JE, Stoddard GJ, Higgins TF. Rates of prescription opiate use before and after injury in patients with orthopaedic trauma and the risk factors for prolonged opiate use. *J Bone Joint Surg Am* 2013; 95: 1075–80. <https://doi.org/10.2106/JBJS.L.00619>
 18. Callinan CE, Neuman MD, Lacy KE, Gabison C, Ashburn MA. The initiation of chronic opioids: a survey of chronic pain patients. *J Pain* 2017; 18: 360–5. <https://doi.org/10.1016/j.jpain.2016.11.001>
 19. Alghnam S, Castillo R. Traumatic injuries and persistent opioid use in the USA: findings from a nationally representative survey. *Inj Prev* 2017; 23: 87–92. <https://doi.org/10.1136/injuryprev-2016-042059>.
 20. Al Dabbagh Z, Jansson KA, Stiller CO, Montgomery S, Weiss RJ. Long-term pattern of opioid prescriptions after femoral shaft fractures. *Acta Anaesthesiol Scand* 2016; 60: 634–41. <https://doi.org/10.1111/aas.12666>
 21. Weiss RJ, Montgomery SM, Stiller CO, Wick MC, Jansson KA. Long-term follow-up of opioid use in patients with acetabular fractures. *Injury Extra* 2012; 43: 49–53. <https://doi.org/10.1016/j.injury.2012.03.027>
 22. Deyo RA, Von Korff M, Duhkoop D. Opioids for low back pain. *BMJ* 2015; 350: g6380. <https://doi.org/10.1136/bmj.g6380>
 23. Desai R, Hong YR, Huo J. Utilization of pain medications and its effect on quality of life, health care utilization and associated costs in individuals with chronic back pain. *J Pain Res* 2019; 12: 557–69. <https://doi.org/10.2147/JPR.S187144>
 24. Huang A, Azam A, Segal S, et al. Chronic postsurgical pain and persistent opioid use following surgery: the need for a transitional pain service. *Pain Manag* 2016; 6: 435–43. <https://doi.org/10.2217/pmt-2016-0004>
 25. Vowles KE, McEntee ML, Julnes PS, Frohe T, Ney JP, van der Goes DN. Rates of opioid misuse, abuse, and addiction in chronic pain: a systematic review and data synthesis. *Pain* 2015; 156: 569–76. <https://doi.org/10.1097/01.j.pain.0000460357.01998.f1>
 26. Cochran G, Pacella ML, Ringwald W, et al. Opioid use patterns and risk characteristics among injured patients. *Subst Abuse* 2020; 41: 24–8. <https://doi.org/10.1080/08897077.2019.1635065>
 27. Coffin PO, Rowe C, Oman N, et al. Illicit opioid use following changes in opioids prescribed for chronic non-cancer pain. *PLoS One* 2020; 15: e0232538. <https://doi.org/10.1371/journal.pone.0232538>
 28. Gaines TL, Wagner KD, Mittal ML, et al. Transitioning from pharmaceutical opioids: a discrete-time survival analysis of heroin initiation in suburban/exurban communities. *Drug Alcohol Depend* 2020; 213: 108084. <https://doi.org/10.1016/j.drugalcdep.2020.108084>
 29. Jones W, Vojtila L, Kurdyak P, Fischer B. Prescription opioid dispensing in Canada: an update on recent developments to 2018. *J Pharm Policy Pract* 2020; 13: 68. <https://doi.org/10.1186/s40545-020-00271-x>
 30. Gomes T, Tadrous M, Mamdani MM, Paterson JM, Juurlink DN. The burden of opioid-related mortality in the United States. *JAMA Netw Open* 2018; 1: e180217. <https://doi.org/10.1001/jamanetworkopen.2018.0217>
 31. *Centers for Disease Control and Prevention*. Mortality statistics, 2022. Available from URL: <https://www.cdc.gov/nchs/nvss/deaths.htm> (accessed July 2022).
