

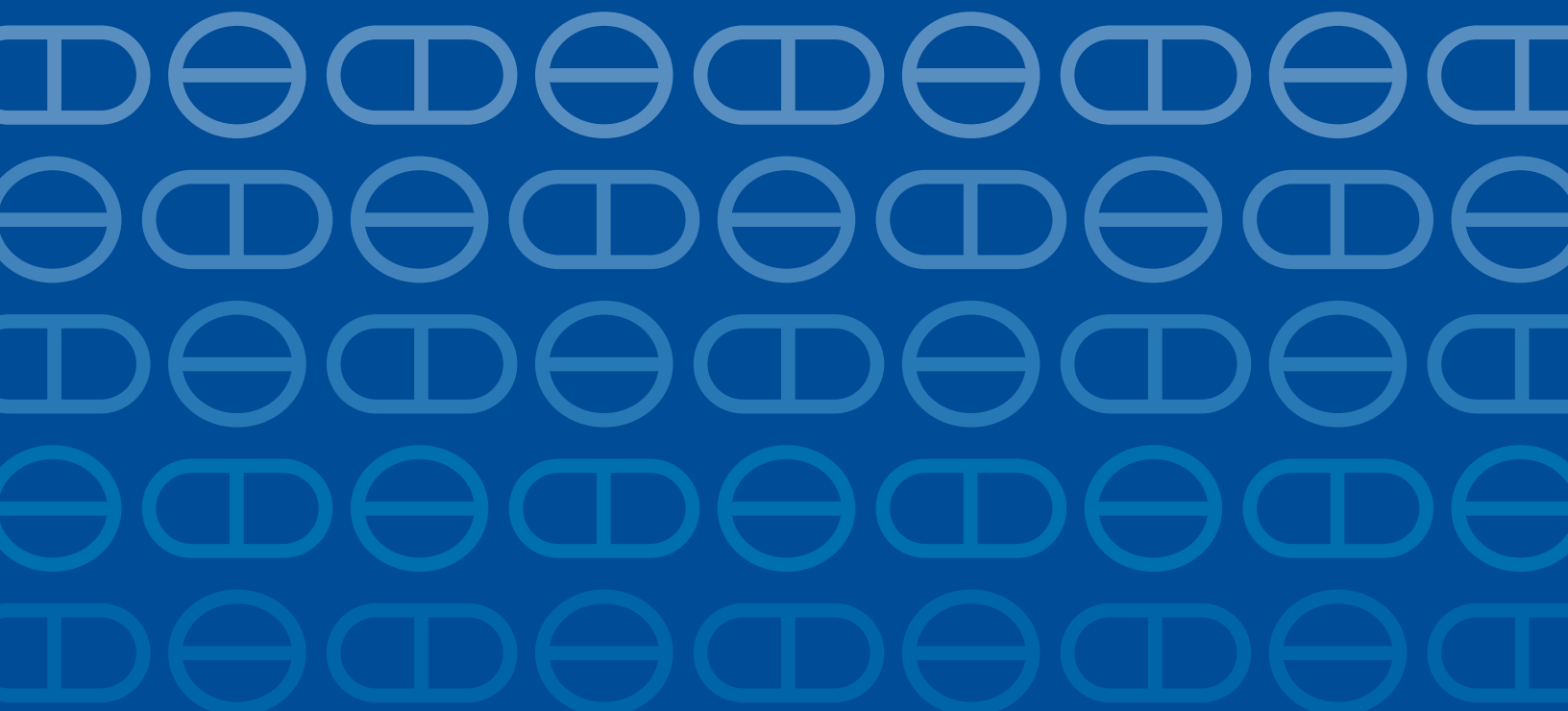


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Reducing pain and prescribing safely in dentistry



Reducing pain and prescribing safely in dentistry

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Alosa Health

Reducing pain and prescribing safely in dentistry

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1. Dentists (ADA)
2. Other

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Statement of Need

The goal of the educational program is to educate dentists and dental hygienists on effective treatment of acute dental pain, the use of evidence-based treatment options for the management of acute dental pain, and to encourage the implementation of risk mitigation strategies for opioid prescribing.

