BJA

British Journal of Anaesthesia, 123 (2): e333–e342 (2019)

doi: 10.1016/j.bja.2019.03.044
Advance Access Publication Date: 29 May 2019
Special Article

Perioperative Pain and Addiction Interdisciplinary Network (PAIN) clinical practice advisory for perioperative management of buprenorphine: results of a modified Delphi process

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Summary

Until recently, the belief that adequate pain management was not achievable while patients remained on buprenorphine was the impetus for the perioperative discontinuation of buprenorphine. We aimed to use an expert consensus Delphi-based survey technique to 1) specify the need for perioperative guidelines in this context and 2) offer a set of recommendations for the perioperative management of these patients. The major recommendation of this practice advisory is to continue buprenorphine therapy in the perioperative period. It is rarely appropriate to reduce the buprenorphine dose irrespective of indication or formulation. If analgesia is inadequate after optimisation of adjunct analgesic therapies, we recommend initiating a full mu agonist while continuing buprenorphine at some dose. The panel believes that before operation, physicians must distinguish between buprenorphine use for chronic pain (weaning/conversion from long-term high-dose opioids) and opioid use disorder (OUD) as the primary indication for buprenorphine therapy. Patients should ideally be discharged on buprenorphine, although not necessarily at their preoperative dose. Depending on analgesic requirements, they may be discharged on a full mu agonist. Overall, long-term buprenorphine treatment retention and harm reduction must be considered during the perioperative period when OUD is a primary diagnosis. The authors recognise that inter-patient variability will require some individualisation of clinical practice advisories. Clinical practice advisories are largely based on lower classes of evidence (level 4, level 5). Further research is required in order to implement meaningful changes in practitioner behaviour for this patient group.

Keywords: buprenorphine; chronic pain; guidelines; opioids; opioid use disorder; perioperative

Editorial decision: 21 March 2019; **Accepted:** 21 March 2019

Editor's key points

- Buprenorphine is used for both chronic pain and opioid use disorder management. As a partial mu opioid receptor agonist, it may have an analgesic ceiling. This could be problematic in management of acute pain.
- There is limited evidence on the best strategy for acute pain management for patients on long-term buprenorphine, so a modified Delphi process was used.
- After Delphi Round 2 there was consensus in a number of key areas, including the recommendation to almost always continue perioperative buprenorphine therapy.
- With a major focus on perioperative opioid use, there is a need for more high quality research in this area.

Buprenorphine has been used for opioid detoxification, addiction therapy, acute pain, and chronic pain management in the USA since 2002.[1] Buprenorphine is a partial agonist of mu receptors with unique properties. It has a high binding affinity, exceeded only by sufentanil, and mimics antagonist properties at higher doses.[2,3] In addition, buprenorphine is a kappa antagonist and has a ceiling for its respiratory effects.[4] Its pharmacological properties and wide safety profile have made it increasingly prescribed in the chronic pain and addiction patient populations. The number of patients on buprenorphine treatment is increasing.[5,6] Since its approval in 2002, the number of buprenorphine/naloxone tablets sold in the USA increased from 8 million in 2005 to more than 145 million in 2009. Emerging studies have shown that increasing Medicaid coverage for buprenorphine-naloxone has resulted in an overall increase in people filing prescriptions for buprenorphine-naloxone.[7]

Until now, the belief that adequate pain management was not achievable while patients remained on buprenorphine was the impetus for the perioperative discontinuation of buprenorphine.[1] Recent studies suggest that its perioperative discontinuation can destabilise patients with a history of opioid use disorder (OUD). For example transitioning a patient off buprenorphine to a full agonist opioid will permit free access to opioid receptors for the purposes of analgesia, but significantly increases the relapse possibility of the previous substance use disorder.[8] Emerging evidence suggests that certain subsets of patients are less likely to experience deterioration of their substance use disorder[8,9] no matter which strategy is pursued (continue or discontinue).

Aims

We aimed to use an expert consensus Delphi-based survey technique to develop and evaluate a set of recommendations (Supplementary Document E2) that addresses perioperative buprenorphine management strategies. We sought to improve morbidity and mortality associated with the following health indicators: 1) perioperative stability and exacerbation of underlying substance use disorder, co-occurring pain disorder (PD), or both; and 2) optimal perioperative analgesia. This clinical practice advisory was formed using the 22-step checklist recommended by the essential reporting items for practice guidelines in healthcare (RIGHT) group[10] for the Enhancing the Quality and Transparency of Health Research (EQUATOR) network (Supplementary Document E3). A Research and Ethics Board (REB) Waiver was obtained from the local REB in order to conduct this research (Supplementary Document E1).

Target population

The primary population of interest includes: 1) patients undergoing any minor or major diagnostic or therapeutic procedure and 2) patients who have their underlying Chronic Pain (CP), Opioid Use Disorder (OUD), or both managed with a buprenorphine product.

