

Therapeutics Initiative

Better prescribing. Better health.

Pharmacological management of dental pain and inflammation

Vignette: You are about to extract non-impacted third molars from a healthy 22-year-old in your dental office. Anticipating moderate postoperative pain, you consider analgesic options. The patient requests "something strong" and mentions that a friend was prescribed "Percocets" after a similar procedure. **What will you recommend or prescribe for this patient, and how much?**

Summary and conclusions:

- Non-steroidal anti-inflammatory drugs (NSAIDs) with or without acetaminophen provide similar or better pain control than opioids for post-procedure dental pain.
- Patients receiving opioids report more adverse events than people taking NSAIDs and/or acetaminophen.
- Dental prescriptions for opioids may increase the risk of opioid use disorder (OUD).
- To reduce long-term harms, prescribe opioids only when there are absolute contraindications to other analgesics. If you do, prescribe the lowest effective dose for the shortest clinically reasonable duration.

Introduction

Opioid toxicity deaths are a significant public health problem, particularly in British Columbia (BC),^{1,2} reflecting a broader North American crisis in which medical overprescribing of opioids was a dominant contributor to fatal accidental overdoses from 1995 to 2015.^{3,4}

While fentanyl and other illegal synthetic drugs now drive the overdose epidemic, prescription opioids alone are identified in about 2% of fatal overdoses in BC.⁵ Further, from a cohort of 13,318 British Columbians who experienced 19,125 opioid overdoses during 2014 through 2016, 46% had been dispensed at least one prescribed opioid in the year before their first opioid overdose.⁶ Opioids are prescribed in up to 50% of dental procedures.^{7,8} From 2019 to 2023 in BC, approximately 425,000 opioid naïve patients received



an opioid from a dental prescriber, corresponding to an incidence of around 12 per 10,000 persons per year over this period.⁹ Most opioid prescribing was by family dentists — primarily codeine (with acetaminophen), followed by tramadol.⁹

Randomized controlled trials (RCTs) have demonstrated that opioids are less efficacious than alternative analgesics for post-procedure dental pain. Opioids are potentially more dangerous during acute use and can lead to pharmacological dependence and opioid use disorder (OUD). This *Therapeutics Letter* summarizes evidence about safe and effective management of post-procedure pain for dental outpatients.

Analgesic options for dental pain

Postoperative dental pain results from inflammation and peripheral sensitization of the injured tissue. Dental patients may also experience pain that is abnormally intense (hyperalgesia) or induced by normally nonpainful stimuli (allodynia).¹⁰ Three common analgesic options used alone or in combination after dental procedures are:

- nonsteroidal anti-inflammatory drugs (NSAIDs), which inhibit cyclooxygenase (COX) enzymes and reduce production of prostaglandins, thereby reducing inflammation;¹¹
- acetaminophen, which may provide analgesia via inhibition of the COX enzymes in the central nervous system (CNS);¹²
- opioids that stimulate mu-opioid receptors in the CNS.¹³

Individualized prescribing approaches should be considered, particularly for patients with complex medical conditions, or known contraindications to certain analgesics. Factors such as age, renal and hepatic function, cardiovascular history, and substance use history should be considered when selecting an appropriate analgesic regimen for pain management following dental procedures.



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Opioids are overprescribed for pain after dental procedures

Overprescribing of opioids by dentists in the United States (US) was documented in the period 2011-2015, when one quarter of prescriptions for post-procedural indications exceeded the recommended dose, and half exceeded the recommended duration.¹⁴ A 2014 study assessing prescribing habits of Canadian oral and maxillofacial surgeons found that 93% of respondents prescribed an opioid for patients after removal of impacted third molars.¹⁵ The American Dental Association (ADA) has recommended that nonopioid medications be first line for dental pain. Its most recent guidelines specify that opioids should be reserved for when nonopioids are insufficient or contraindicated.^{16a,b}

A comparison of jurisdictions shows that less frequent opioid prescribing is possible. In 2016, dentists in the US averaged 58 opioid prescriptions per year, a rate of 35 per 1,000 of population. This was 70-fold higher than the 0.5 opioid prescriptions per 1,000 population in England, where dentists' annual average was just over 1 such prescription.¹⁷ While dental opioid prescribing in the US is likely declining, it is still higher than appropriate.^{18,19}