The educational program has several components, which include:

- Written evidence report (print monograph)
- Summary document of top 4-5 key messages
- “Academic detailing” educational sessions in clinicians’ offices with trained outreach educators (pharmacists, nurses, physicians) who present the material interactively
- Reference cards for easy access to key materials
- Patient education information (brochure/tear-off sheets)

This program works to synthesize the current clinical information on this topic into accessible, non-commercial, evidence-based educational material, which is taught interactively to providers by specially trained clinical educators.

As caregivers and prescribers of medications, dentists must understand the evidence base behind the efficacy of nonopioid medications like ibuprofen and acetaminophen to manage pain after dental procedures. Dentists should implement risk mitigation strategies in the rare instances when opioids are needed for severe pain, such as recommending naloxone, checking the prescription drug monitoring program, and discussing safe storage and disposal of leftover opioids.

Learning Objectives:

Upon completing this activity, participants will be able to:

- Discuss the epidemiology of opioid prescribing in the United States and trends related to dental prescribing.
- Summarize evidence-based recommendations for the management of acute dental pain.
- Recognize strategies to mitigate risks associated with opioid prescribing.

Financial Support

There is no commercial support associated with this educational activity.

Target Audience

The educational program is designed for dentists and dental hygienists.

Credit Information

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Introduction

Dentists both prevent and treat the acute pain caused by dental disease; however, dental procedures themselves may also cause pain. As deaths and health harms related to opioid use have increased, peaking (thus far) at 107,000 overdose deaths in the U.S. in 2021,¹ acknowledgment of the role of prescription opioids in the origin and perpetuation of opioid use disorders has grown. Dentists are responsible for a large share of opioid prescriptions in the U.S.; in 2012, the 195,000 practicing dentists wrote 6.4% of all opioid prescriptions nationwide.² In 2019, dentists wrote more opioid prescriptions for patients under age 21 than any other type of prescriber, comprising 61% of all opioids prescriptions for this age group.³

These high rates of dental opioid prescribing in the U.S. exceed rates observed elsewhere, suggesting that practice patterns, rather than clinical necessity, may be driving prescribing behavior. In the U.S. in 2016, 22.3% of all prescriptions written by dentists were for opioids, compared to 0.6% of those written by dentists in the United Kingdom (difference 21.7%; 95% CI: 13.8%-32.1%).⁴ Prescribing patterns also vary geographically within the U.S., with dentists in the Northeast, including the mid-Atlantic region, less likely to prescribe high volumes of opioids (at or more than the 95th percentile of opioid prescriptions), and those in the South more likely to prescribe high volumes of opioids.⁵ Dentists practicing in rural areas were more likely to report that opioid misuse and diversion were a problem for patients in their practice ($p < 0.001$), and more likely to prescribe non-opioid analgesics than urban dentists within a practice-based research network ($p = 0.03$).⁶ Oral surgeons are more likely to prescribe opioids than other dentists; dentists who work in group practices are more likely to prescribe opioids than those who work in solo practice; and male dentists are more likely to prescribe opioids than female dentists.⁵ In one national survey of dentists, 69% reported that patients had misused or diverted opioids that they had prescribed.⁷

High rates of dental opioid prescriptions can increase the risk of overdose and death, and not just for patients prescribed opioids. A study of more than 5.5 million patients with private dental insurance or Medicaid from 2011 through 2018 found that being prescribed an opioid after a dental procedure resulted in a higher risk of opioid overdose within 90 days when adjusting for other covariates (average marginal effect 1.5; 95% CI: 1.2-1.8), and that family members were also more likely to have an opioid overdose (average marginal effect 0.4; 95% CI: 0.1-0.7).⁸

Children and young adults may be placed at especially high risk of negative consequences from a dental opioid prescription. Among opioid-naïve privately insured 16- to 25-year-olds, 30.6% of all first opioid prescriptions were from a dentist; 6.9% of those who received an opioid prescription received another prescription in the next year, compared to only 0.1% of those who had not been prescribed a dental opioid (adjusted absolute risk difference 6.8%; 95% CI: 6.3%-7.2%).⁹ In addition, 5.3% of those who had been prescribed a dental opioid had a subsequent medical encounter with an opioid use-related diagnostic code, compared to 0.4% of those who had not (adjusted absolute risk difference 5.3%; 95% CI: 5.0%-5.7%). This is especially concerning because dentists are the largest single source of opioid prescriptions for youth and young adults.¹⁰