End-users and settings

This clinical practice advisory is intended for use by physicians, allied healthcare providers, patients, pharmacists, and policy-makers. Primary care and perioperative clinicians (including but not limited to nurse practitioners, pharmacists, anaesthesiologists, surgeons, addiction specialists, and primary care providers) may use these practice advisories to make treatment decisions with the buprenorphine-maintained patient in the perioperative period. Similarly, regional policy experts may apply these practice advisories to reflect institution-specific variations and preferences.

Clinical practice advisory development groups

Systematic review team

The Senior Investigator (HC) and two independent reviewers (SA and AG) completed a review on the topic: '*The Perioperative Patient on Buprenorphine: A Systematic Review of Perioperative Management Strategies and Patient Outcomes*'.[11]

Steering committee

A steering committee from multiple institutions (Harvard University, University of Toronto, McMaster University, Queen's University) was formed to develop and conduct this project and consists of representation from various disciplines (anaesthesiology, family practice, epidemiology, addictions medicine, pain medicine), geographical areas (Canada, USA) and research expertise (Delphi, health services, and quantitative methods). Further details regarding the formation of the steering committee can be found in the protocol entitled '*The Perioperative Management of Buprenorphine: Protocol for a Modified Delphi Process*' by Goel and colleagues (Supplementary Document E2).[12]

Expert consensus panel

'Experts' were defined as individuals involved in the management, development, research, teaching, or analysis of clinical perioperative buprenorphine strategies. To identify experts in the field of addiction and perioperative medicine, we reviewed authorship of published guidelines, reviews, and case reports of buprenorphine management in the perioperative period; we identified established profiles in addiction, pain, or perioperative medicine; we solicited peer recommendations from individuals on boards of the National Canadian Society of Addiction Medicine (CSAM), Canadian Pain Society (CPS) and Canadian Anesthesiologist's Society (CAS). In order to optimise the face validity of our panel, we sought to include allied healthcare professionals and patients as well. Inclusion of a nurse practitioner and patient allowed the panellists to consider the values and preferences of the target population. We sought to diversify our panel by selecting panellists with