Prescribing patterns vary by patient, dentist, and other factors

Whether a patient receives an opioid after a dental procedure depends on several variables. Multiple and more invasive procedures predict an increased likelihood of opioid prescription, as do dental specialty type, patient age of 15-24 years, receipt of a prescription for another analgesic or an antibiotic, treatment in a non-teaching clinic, or treatment on a Friday.^{18,19} In Nova Scotia, a 7-year retrospective observational study (2011/12 through 2017/18) of children and adolescents found that urban-based dentists consistently wrote more opioid prescriptions than dentists working in rural areas.²⁰

New treatment guidelines have had variable impacts. For example, although a 2015 Ontario dental guideline did not immediately reduce opioid prescriptions, it was associated with a 28% decrease in the total volume of opioids dispensed.^{21,22}

NSAIDs work best for post-procedure dental pain; opioids are no better

We found no systematic review of clinically meaningful pain reduction, defined in dental and other research as at least a 50% reduction in a patient's self-reported pain.^{23,24}

A recent large network meta-analysis assessed the effects of analgesics after simple and surgical tooth extraction, based mostly on single-dose RCTs conducted in the United States.²⁵ From 56 RCTs (N=9,095 participants), the investigators identified "moderate-certainty evidence" that ibuprofen 400 mg alone, or ibuprofen 200-400 mg plus acetaminophen 500-1,000 mg reduced pain by a mean of 1.3-1.7 points on a scale of 0-4 at 6 hours compared with placebo. Oxycodone 5 mg, codeine 60 mg, and tramadol 37.5 mg/acetaminophen 325 mg **were no better than placebo for pain relief.** Oxycodone 10 mg/acetaminophen 650 mg appeared to be 19% better than placebo. But the confidence interval of 0.85-1.54 suggests that oxycodone's apparent benefit may be due to chance alone.

Another systematic review and meta-analysis of 13 studies (12 double-blind RCTs) assessed mainly single dose oxycodone (2.5, 5, or 10 mg with or without NSAIDs or acetaminophen) for postoperative dental pain. **At any dose or in any combination, oxycodone was less efficacious than NSAID monotherapy,** although it was better than placebo.²⁶ A US telephone survey of 329 patients who underwent routine or surgical dental extractions found no difference in satisfaction rates between people who received opioids and those who did not.²⁷

Four RCTs compared the combination of ibuprofen (250-400 mg/dose) plus acetaminophen (500-1,000 mg/dose) with ibuprofen alone, for up to 48 hours after dental surgery.²⁸⁻³⁰ The combination was well tolerated, and adding acetaminophen provided better analgesia than ibuprofen alone.

NSAIDs and acetaminophen are better tolerated than opioids

The short duration of dental RCTs, which often use single doses of analgesics, limits knowledge about drug tolerability after dental procedures. However, meta-analyses and systematic reviews conclude that opioids cause more nausea, vomiting, and dizziness than placebo, acetaminophen, NSAIDs, or combination acetaminophen/NSAIDs.^{25,26,31} Oxycodone adverse effects are dose-dependent.²⁶

While opioids more often cause adverse events, NSAIDs and acetaminophen also cause harms.^{32,33} NSAIDs risk gastrointestinal toxicity, renal impairment, cardiovascular injury during long-term use, and increased bleeding from interference with platelet function.³² Acetaminophen risks serious liver injury at high doses, and does not reduce inflammation.^{33,34}

Recurrent use and misuse are unique to opioids

Opioid use disorder (OUD) refers to the chronic use of opioids that causes clinically significant distress or impairment.³⁵ Short-term analgesic trials in dental or other acute pain cannot provide information about the risk that short prescriptions may progress to the long-term and often intractable outcome of OUD. However, observational data from BC show that among opioid-naïve people who were later diagnosed with OUD, 32% had been previously prescribed opioid analgesics for non-cancer pain.³⁶ This study did not identify the proportion of such prescriptions from dentists.