These studies highlight how the dental setting is a common and potentially dangerous source of opioids for many patients. In addition, patients may receive opioids for dental pain from other clinicians outside of dental offices, often because they lack access to affordable dental care. Patients presenting to the emergency department (ED), urgent care, or primary care setting with dental pain because they did not have access to dental care were 2.5 to five times more likely to be prescribed an opioid by a non-dentist

provider such as a physician, nurse practitioner, or physician assistant.¹¹ A study of Washington state Medicaid beneficiaries found that persistent or high-risk opioid use was highest among patients prescribed an opioid in the ED for neck, back, or dental pain.¹² Among privately insured patients, 58% of those with an ED visit for dental pain were prescribed an opioid.¹³ In the nationally-representative 2018 National Hospital Ambulatory Medical Care Survey, 36.6% of patients received an opioid prescription after an ED visit for a dental problem.¹⁴ Reassuringly, this number has declined over time, from 59% in 2010.¹⁵

Dentistry's efforts to improve patient safety in analgesia

Acknowledging the prevalence of opioid prescriptions for dental problems and their relationship with potentially dangerous long-term opioid use, many dental organizations have participated in advocacy to reduce rates of opioid prescribing by dentists and develop evidence-based guidelines to support clinicians in delivering optimal, evidence-based pain control. The American Dental Association (ADA) has developed policy statements, robust clinical recommendations, and educational curricula for dentists regarding opioid prescribing,¹⁶ as have several state dental societies and the Association of State and Territorial Dental Directors.¹⁷⁻¹⁹ In 2018, the ADA released their Policy on Opioid Prescribing, which advised limiting opioid prescriptions to no more than seven days.²⁰ Several governmental organizations have also released guidance for practitioners in specific settings and for the general public, including the Centers for Disease Control and Prevention (CDC),²¹ the Indian Health Service,²² and the National Maternal and Child Oral Health Resource Center.^{23,24} The CDC, in fact, advised even shorter duration opioid prescriptions for the acute management of post-operative dental pain, suggesting prescriptions be limited to three days or less, particularly in young adults under 24 years old.²¹

These efforts and national attention to the opioid crisis have contributed to reduced dental opioid prescribing. From 2012 through 2019, opioid prescriptions per 1,000 dentists decreased by 39.12 prescriptions monthly, with the rate of decline accelerating during the study period.²⁵

However, dental organizations and public health officials recognize that more work needs to be done. An analysis of dental opioid prescriptions among privately insured patients from 2011 through 2015 found that 53% of prescriptions exceeded three day length limits, and 29% exceeded the 120 oral morphine equivalents (MME) recommended by the CDC (equivalent to 10 mg of hydrocodone every six hours for three days).²⁶ A survey of 269 dentists in 2020 across the U.S. found that while 84% agreed that non-opioid analgesics were equally effective for pain control, 48% nonetheless regularly prescribed opioids.⁷ An analysis of 2019 pharmacy data found that 5% of dentists were responsible for 46.9% of all opioid prescriptions, a group that has not yet been reached by organizational efforts and practice recommendations.⁵

Best practices for dental pain control

Clinical trials have repeatedly demonstrated that non-steroidal anti-inflammatory drugs (NSAIDs), alone²⁷ or in combination with acetaminophen, offer superior or equivalent pain relief when compared to opioids, with comparable rates of complications.²⁸⁻³⁰ Because NSAIDs and acetaminophen act on different targets

in the pain pathway (peripherally and centrally, respectively), their effect on pain control can be additive. A meta-analysis of three trials enrolling 1,647 participants found superior pain relief from a combination of ibuprofen and acetaminophen when compared to either medication alone (number needed to treat [NNT] with combination medication 5.4 when compared to ibuprofen alone).³¹ For most patients, these medications offer a safe and highly effective regimen to reduce post-operative pain. First-line prescription of these medications is aligned with the recommendations of multiple federal and state agencies,^{18,21,32} as well as guidelines produced by organized dentistry and dental specialty organizations.^{19,20,33}

The mechanisms of action and specific guidance for the safe and effective use of these medications is described below.