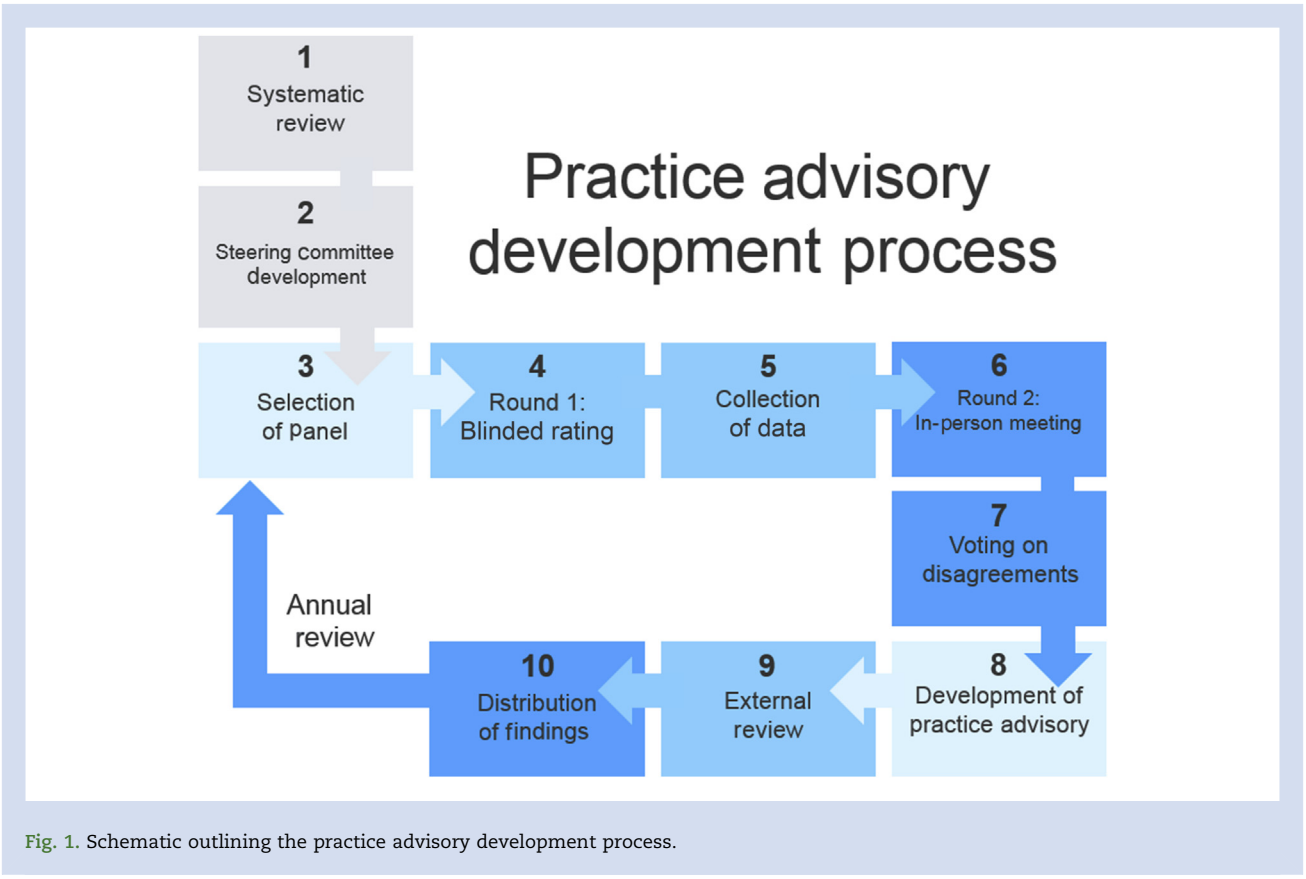

Fig. 1. Schematic outlining the practice advisory development process.

practice experience in all of the Canadian provinces, membership on professional societies, and wide-ranging expertise. Eleven experts were included in the final panel. Further details regarding the selection of the steering committee and the practice advisory development process can be found in the protocol (Supplementary Document E2).[12]

Methodologists

Senior methodologists (JW, HS) were selected on the basis of prior experience with major published Delphi protocols, an academic track record of collaborative guideline development, or both.

Clinical practice advisory development process

The clinical practice advisory development process is outlined in Figure 1 and was detailed *a priori* by the steering committee in Supplementary Document E2.[12] Instructions for panellists can be found in Supplementary Document E4. Samples of the Round 1 blinded panel rating forms can be found in Supplementary Documents E5, E6, and E7. A summary of consensus findings after Round 1 can be found in Supplementary Document E8. Finally, a summary of consensus findings after voting on disagreements can be found in Supplementary Document E9.

Evidence

Assessment of certainty of evidence

Currently, the quality of evidence regarding perioperative management of patients on buprenorphine is weak as determined by the Grading of Recommendations, Assessment, Development and Evaluations (GRADE) tool.[13] A systematic review[11] revealed that the number of studies to address the perioperative dilemma is limited, and few directly evaluated the question of continuation *vs* discontinuation of buprenorphine.[14–30] This review evaluated articles collected on June 14, 2017 of human studies on patients who were using buprenorphine for addiction or pain and was not limited by study type. Databases included Medline, Medline In-Process, Embase, Cochrane Central, Cochrane Databases of Systematic Reviews, PsycINFO, Web of Science (Clarivate), Scopus (Elsevier), CINAHL (EbscoHost), and PubMed (NLM), supplemented by book chapters, dissertations, and ongoing clinical trials. A summary of the search strategy and MeSH terms are included in Supplementary Document E10. Complete details regarding the methodology of this review can be found in the *Canadian Journal of Anaesthesia*.[11]

Few studies make considerations for the possibility of relapse in cases where there has been a history of OUD. Many studies highlighted the importance of multimodal and regional anaesthesia techniques. Furthermore, the only RCT combined patients taking buprenorphine and methadone into one group,[31] limiting the study's applicability to the important question: should buprenorphine be continued in the perioperative period or not?

Until now, four practice advisories, three reviews, and one guideline[1,32–38] were built on the backbone of anaesthesiologists' opinions and existing case reports (Table 1).[14–30] Many of the existing recommendations propose discontinuation of buprenorphine before surgery, especially where high pain is expected. However, more recently, editorialised practice

Table 1 Summary of existing reviews on perioperative management of buprenorphine. PCA, patient-controlled analgesia; SL, sublingual.