In BC from 2019 to 2023, codeine (e.g., as Tylenol #2 or Tylenol #3) was by far the opioid most prescribed by dentists, followed by tramadol. The mean duration of an opioid prescription was 3.5 days in 2023, a slight decline from 3.7 days in 2019.⁹

While a brief prescription for a low-potency opioid may seem innocuous, there is evidence that a young person's first exposure to opioids prescribed by a dentist can lead to subsequent misuse.³⁷

A matched-control study in the United States of opioid-naïve adolescents and young adults aged 16 to 25 years compared outcomes after third molar extraction between 14,888 patients who received an opioid prescription from a dental professional and those who did not. Amongst those who were prescribed opioids, 6.9% of those received another opioid prescription 3-12 months later, versus 0.1% in the matched control group. **Diagnoses of opioid misuse/abuse were made within 1 year in 5.3% of the young adults who received opioids after third molar extraction, but in only 0.4% of matched controls.**³⁷

In Ontario, 1 in 23 people newly dispensed an opioid prescribed by a dentist went on to have persistent use, defined as a second opioid prescription dispensed within 3 months, and a third prescription (or more) between 3-12 months after the first.³⁸ Receiving >90 mg of morphine equivalents in the initial prescription — versus 20 mg or less — was associated with a 20% higher likelihood of persistent opioid use.³⁸ Longer prescription duration and use of controlled-release opioid formulations were also associated with increased risk of ongoing opioid use.³⁸

Prescribe opioids rarely, at low dose for short duration

Based on the evidence from RCTs reviewed above and guidance from the Ontario Drug Policy Research Network,²² optimum prescribing after painful dental procedures includes (with adjustment for age and body weight in children):

- Ibuprofen 200-400 mg by mouth every 6-8 hours
- Plus acetaminophen 500-1,000mg by mouth 3-4 times/day

The British Columbia College of Oral Health Professionals, the Canadian Association of Hospital Dentists, and Choosing Wisely Canada offer consistent guidance against prescribing opioids for postoperative dental pain until an optimized dose of NSAIDs/acetaminophen has been used.

Codeine, tramadol, and oxycodone are the opioids most prescribed by BC dentists. Codeine is converted to the active analgesic morphine by the

intestinal and liver enzyme cytochrome CYP2D6, and genetic polymorphisms of metabolism render its potency unpredictable and a potentially lethal risk to young children.³⁹ Morphine metabolism is more predictable but requires a duplicate prescription.⁴⁰ Tramadol has all the disadvantages of other opioids and some unique risks and drug interactions, but offers no advantage.⁴¹ Oxycodone had a unique role in the opioid overdose epidemic and has no advantage over morphine. Since it is usually not more effective than NSAIDs or acetaminophen, a simple rule is to not prescribe oxycodone.

Where NSAIDs and acetaminophen are ineffective or contraindicated, opioids can be considered for pain management. If you prescribe an opioid, use the lowest effective dose for no more than a few days in the immediate postoperative period.⁴²⁻⁴⁴

Consultation before a procedure with a patient's primary care clinician is advisable for people who already take long-term opioid therapy for chronic or cancer pain, palliative care, or who take an opioid agonist for OUD (e.g., methadone, buprenorphine/naloxone).

Vignette resolution: *Given the evidence of efficacy and safety, you recommend a combination of ibuprofen 400 mg and acetaminophen 1,000 mg up to 4 times per day for 3 days. You reassure your patient that he can expect good pain control, and that this approach is safer than prescribing an opioid. You invite the patient to call your office if pain is not well controlled, or for any other complication.*

Data availability statement

The British Columbia (BC) Ministry of Health approved access to and use of BC data from the Healthideas data warehouse (Information Sharing Agreement 16-036). Access to data provided by the Data Stewards is subject to approval but summary data can be requested for research projects through the Data Stewards. The following data sets were used in this study: *PharmaNet, Medical Services Plan, Client Roster*. Health records for federally insured residents and those receiving benefits through the First Nations Health Benefit Plan were not included in this data access. All inferences, opinions, and conclusions drawn in this manuscript are those of the authors, and do not reflect the opinions or policies of the Data Stewards.



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