Sample prescriptions for post-operative dental pain for a patient without serious comorbidities are as follows:

Severe post-operative pain:

- 800 mg ibuprofen TID
- 325 mg acetaminophen TID

Mild-to-moderate post-operative pain:

- 400-600 mg ibuprofen Q6H
- 325 mg acetaminophen Q6H

A study of 329 patients who underwent dental extraction found that patients who had received opioids reported higher levels of recalled pain compared to those who did not ($p < 0.001$) and no difference in levels of satisfaction with their provider.³⁴ Prescribers should also be cautious about how much post-operative pain is anticipated and defer opioids if at all possible for lower-pain procedures. In an analysis of Pennsylvania Medicaid claims from 2012 through 2017, patients who received opioids for lower-pain procedures (e.g., restorative procedure codes) were more likely to have sustained opioid use compared to those who received an opioid prescription after higher-pain procedures (e.g., oral surgery procedure codes) (25% versus 13.5%).³⁵ This is also consistent with a retrospective cohort study of more than 33,000 individuals, which found that rates of sustained opioid use were comparable between patients undergoing minor (i.e., less painful) and major (i.e., more painful) surgical procedures.³⁶

Non-steroidal anti-inflammatory medications

NSAIDs act peripherally on the cyclooxygenase (COX) pathway to reduce prostaglandin production and directly mitigate inflammation and associated pain.^{37,38} The most commonly available NSAIDs in the U.S. are aspirin, ibuprofen and naproxen sodium; additional formulations include diclofenac, etodolac, and ketorolac. Aspirin binds irreversibly to inhibit the COX enzyme, while other NSAIDs bind reversibly. While ibuprofen is commonly used and highly effective, studies below have also demonstrated the efficacy of other NSAIDs for dental pain, including naproxen and ketorolac.³⁸

In one study, 800 mg of ibuprofen reduced pain to palpation above the tooth by 40%, pain to percussion by 25%, and pain from cold by 25% among patients presenting with irreversible pulpitis and symptomatic apical periodontitis who had not yet been treated.³⁹ Ibuprofen, diclofenac, and ketorolac were all found to increase the efficacy of intra-operative dental anesthesia when administered prior to the procedure in

patients with irreversible pulpitis (compared to placebo, RR 1.83; 95% CI: 1.43-2.35; RR 2.56; 95% CI: 1.46-4.50, and RR 2.07; 95% CI: 1.47-2.90, respectively).⁴⁰

NSAIDs alone may be comparable or superior to ibuprofen or acetaminophen with an opioid. In a trial of 221 patients undergoing tooth extraction, naproxen administration resulted in significantly lower pain scores at 12 hours post-operatively compared to acetaminophen with hydrocodone.⁴¹ A meta-analysis of three trials enrolling 1,202 individuals found no significant difference in pain control when comparing 400 mg ibuprofen plus 5 mg oxycodone to 400 mg ibuprofen alone.⁴² A randomized trial of a combination tablet with 200 mg ibuprofen and 500 mg acetaminophen showed that even a single tablet was more effective for pain relief after a dental procedure than acetaminophen/codeine and that two tablets were more effective than ibuprofen/codeine ($p < 0.001$ for both).⁴³ Similarly, combination therapy using ibuprofen and acetaminophen was more effective than opioid preparations.

While NSAIDs are safe and highly effective for short-term use, patients should be counseled to avoid long-term use and to limit doses to the lowest amount possible.⁴⁴ NSAIDs can cause acute kidney injury, bleeding within the gastrointestinal tract and potentiate chronic liver disease; for these reasons, caution is needed when prescribing NSAIDs to patients with a history of kidney or liver disease or gastrointestinal bleeding.⁴⁵ All patients should be counseled to monitor for reduced urine output, dark stools, and abdominal pain, and to stop NSAIDs and notify their clinician if they experience these symptoms.

When should NSAIDs be avoided?

- patients with a history of gastrointestinal bleeding
- patients with kidney disease
- patients with liver disease
- patients with a history of gastric bypass surgery
- patients with a history of NSAID-induced respiratory disease
- pregnant patients, especially in the first and third trimester

Acetaminophen

Acetaminophen also directly inhibits the COX pathway to reduce pain, but while NSAIDs act peripherally in the affected tissues, acetaminophen's effects occur directly within the central nervous system.⁴⁶

Acetaminophen carries a black box warning that doses in excess of 4,000 mg per day can cause acute liver failure, and doses lower than 3,000 mg per day are recommended for all patients.⁴⁶ Patients taking multiple drug products containing acetaminophen (e.g., Tylenol in addition to hydrocodone-acetaminophen) are at elevated risk of excess dosing, and should be counseled to carefully read medication ingredients to limit acetaminophen intake to one product. Despite this concern for hepatotoxicity, it is nonetheless safe to prescribe appropriate doses of acetaminophen even for individuals with liver disease.⁴⁷ The American College of Gastroenterology recommends doses of up to 2,000 mg per day for individuals with liver disease.⁴⁸ All individuals should be advised to avoid alcohol while taking acetaminophen regularly.