Title	Date	Major perioperative recommendations
Anderson and colleagues[1]	2017	1) Where moderate-to-severe pain is expected, cancel surgery such that buprenorphine is weaned off before surgery and short-acting opioids are used to replace it 2) A plan for follow-up and reinstitution of therapy should be established 3) Anticipate patient's opioids requirements will be similar to an opioid-tolerant patient 4) Consider adjuncts—NSAIDs, membrane stabilisers, acetaminophen, local anaesthetics, regional anaesthetic techniques 5) Ensure appropriate outpatient follow-up with buprenorphine provider
Sen and colleagues[35]	2016	1) Discontinue buprenorphine 72 h before operative procedure, or replace buprenorphine with methadone 2) Expect additional opioid doses for acute pain control 3) Discharge on pure opioid induction protocol of buprenorphine in conjunction with primary provider
Jonan and colleagues[43]	2018	1) Utilise non-opioid adjuncts, regional anaesthesia, and local anaesthetic infiltration by surgeon where possible 2) Where low postoperative pain is expected, continue buprenorphine perioperatively without taper 3) Where intermediate pain is expected, discontinue buprenorphine 3 days before procedure, consider high dose PCA, and consider ICU admission for respiratory monitoring 4) Where high pain is expected, discontinue buprenorphine 3–5 days before procedure, consider pure opioid agonist to manage withdrawal, and consider ICU for respiratory monitoring
Childers and Arnold[32]	2012	1) Adjuvant analgesics and interventional procedures should be provided if available 2) Hold buprenorphine and start short-acting opioid agonists if expecting moderate-to-severe pain 3) Re-initiate buprenorphine in the postoperative period with the buprenorphine provider 4) Where mild-to-moderate pain is expected, consider treating pain with buprenorphine alone, or use short-acting opioid agonists at higher doses 5) Consider replacing buprenorphine with methadone for opioid addiction where ongoing pain management is expected
Bryson[33]	2014	1) Ideally, buprenorphine should be discontinued 72 h before surgery, then restarted once patient no longer has acute pain requiring narcotic analgesics 2) If the plan is to continue buprenorphine, use short-acting opioid analgesics to achieve pain control, expecting higher than normal effective doses. Divide buprenorphine maintenance dose and administer every 6–8 h 3) If the plan is to stop the buprenorphine, use standard opioids for analgesia, conduct a slow taper over 2 weeks or an abrupt taper over 3 days, remaining buprenorphine-free for 72 h before surgery 4) If the relapse rate is too high, replace maintenance dose of buprenorphine with methadone before surgery, and use another short-acting opioid and analgesic for breakthrough pain
Berry and colleagues[34] (Vermont Guidelines)	2015	1) Reduce buprenorphine dose to 8 mg SL on the day of surgery 2) Use oxycodone or other full agonists to make up opiate debt + typical postoperative course management 3) Expect longer than normal pain management regimen in the postoperative period 4) Buprenorphine doses above 10 mg daily will block opioid analgesics for pain
Lembke and colleagues[37] (Editorial)	2019	1) Continue buprenorphine in the perioperative period for patients taking 12 mg SL or less 2) Taper buprenorphine to 12 mg SL 2–3 days before operation 3) Multimodal analgesia, regional techniques where possible 4) Higher than normal doses of opioids to treat pain for 2–4 days post-surgery
Harrison and colleagues[38]	2018	1) Buprenorphine and methadone should be continued for most patients in the perioperative period 2) Discontinue oral naltrexone 2 days before operation and resumed after operation 3) Multimodal pain management is cornerstone of treatment of patients on chronic opioid therapy

advisories have proposed continuation of buprenorphine depending on the preoperative dose and indication.[37,38] Moreover, there is disagreement on the best discharge strategies for patients taking buprenorphine, irrespective of diagnosis. While most recommendations agree upon major principles such as multimodal analgesia, there is no consensus on which strategies are more likely to succeed.

Overall, there is disagreement on optimal pre-, intra-, and postoperative strategies for managing buprenorphine in patients with OUD, PD, or both. Therefore, the steering