 32. Côté C, Bérubé M, Moore L, et al. Strategies aimed at preventing long-term opioid use in trauma and orthopaedic surgery: a scoping review. *BMC Musculoskeletal Disord* 2022; 23: 238 <https://doi.org/10.1186/s12891-022-05044-y>
 33. Burns KE, Duffett M, Kho ME, et al. A guide for the design and conduct of self-administered surveys of clinicians. *CMAJ* 2008; 179: 245–52. <https://doi.org/10.1503/cmaj.080372>
 34. Sharma A, Minh Duc NT, Luu Lam Thang T, et al. A consensus-based checklist for reporting of survey studies (CROSS). *J Gen Intern Med* 2021; 36: 3179–87. <https://doi.org/10.1007/s11606-021-06737-1>
 35. *Institut national d'excellence en santé et en services sociaux*. Structure du continuum de traumatologie. Available from URL: <https://www.inesss.qc.ca/en/themes/sante/traumatology/trauma-care-continuum-tcc/structure.html>. (accessed July 2022)
 36. *Government of Canada*. Opioid- and stimulant-related harms in Canada, 2022. Available from URL: <https://health-infobase.canada.ca/substance-related-harms/opioids-stimulants> (accessed July 2022).
 37. *Réseau-1 Québec*. RRAPPL Université Laval. Available from URL: <http://reseau1quebec.ca/partner/universite-laval/> (accessed July 2022).
 38. Cunningham CT, Quan H, Hemmelgarn B, et al. Exploring physician specialist response rates to web-based surveys. *BMC Med Res Methodol* 2015; 15: 32. <https://doi.org/10.1186/s12874-015-0016-z>
 39. Turgeon AF, Lauzier F, Burns KE, et al. Determination of neurologic prognosis and clinical decision making in adult patients with severe traumatic brain injury: a survey of Canadian intensivists, neurosurgeons, and neurologists. *Crit Care Med* 2013; 41: 1086–93. <https://doi.org/10.1097/CCM.0b013e318275d046>
 40. Bonaventure PL, Lauzier F, Zarychanski R, et al. Red blood cell transfusion in critically ill patients with traumatic brain injury: an international survey of physicians' attitudes. *Can J Anesth* 2019; 66: 1038–48. <https://doi.org/10.1007/s12630-019-01369-w>
 41. Moberg J, Oxman AD, Rosenbaum S, et al. The GRADE evidence to decision (EtD) framework for health system and public health decisions. *Health Res Policy Syst* 2018; 16: 45. <https://doi.org/10.1186/s12961-018-0320-2>
 42. Beaton DE, Bombardier C, Guillemin F, Ferraz MB. Guidelines for the process of cross-cultural adaptation of self-report measures. *Spine (Phila Pa 1976)*. 2000; 25: 3186–91. <https://doi.org/10.1097/00007632-200012150-00014>
 43. *United Way Centraide Canada*. United Way Centraide Canada. Available from URL: <https://www.unitedway.ca/> (accessed July 2022).
 44. Sackett DL, Straus SE, Richardson WS, Rosenberg W, Haynes RB. Evidence-based Medicine: How to Practice and Teach EBM, 2nd edition. Edinburgh: Churchill Livingstone; 2000.
 45. *British Columbia Ministry of Mental Health and Addictions*. Escalating BC's response to the overdose emergency. Available from URL: https://www2.gov.bc.ca/assets/gov/overdose-awareness/mmha_escalating_bcs_response_report_final_26feb.pdf (accessed July 2022).
 46. *BC Centre for Disease Control*. Harm reduction services, 2022. Available from URL: <http://www.bccdc.ca/our-services/programs/harm-reduction> (accessed July 2022).
 47. *Public Health Ontario*. Opioids, 2022. Available from URL: <https://www.publichealthontario.ca/en/diseases-and-conditions/mental-illness-substance-use/opioids> (accessed July 2022).
 48. Friesen EL, Kurdyak PA, Gomes T, et al. The impact of the COVID-19 pandemic on opioid-related harm in Ontario, 2021. Available from URL: https://covid19-sciencetable.ca/wp-content/uploads/2021/09/The-Impact-of-the-COVID-19-Pandemic-on-Opioid-Related-Harm-in-Ontario_published_20210908.pdf (accessed July 2022).