When should acetaminophen be avoided?

- patients in acute liver failure
- patients already taking medications containing acetaminophen

BOTTOM LINE: A combination of NSAID and acetaminophen provides optimal pain relief for almost all patients expected to experience pain from a dental problem or after a dental procedure. For mild-to-moderate post-operative pain, 400-600 mg ibuprofen up to four times daily with 325 mg acetaminophen four times daily should successfully control pain. For severe post-operative pain, a three to five-day supply of acetaminophen 325 or 500 mg three times daily and ibuprofen 800 mg three times daily is ideal.

Other potential analgesics

Because microbial burden is known to be associated with dental pain, some clinicians may consider prescribing an antibiotic to provide additional pain relief. However, the ADA and the American Association of Endodontists recommend against prescribing antibiotics unless a patient demonstrates swelling combined with constitutional symptoms indicative of a systemic infection, such as fever or tachycardia.^{49,50} This is also consistent with findings from two meta-analyses of randomized controlled trials that did not find a significant improvement in dental pain relief when antibiotics were prescribed in addition to definitive clinical management compared to clinical management alone.^{51,52} The most recent Cochrane Review of this topic, which included only one trial, concluded that data were insufficient to determine if pre-operative antibiotics affect subsequent post-operative pain for patients with irreversible pulpitis.⁵³ A survey-based study of dentists in the United Kingdom found that having shorter appointment times and concerns for adequate anesthesia made providers more likely to inappropriately prescribe antibiotics for adjunctive pain control.⁵⁴

Adjunctive corticosteroids have also been proposed for supplemental analgesia by reducing post-operative inflammation. A study evaluating pain among 73 patients who presented to the ED with periapical abscess found that those who received a single dose of dexamethasone had lower pain scores at 12 hours ($p=0.029$), but not at one, two, or three days.⁵⁵ This finding is especially notable as 47.6% of patients presenting to the ED with dental pain do not obtain definitive dental care after an ED visit.⁵⁶ However, a meta-analysis of 11 randomized controlled trials did not find that NSAIDs combined with corticosteroid significantly reduced pain when compared to NSAIDs alone.²⁸ Corticosteroid use is not without risk, and significant gastrointestinal, mood and physiologic changes may result with their use. Therefore, adjunctive corticosteroids are not recommended for the routine treatment of dental pain.

BOTTOM LINE: Combination therapy with NSAIDs and acetaminophen remain the best choices for managing dental pain. Antibiotics do not serve the purpose of analgesics, and their use should be limited to patients suffering from infections exhibiting systemic spread. Similarly, corticosteroids are less effective than NSAIDs, and due to their greater side effect profile, their use should be limited.

Non-pharmacologic management

Anticipatory guidance for patients and close follow-up can help manage patient expectations about pain. After a procedure for which post-operative pain is anticipated, patients should be counseled that some discomfort is to be expected, and that it should be managed adequately with NSAIDs and acetaminophen, as appropriate.⁴⁶ A trial studying a pain management program that provided such

counseling prior to tooth extraction resulted in significantly lower patient-reported opioid use (29.74 vs. 43.59 MMEs, $p=0.026$).⁵⁷

Patients should also be advised when to return to care (e.g., increasing pain several days after a tooth extraction in the case of alveolar osteitis), and how to reach a clinician in the case of an emergency. Among opioid-naïve, privately insured adults who had a dental procedure between 2013 and 2017, individuals were 1.27 times more likely to have a dental opioid prescription if their procedure was on a Friday or the day before a holiday (95% CI: 1.26-1.28).⁵⁸ Veterans with a dental procedure on a Friday were also more likely to be prescribed doses of opioids that exceeded CDC recommendations.⁵⁹ If feasible, clinicians should ensure access to an on-call dentist or phone service during non-business hours, as this may reduce rates of unnecessary pre-emptive opioid prescription.