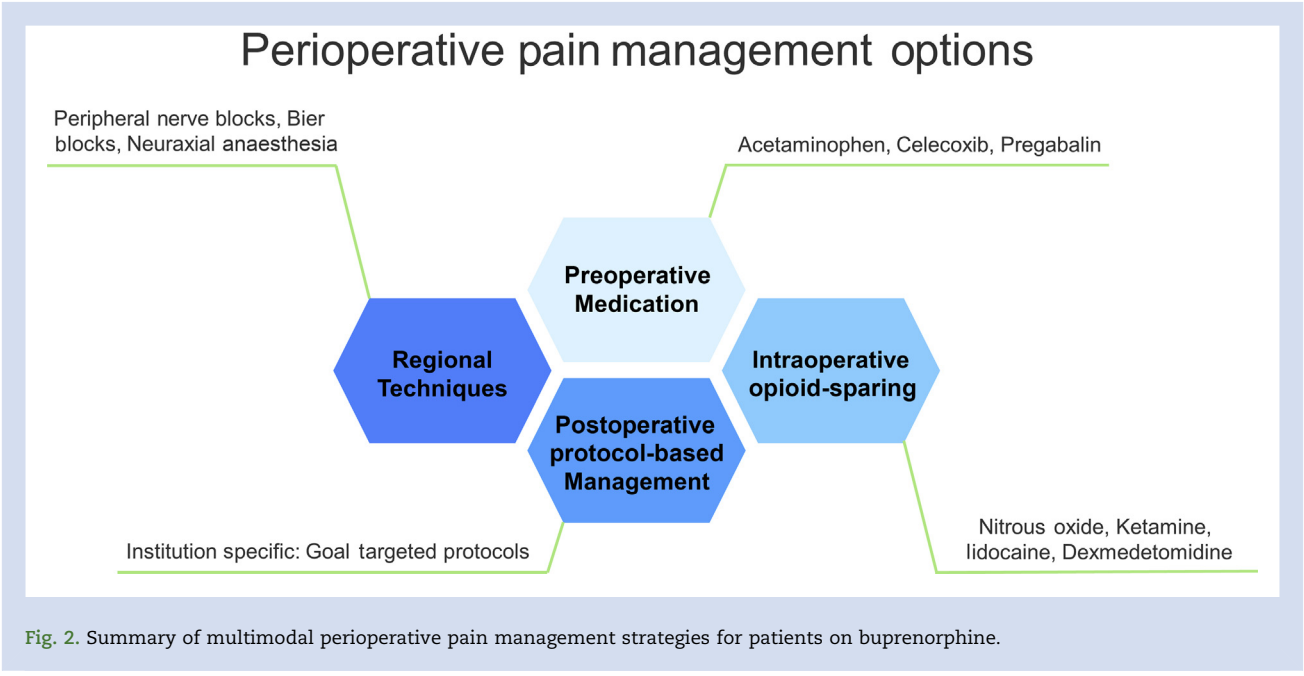

Fig. 2. Summary of multimodal perioperative pain management strategies for patients on buprenorphine.

committee sought to address the following key questions that would form the basis for our recommendations.

Healthcare questions

The steering committee used the Population-Intervention-Comparator-Outcome format to identify key healthcare questions that would form the basis for the expert panellists' ratings in Rounds 1 and 2.

Population

Surgical patients with OUD, PD, or both necessitating preoperative maintenance on buprenorphine (sublingual [SL] or transdermal [TD]) therapy).

Interventions

1) Any diagnostic or therapeutic procedure.
2) Stop, continue, or reduce buprenorphine in the preoperative period.
3) Stop, continue, or reduce buprenorphine in the postoperative period.
4) Initiate a full mu agonist in the postoperative period for analgesia.
5) Initiate adjunct analgesics (NSAIDs, Acetaminophen, ketamine, gabapentin/pregabalin, dexmedetomidine, lidocaine) in the perioperative period for analgesia.
6) Discharge the patient on some dose of buprenorphine.
7) Discharge the patient on some full mu agonist for analgesia.
8) Initiate outpatient buprenorphine provider involvement in the perioperative period.

Comparators

1) Different buprenorphine doses and formulations (0–4, 5–8, 9–12, 13–16, ≥17 mg SL, TD).
2) Regional anaesthesia technique *vs* no regional anaesthesia technique.
3) High *vs* low-intermediate pain surgery.
4) Elective *vs* emergent surgery.
5) High *vs* low-intermediate likelihood of exacerbation of underlying disorder (OUD, PDs, or both).

Outcomes

1) Postoperative analgesia.
2) Exacerbation of underlying disorder.
   a. Exacerbation of underlying PD (unmanaged acute pain).
   b. Exacerbation of underlying OUD (reusing, increased frequency of substance use in the perioperative period, destabilisation of pre-existing status of their OUD).
3) Associated morbidity, mortality, or both from exacerbation of underlying disorder.

Clinical practice advisory

Section 1. preoperative planning

Level 5 evidence (case series, studies with no controls)

Recommendation: it is almost always appropriate to continue buprenorphine at the preoperative dose. Furthermore, it is rarely appropriate to reduce the buprenorphine dose.

In this section, panellists were asked to rate the appropriateness of continuing, reducing, or stopping buprenorphine in the preoperative period. All combinations of buprenorphine formulations (TD, SL, not including newly introduced extended-release formulations) and doses, surgery type (elective *vs* emergent), expected pain (high *vs* low-to-moderate), availability of regional anaesthesia technique (available *vs* not available) and likelihood of exacerbation of underlying disorder (OUD, PD, or both) were provided to panellists. The steering committee acknowledged through its voting form design that buprenorphine SL is increasingly being prescribed off-label for management of chronic pain. Similarly, they acknowledged

the off-label use of buprenorphine TD for the management of OUD.

Overall, the quality of evidence regarding perioperative management of patients on buprenorphine was weak.[11] The number of studies was limited, and few directly evaluated the question of continuation *vs* discontinuation of buprenorphine. Among the studies that addressed this question, controls were scant, with none being randomised. Of the observational studies (matched cohort, prospective cohort, retrospective cohort) that included patients on buprenorphine as part of their outcomes, only two studied the effects of buprenorphine as a main outcome.[28,29] The only controlled study combined patients taking buprenorphine and methadone into one group, making the controlled randomisation ineffectual.[31]

OUD exacerbation rates were not reported in any of the controlled or observational studies. The panel discussed existing primary care studies demonstrating that patients with a history of recent misuse, including a positive urine drug screen in the past 20 months, are at increased risk of relapse in the perioperative period.[5,6,9]

In addition to problematic pain management, discontinuation may hinder harm reduction with respect to addiction. Some expert opinions suggest improved treatment retention and lower misuse rates with discontinuation, but do not acknowledge the greater risk of destabilising a pre-existing chronic pain condition or OUD when opioid replacement therapy is stopped. According to the reviewed literature, there is no evidence to suggest that discontinuation of buprenorphine is the preferred method of OUD relapse prevention. Relapse rates are poorly defined in the reviewed literature, a surprising result given the importance of addiction management in this population. Also concerning is the lack of reporting of indication for buprenorphine use. The majority of reviewed studies report chronic pain as the main indication *vs* OUD (10 *vs* five). This failure to report the indication for buprenorphine therapy in the existing literature may reflect the lack of awareness surrounding addiction therapy among perioperative physicians. If patient well-being beyond the operative room is to be factored into the decision-making process, current practice advisories and guidelines seem insufficient in addressing this matter.