 49. Acuña AJ, Mengers SR, Raji Y, et al. Opioid-prescribing patterns among shoulder and elbow surgeons: considerations for future

- prescription guidelines. *J Shoulder Elbow Surg* 2021; 30: e531–8. <https://doi.org/10.1016/j.jse.2020.12.001>
50. Anderson JE, Cocanour CS, Galante JM. Trauma and acute care surgeons report prescribing less opioids over time. *Trauma Surg Acute Care Open* 2019; 4: e000255. <https://doi.org/10.1136/tsaco-2018-000255>
 51. Balayssac D, Pereira B, Cuq P, et al. Perception of pharmacy students toward opioid-related disorders and roles of community pharmacists: a French nationwide cross-sectional study. *Subst Abuse* 2021; 42: 706–15. <https://doi.org/10.1080/08897077.2020.1850607>
 52. Biskup M, Dzioba A, Sowerby LJ, Monteiro E, Strychowsky J. Opioid prescribing practices following elective surgery in Otolaryngology-head & neck surgery. *J Otolaryngol Head Neck Surg* 2019; 48: 29. <https://doi.org/10.1186/s40463-019-0352-9>
 53. Dasgupta N, Brown JR, Nocera M, Lazard A, Slavova S, Freeman PR. Abuse-deterrent opioids: a survey of physician beliefs, behaviors, and psychology. *Pain Ther* 2022; 11: 133–51. <https://doi.org/10.1007/s40122-021-00343-z>
 54. Dubé PA, Vachon J, Sirois C, Roy É. Opioid prescribing and dispensing: experiences and perspectives from a survey of community pharmacists practising in the province of Quebec. *Can Pharm J (Ott)* 2018; 151: 408–18. <https://doi.org/10.1177/1715163518805509>
 55. Ebbert JO, Philpot LM, Clements CM, et al. Attitudes, beliefs, practices, and concerns among clinicians prescribing opioids in a large academic institution. *Pain Med* 2018; 19: 1790–8. <https://doi.org/10.1093/pm/pnx140>
 56. Ekhtiari S, Horner NS, Shanmugaraj A, Duong A, Simunovic N, Ayeni OR. Narcotic prescriptions following knee and shoulder arthroscopy: a survey of the arthroscopy association of Canada. *Cureus* 2020; 12: e7856. <https://doi.org/10.7759/cureus.7856>
 57. Fowler M, Ali S, Gouin S, et al. Knowledge, attitudes and practices of Canadian pediatric emergency physicians regarding short-term opioid use: a descriptive, cross-sectional survey. *CMAJ Open* 2020; 8: E148–55. <https://doi.org/10.9778/cmajo.20190101>
 58. Freilich E, Zhao Y, Yan S, Caldrony S, Mehra P. Opioid prescribing patterns among oral and maxillofacial surgeons: a regional survey-based study. *J Oral Maxillofac Surg* 2020; 78: 1078–87. <https://doi.org/10.1016/j.joms.2020.02.032>
 59. Furlan AD, Diaz S, Carol A, MacDougall P, Allen M. Self-reported practices in opioid management of chronic noncancer pain: an updated survey of Canadian family physicians. *J Clin Me* 2020; 9: 3304. <https://doi.org/10.3390/jcm9103304>
 60. Goel A, Feinberg A, McGuinness B, et al. Postoperative opioid-prescribing patterns among surgeons and residents at university-affiliated hospitals: a survey study. *Can J Surg* 2020; 63: E1–8. <https://doi.org/10.1503/cjs.016518>
 61. Hall DJ, Mira JC, Hoffman MR, et al. Postoperative surgical trainee opioid prescribing practices (POST-OPP): a national survey. *J Opioid Manag* 2019; 15: 307–22. <https://doi.org/10.5055/jom.2019.0516>
 62. Linnaus ME, Sheaffer WW, Ali-Mucheru MN, Velazco CS, Neville M, Gray RJ. The opioid crisis and surgeons: national survey of prescribing patterns and the influence of motivators, experience, and gender. *Am J Surg* 2019; 217: 1116–20. <https://doi.org/10.1016/j.amjsurg.2018.11.032>
 63. Oyler DR, Deep KS, Chang PK. Opioid use in the acute setting: a survey of providers at an academic medical center. *J Opioid Manag* 2018; 14: 203–10. <https://doi.org/10.5055/jom.2018.0450>
 64. Ranases E, Secrist ES, Freedman KB, Sohn DH, Fleeter TB, Aland CM. Opioid prescribing practices of orthopaedic surgeons: results of a national survey. *J Am Acad Orthop Surg* 2019; 27: e166–72. <https://doi.org/10.5435/JAAOS-D-16-00750>