Table 1: Patient guidance for return precautions following dental treatment

Procedure type	Patient should be advised to contact their dentist in the case of:
Oral surgery	<ul style="list-style-type: none"> worsening pain, or newly increased pain on days 3-5 post-operatively progressive swelling exudate fever or lymphadenopathy
Endodontics	<ul style="list-style-type: none"> worsening pain with occlusion progressive swelling exudate fever or lymphadenopathy
Restorative dentistry	<ul style="list-style-type: none"> pain with occlusion spontaneous pain or worsening thermal sensitivity (especially if preparation was deep or pulp exposure occurred during caries excavation)

Special considerations in endodontics

Endodontic treatment ultimately provides the most definitive and lasting pain control for patients presenting with pain in a restorable tooth. Definitive endodontic care should be delivered as quickly as possible to obviate the need for analgesia. That said, the “Best Practices” section above applies well to Endodontics. Combination therapy with NSAIDs and acetaminophen represents the best pharmacologic agents for pain of endodontic origin, both pre-operatively and post-operatively. A survey of endodontists in fact found that they were most likely to recommend NSAIDs and acetaminophen for pain control, and to prescribe opioids for durations of less than four days when necessary, in alignment with several organizations’ best practice recommendations.⁶⁰

Pre-operative pain associated with symptomatic irreversible pulpitis or pulp necrosis with acute apical abscess is expected to be of significantly greater severity than pain following endodontic interventions.^{27,61} Therefore, higher dosages of analgesics are often required prior to endodontic interventions. For example, pre-operative pain may require 600-800 mg ibuprofen along with 325-500 mg acetaminophen every six to eight hours. Conversely, lesser dosages may be indicated following endodontic treatment, with an expected downward trend in pain over the following week.⁶² Ibuprofen may be considered as a stand-alone post-operative analgesic. A systematic review of 15 published articles

found equivalent pain control six hours after root canal therapy from either 600 mg ibuprofen or 600 mg ibuprofen taken with 1000 mg acetaminophen.²⁷

Post-operative pain may be of greater intensity and longer duration in patients suffering from a flare-up, a post-operative complication defined as an acute exacerbation of periradicular pathosis following non-surgical endodontic therapy.⁶³ A flare-up is marked by increasing pain, and sometimes swelling, usually 48 to 72 hours following endodontic treatment. Its incidence is relatively low, though it may occur more commonly in patients suffering from greater amounts of pre-operative pain and following retreatments.⁶⁴⁻⁶⁶ Unless swelling is progressive warranting systemic antibiotics, flare-ups may be managed similarly to post-operative pain, though using higher dosage medications for longer duration.⁶⁶

Beyond the baseline “Best Practices” analgesia, post-operative analgesia may be enhanced by incorporation of particular intra-operative practices. These include conferring adequate pulpal anesthesia, the use of long-acting anesthesia after the procedure is complete, and, in cases where multi-visit therapy is indicated, reducing microbial load with intrapulpal medicaments when two visit therapy is performed.

In patients in whom profound pulpal anesthesia is difficult to achieve, particularly in cases of symptomatic irreversible pulpitis presenting in mandibular molars, supplemental techniques to traditional inferior alveolar nerve block are often required. Buccal infiltration with articaine and intra-osseous or intraligamentary injections have been shown to significantly enhance pulpal anesthesia to levels allowing for comfortable delivery of endodontic care.^{67,68} In a randomized controlled trial of 182 patients, buccal articaine infiltration or intra-osseous lidocaine were significantly more likely to provide definitive anesthesia after incomplete anesthesia from an inferior alveolar nerve block when compared to repeat nerve block or intraligamentary injection ($p=0.001$, success rates of 84%, 68%, 32%, and 48%, respectively).⁶⁸ Peri-operative administration of a one-time dose of NSAIDs to reduce inflammation can also increase anesthetic efficacy.^{40,69} Providing sufficient dosage of anesthetic solution is also important; administration of 3.6 mL of anesthesia in an inferior alveolar nerve block results in significantly greater rates of pulpal anesthesia than only 1.8 mL.⁷⁰ However, supplemental lingual nerve infiltration does not significantly improve the efficacy of block anesthesia.⁷¹