Existing recommendations are largely driven by expert opinion, with little reference to peer-reviewed primary evidence (Table 1). Potential weaknesses in the existing practice advisory include the recommendation to transition patients to short-acting opioids before surgery.[34] Evidence to the contrary shows lower relapse rates in the OUD patient population who are maintained on buprenorphine.[32] Other recommendations disagree with this practice and do not recommend replacing buprenorphine with full mu agonists in the perioperative period.[33] Lembke and colleagues[37] most recently editorialised their support of perioperative buprenorphine continuation with evidence from case reports and series.[37]

The panel recommends the continuation of buprenorphine in the preoperative period in order to avoid disruption of the existing regimen and possible exacerbation of the underlying disorder in an unmonitored setting. The recommendations in this section apply to all doses, formulations (not including newly introduced extended-release formulations), surgery types, patient risk levels, and indications for buprenorphine therapy, as defined by the paper rating forms developed by the steering committee. Permission to view these forms can be obtained by contacting the first author.

Section 2. postoperative pain—buprenorphine and opioids

Level 4 evidence (observational studies, some case reports)

Recommendation:

1) After analgesic adjuncts have been initiated (see Section 3), consider initiating a full mu agonist to manage pain (fentanyl, hydromorphone, morphine).
2) If inadequate analgesia persists, consider a buprenorphine dose reduction.
3) If a buprenorphine dose reduction is pursued in the context of a full mu agonist, additional monitoring should be considered.

In this section, panellists were asked to rate the appropriateness of continuing *vs* not continuing buprenorphine during the inpatient postoperative period. Panellists were also asked to rate the appropriateness of initiating a full mu agonist for analgesia during the inpatient postoperative period. All combinations of buprenorphine formulations (TD, SL, not including newly introduced extended release formulations) and doses, surgery type (elective and emergent), and likelihood of exacerbation of underlying disorder (OUD, PD, or both) were provided to panellists.

Of the existing recommendations retrieved by our literature review (Table 1) Sen and colleagues[35] warn clinicians to 'expect additional opioid doses for acute pain control'. Several other practice advisories suggest that the high affinity of buprenorphine to the mu-opioid receptor necessitates escalated doses of full mu agonists in order to achieve adequate analgesia.[1,32,36] The literature search returned only one experimental study which used positron emission tomography in heroin-dependent human volunteers to show that higher buprenorphine doses (32 mg) resulted in higher mu-opioid receptor occupancy (near 95%) at most brain regions compared with lower buprenorphine doses.[39] However, a systematic review on the topic yielded the conclusion that more evidence is required to substantiate this belief.[11] While high quality evidence is missing, multiple case reports and observational studies cite the successful management of pain and addiction in buprenorphine-maintained patients using increased doses of opioids.[15,16,19]

Continuing buprenorphine in the postoperative period ensures that the existing buprenorphine regimen is not disrupted. Furthermore, the panel felt that this management strategy reduces the likelihood of exacerbation of an underlying pain or OUD in the post-discharge period. There is also the benefit of the respiratory depression protective effect. Given that these patients may display characteristics of opioid tolerance, providers should consider lengthier admission in order to appropriately manage pain and cravings. Appropriate transition to care should be planned in order to facilitate transitions in their addiction, pain management, or both, and where possible, a transitional pain team should be involved in these patients' care.[40,41]

Section 3. postoperative pain—adjunct analgesia

Level 5 evidence (case series, studies with no controls)

Recommendation: it is almost always appropriate to prescribe adjunct analgesia in the perioperative period, including NSAIDs, acetaminophen, gabapentin/pregabalin, ketamine, dexmedetomidine, and lidocaine. Where possible, regional anaesthesia techniques should be used.