 65. Razouki Z, Khokhar BA, Philpot LM, Ebbert JO. Attributes, attitudes, and practices of clinicians concerned with opioid prescribing. *Pain Med* 2019; 20: 1934–41. <https://doi.org/10.1093/pm/pny204>
 66. Sonneborn O, Miller C. The pain nurse practitioner and pain nurse's role and views on opioid management in Australia: a national questionnaire survey. *Pain Manag Nurs* 2021; 22: 740–6. <https://doi.org/10.1016/j.pmn.2021.05.002>
 67. French SD, Green SE, O'Connor DA, et al. Developing theory-informed behaviour change interventions to implement evidence into practice: a systematic approach using the theoretical domains framework. *Implement Sci* 2012; 7: 38. <https://doi.org/10.1186/1748-5908-7-38>
 68. Centre intégré universitaire de santé et de services sociaux du Centre-Sud-de-l'Île-de-Montréal. Recommandations canadiennes 2017 sur l'utilisation des opioïdes pour le traitement de la douleur chronique non cancéreuse, 2022. Available from URL: <http://www.cran.qc.ca/fr/opioïdes/outils/recommandations-canadiennes-2017-sur-l'utilisation-des-opioïdes-pour-le-traitement-de> (accessed July 2022).
 69. Nguyen T, Seiler N, Brown E, O'Donoghue B. The effect of clinical practice guidelines on prescribing practice in mental health: a systematic review. *Psychiatry Res* 2020; 284: 112671. <https://doi.org/10.1016/j.psychres.2019.112671>
 70. Pereira VC, Silva SN, Carvalho VK, Zanghelini F, Barreto JO. Strategies for the implementation of clinical practice guidelines in public health: an overview of systematic reviews. *Health Res Policy Syst* 2022; 20: 13. <https://doi.org/10.1186/s12961-022-00815-4>
 71. Mazrou SA. Expected benefits of clinical practice guidelines: factors affecting their adherence and methods of implementation and dissemination. *J health specialties* 2013; 1: 141.
 72. Wiens M, Jarrett D, Settini A, White C, Hollingham Z, Packham T. Role of rehabilitation in opioid tapering: a scoping review. *Physiother Can* 2022; 74: 75–85. <https://doi.org/10.3138/ptc-2020-0011>
 73. Furlan AD, Carnide N, Irvin E, et al. A systematic review of strategies to improve appropriate use of opioids and to reduce opioid use disorder and deaths from prescription opioids. *Can J Pain* 2018; 2: 218–35. <https://doi.org/10.1080/24740527.2018.1479842>
 74. World Health Organization. The alcohol smoking and substance involvement screening test (ASSIST): manual for use in primary care. Available from URL: <https://www.who.int/publications/i/item/978924159938-2> (accessed July 2022).
 75. Webster LR, Webster RM. Predicting aberrant behaviors in opioid-treated patients: preliminary validation of the opioid risk tool. *Pain Med* 2005; 6: 432–42. <https://doi.org/10.1111/j.1526-4637.2005.00072.x>
 76. Cheatle MD, Compton PA, Dhingra L, Wasser TE, O'Brien CP. Development of the revised opioid risk tool to predict opioid use disorder in patients with chronic nonmalignant pain. *J Pain* 2019; 20: 842–51. <https://doi.org/10.1016/j.jpain.2019.01.011>
 77. Brown RT, Deyo B, Nicholas C, et al. Screening in trauma for opioid misuse prevention (STOMP): results from a prospective cohort of victims of traumatic injury. *Drug Alcohol Depend* 2022; 232: 109286. <https://doi.org/10.1016/j.drugalcdep.2022.109286>

Publisher's Note Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations. Springer Nature or its licensor holds exclusive rights to this article under a publishing agreement with the author(s) or other rightsholder(s); author self-archiving of the accepted manuscript version of this article is solely governed by the terms of such publishing agreement and applicable law.