Though treatment of necrotic pulps with an intracanal antimicrobial agent followed by a second visit for definitive obturation was previously recommended to reduce bacterial burdens within the canal,^{72,73} outcomes related to patient pain are mixed. A 2016 Cochrane review found no difference in pain between patients receiving single-visit or multiple-visit root canal therapy, though those in the single-visit group had higher rates of adjunctive analgesic usage.⁷⁴ Subsequently published studies have found a significant reduction in pain among patients with only a single-visit;^{75,76} however, these results are also mixed, with one 400 participant randomized controlled trial finding that multiple visit procedures reduced pain significantly.⁷⁷ Clinicians should consider shared decision-making with patients when determining whether a single-visit or multiple-visit protocol for endodontic treatment is more appropriate.

Microbial load within the canal orifice is a significant contributor to endodontic pain; therefore, efforts should be made to maximize disinfection. In multi-visit endodontic therapy, intracanal calcium hydroxide is associated with reduced post-operative pain at 24 hours. Calcium hydroxide combined with lidocaine or dexamethasone was associated with even more robust pain relief.⁷⁸ A scoping review including ten studies found that soluble vehicles for calcium hydroxide, specifically chlorhexidine or lidocaine, augmented the pain-relieving effects of the calcium hydroxide.⁷⁹

Antimicrobial efforts must, however, balance risk. The use of higher concentration sodium hypochlorite solutions is associated with higher post-operative pain up to seven days later when compared to lower

concentrations, likely due to incident damage of adjacent tissue from caustic levels of hypochlorite exposure.⁸⁰ Therefore, especially when higher concentrations of sodium hypochlorite solutions are utilized, care must be taken to minimize any extrusion of the medicament into extraradicular spaces.

Post-procedural administration of a long-acting anesthetic such as bupivacaine can also contribute to improved pain management in the immediate post-operative period, with one randomized controlled trial finding lower reported pain and lower rates of adjunctive medication among patients who received bupivacaine after root canal therapy compared to lidocaine,⁸¹ and another finding lower reported pain levels at six and 12 hours post-operatively ($p < 0.05$).⁸¹ Practitioners can also consider reducing occlusion for teeth likely to require full-coverage restoration in order to reduce percussion sensitivity as the periodontal tissues heal.⁸²

BOTTOM LINE: Definitive endodontic therapy is the best means to control pain of pulpal origin. Both pre-operative and post-operative pain can be managed by combination therapy with ibuprofen and acetaminophen. Conferring adequate pulpal anesthesia during root canal therapy and the use of long-acting anesthesia can greatly improve post-operative pain from endodontic procedures. The choice to perform treatment in a single visit versus multiple visits is not expected to affect pain; however, intracanal medicaments, particularly calcium hydroxide, are advised to reduce the microbial load and therefore pain with multi-visit treatment.

Special considerations in oral surgery

Oral surgeons are more likely to be high-volume prescribers of dental opioids (i.e., within the top 5% of all dental opioid prescribers) than any other dental specialty.⁵ In a study of a large dental clinic embedded within a health system, oral surgeons were 9.11 times more likely to prescribe an opioid post-operatively compared to their general dentist colleagues for a tooth extraction.⁸³ Among all dentists, tooth extraction accounted for 65.2% of dental opioid prescriptions.⁸⁴ The American Association of Oral and Maxillofacial Surgery released guidelines in 2017 that recommended NSAIDs as the first-line agent for post-operative pain, and advised that opioid prescription duration should be as short as possible, in doses as low as possible.³³

In addition to providing procedural anesthesia, local anesthetic injection can also substantially reduce post-operative pain. In one study of 26 patients undergoing removal of impacted third molars, bupivacaine resulted in lower pain ratings on a visual analog scale even 48 hours after extraction ($p = 0.03$).⁸⁵ Liposomal bupivacaine, which is especially long-lasting, was associated with a 59% lower rate of post-operative opioid prescriptions than alternative anesthetic agents in a retrospective analysis of 600 patients undergoing third molar extraction ($p < 0.001$).⁸⁶ Clinicians may consider administering long-acting local anesthetic post-procedurally (i.e., bupivacaine injection after flap closure) as part of their acute pain management plan.

A meta-analysis of 18 articles regarding flap design found no significant difference in post-operative pain rates or complication rates.⁸⁷ Surgeons should elect a flap design that optimizes visualization and according to their personal preference.