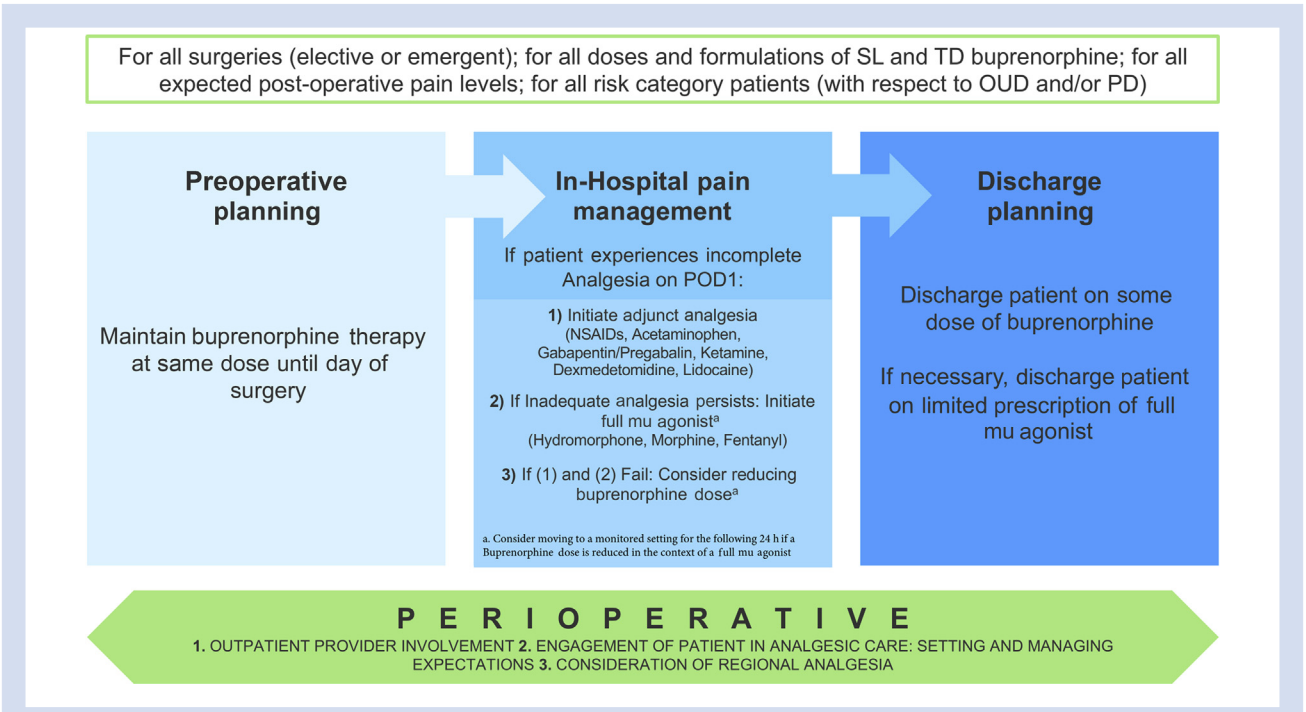

Fig. 3. A summary of recommendations for perioperative management of patients taking buprenorphine. OUD, opioid use disorder; PD, pain disorder; POD, postoperative day; SL, sublingual; TD, transdermal.

Evidence/rationale for recommendation: adjunctive analgesia including regional anaesthesia techniques has become a key player in the multimodal approach to analgesia in the perioperative setting. The panel noted that several of the existing reviews and recommendations make note of regional anaesthesia techniques and adjuncts to manage higher than normal pain in the perioperative patient taking buprenorphine (Fig 2).[1,32,34,37] Various case reports suggest appropriate pain management where regional anaesthesia techniques were used.[15]

Apart from the risks associated with regional techniques (i.e. infection, bleeding, nerve damage), a potential harm includes poor pain control after discontinuation of the regional technique. Patients should be counselled before surgery about the utility of regional techniques and potential difficulties in pain management once any catheter or adjunct is discontinued.

Section 4. postoperative pain—opioid selection

Level 5 evidence (case series, studies with no controls)

Recommendation: it is almost always appropriate to prescribe hydromorphone, morphine, and fentanyl in the postoperative period to manage pain.

Rationale for recommendation: existing scientific literature suggests that mu-opioid receptor binding affinity and oil-water partition coefficients are important in determining the ability of competing mu agonists to overcome the buprenorphine-mu-opioid receptor complex.[23] However, given that these ranges are broad and overlapping with those of buprenorphine, the panel did not feel that recommendations on a particular full mu agonist were appropriate. Furthermore, there was a lack of consensus on the use of sufentanil to overcome the binding effects of buprenorphine given the lack of familiarity with this full mu agonist.

Overall, the panel discussed the utility of opioid rotation where appropriate analgesia is not being achieved. Furthermore, they recognised the possibility that higher doses of full mu agonists may be required in order to overcome the binding affinity of buprenorphine. Lastly, the panel felt it important to recognise that full mu agonists be implemented only after multimodal analgesia and regional anaesthesia techniques (Section 3) have been implemented extensively.

Where OUD is part of the underlying patient diagnosis, clinicians should take extra care in re-introducing full agonists that may have previously been part of opioid misuse episodes. Clinicians should seek to engage patients in the delivery of their analgesic care during this high-risk period.

Section 5. discharge planning

Level 5 evidence (case series, studies with no controls)

Recommendation:

1) It is almost always appropriate to discharge the patient on at least some dose of buprenorphine.
2) If warranted, it is almost always appropriate to discharge the patient on a full mu agonist and with appropriate outpatient monitoring.

Rationale for recommendation: a systematic review of existing literature demonstrated that very few studies make note of discharge planning. Furthermore, existing advisories (Table 1) recommend that the outpatient provider be responsible for re-initiating buprenorphine therapy post-discharge.

We recommend discharging patients on at least some dose of buprenorphine. This recommendation is on the basis of maintaining stability of prior PD/OUD therapy. Being discharged without buprenorphine raises the likelihood of increased cravings and withdrawal in the post-discharge period for patients with OUD. Furthermore, cessation of buprenorphine raises the risk of acute unmanaged pain for the patient with a PD.

Discharging a patient on a full mu agonist alone risks exacerbating the underlying disorder by re-exposing the patient to a culprit medication. If warranted, discharging a patient on a full mu agonist should be conducted with appropriate outpatient monitoring as determined by the primary care physician in order to minimise misuse and diversion. In this setting, appropriate transitional pain monitoring and analgesia can be provided to maximise monitoring and minimise opioid misuse.[42]

This recommendation seeks to ensure stability of OUD/PD management by avoiding triggers for unmonitored reuse of culprit medications. The patient representative was in agreement with this recommendation.

Section 6. outpatient provider involvement

Level 5 evidence: case reports only

Recommendation:

1) The patient's outpatient buprenorphine provider should be engaged before surgery and as soon as is feasible after discharge.
2) Perioperative physicians should engage the patient early to outline strategies, manage expectations about their perioperative course, and explain the importance of treatment retention.

Evidence/rationale for recommendation: existing practice advisories and guidelines make reference to involving the outpatient buprenorphine provider. The panel agreed that this is important. Early engagement of the outpatient provider may also ensure longer and more effective treatment retention and avoidance of relapse by ensuring more appropriate follow-up. Existing studies do not seek to prove that outpatient engagement allows for more appropriate treatment retention and analgesic control in the perioperative period.

Figure 3 details a proposed management scheme that summarises the modified Delphi process outlined above.

Review and quality assurance

We used a two-step process in order to develop and refine an agreed upon clinical practice advisory for the perioperative management of patients maintained on buprenorphine. Initially, a draft practice advisory underwent independent review by members external to the steering committee. Specific comments were addressed in the various sections entitled 'rationale for recommendation'.

A questionnaire was subsequently e-mailed out to panellists after the second round to solicit suggestions for improvement in future iterations.

The clinical practice advisory document should reflect the needs of patients who have co-occurring disorders where possible, therefore facilitating its use in as many perioperative scenarios as possible. The final consensus practice advisories will be submitted to a perioperative journal and championed by individual panellists at their home institutions.

To test the acceptability of the proposed practice advisory because of varying geography and practice patterns, we will seek annual comments and suggestions from regional and national users. This should be reviewed annually in order to reflect shifting evidence and expert opinion.

Limitations and future direction

Increasingly, providers are beginning to see off-label prescription of SL buprenorphine for patients with PDs. Furthermore, there are several new formulations of buprenorphine emerging such as extended-release formulations. As evidence emerges and new formulations of buprenorphine are developed, these clinical practice advisories will require updating in the future, likely on an annual basis.

Further studies are required to assess appropriate perioperative management strategies for these patients, and more evidence regarding long-term treatment retention outcomes is required in order to better guide the perioperative physician. While ongoing clinical trials may hope to study pain control in this patient population, the panel agrees unanimously that long-term treatment retention, morbidity, and mortality are of particular importance when making a decision to stop or continue buprenorphine during the perioperative period.

Authors' contributions

Conceived and designed the Delphi methodology and protocol underlying the clinical practice advisory development process: AG, JW.
Writing paper: AG, SA, HC, BS, MD, KVC, CW, AS, NE, DM, HI, PM, KK, MS, SR, DF, MSW.
Data collection and summarisation: BS, MD.
Writing protocol: KL, SD, TDR, PP, JH, HC.
Patient representative on the expert consensus: MSW.
Expert panel: KVC, CW, AS, NE, DM, HI, PM, KK, MS, SR, DF.
Assisted in the review, editing, and writing of the clinical practice advisory manuscript: WL, HS.

Funding

HS is supported in part by the Canadian Anaesthesia Research Foundation grant as a 'Career Investigator Award'. HC and KL are supported in part by the Ontario Ministry of Health and Long Term Care and by Merit Awards by the Department of Anaesthesia, University of Toronto. AG is supported in part by the University of Toronto Department of Anesthesia Fellows' and Residents' Tuition Award.

Declaration of interest

The authors declare that they have no conflicts of interest.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.bja.2019.03.044.

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Handling editor: L. Colvin