Young people are the predominant group to undergo third molar extraction, and post-operative opioids after third molar extraction is more likely to represent an initial opioid exposure for this group. Among

patients aged 13 to 30 who underwent wisdom tooth extraction, 13 per 1,000 who received an opioid prescription (95% CI: 9-19) had persistent opioid use, defined as more than one opioid prescription 4 days to one year after third molar extraction, compared to 5 per 1,000 among those who did not fill a post-operative opioid prescription.⁸⁸ However, an analysis of 81 young adults who had all four asymptomatic third molars removed found that 75% did not use any opioids after the procedure (mean number of oxycodone 5 mg tabs or equivalent consumed 0.04 ± 0.24).⁸⁹ That said, considering social context in addition to individual risk factors might be prudent when prescribing for this population. One study of 346,251 of adolescents and young adults who underwent a surgical procedure found that patients with family members prescribed long-term opioids had an adjusted odds ratio of 1.54 of having long-term opioid use after the procedure (95% CI: 1.39-1.71).⁹⁰

Even for more intensive surgical procedures, patients may require limited or no opioids. The Division of Oral and Maxillofacial Surgery at the University of Minnesota implemented a prescribing protocol centered on non-opioid analgesics for third molar extraction and found that rates of opioid prescription were significantly decreased after doing so (mean number of opioid tablets per prescription 15.9 versus 11.5).⁹¹ In one study of young men undergoing orthognathic surgery, patients required an average of only 3.9 ± 5.5 doses of 5 mg oxycodone after hospital discharge, and 26% of patients did not use any oral opioid after leaving the hospital.⁹² Since these patients are often the same age as those undergoing third molar extraction, similar concerns about the risk of persistent opioid use apply.

BOTTOM LINE: NSAIDs remain the first-line treatment for post-operative pain in oral surgery. Opioids should be prescribed sparingly, especially for young people undergoing third molar extraction. Long-acting anesthesia such as bupivacaine can further improve pain control after an extraction without the need for opioids.

If an opioid must be prescribed

Opioids act centrally on the mu-opioid receptor to blunt the central nervous system's response to pain.⁴⁶ With the routine use of non-opioid medications, behavioral guidance, and intra-procedural treatments, opioid prescription for post-operative dental pain should be extremely rare.

Although concerns about opioid over-prescription have largely resulted from the risk of opioid use disorder and overdose, even short-term use of opioids can have numerous undesirable side effects, most commonly constipation, nausea, sedation, and dizziness.³⁸ Older adults are especially sensitive to opioids and are at risk of delirium and injury when opioids are prescribed. As a result, for older adults, opioids should be prescribed especially judiciously, in lower doses or not at all.^{93,94}

When prescribing opioids, dentists should endeavor to prescribe as few tablets as possible, in accordance with ADA guidance to limit prescriptions to less than seven days.²⁰ A single opioid prescription after a dental procedure increased the average marginal effect (change in risk) of persistent opioid use by 1.3% in privately insured patients and 2.3% in publicly insured patients.⁹⁵ When patients received a one week course of opioids (28 tablets), one study found that an average of 54% of pills were left over three weeks after their dental procedure.⁹⁶ Risk of sustained opioid use among opioid-naïve privately insured patients increased with each added day of the prescription, but most substantially after the fifth day of initial prescription and for initial prescriptions of ten days or greater.⁹⁷ To reduce potential

misuse and respiratory depression, all opioids should be immediate release formulation rather than sustained-release or long-acting formulations, and at the lowest doses anticipated to be effective.

There have been numerous tools developed for dentists to screen for risk of opioid misuse and opioid use disorder chairside, ranging from incorporation of a question on substance use disorders into standard medical history forms⁹⁸ to adoption of primary care-based screening tools within the dental setting.⁹⁹ Identifying patients at risk of substance use disorder also requires cultivating relationships with medical providers and community resources to appropriately refer patients for treatment, a barrier identified as persistent by many dentists.¹⁰⁰ Additional guidance is available in the “Special Populations” section of this document (page 12).

Prescription drug monitoring program

Dentists should also check their state’s Prescription Drug Monitoring Program (PDMP) prior to prescribing an opioid. While evaluations of the efficacy of the PDMP to reduce unsafe opioid prescription and overdose have been mixed,^{101,102} many states now mandate that clinicians check the PDMP prior to prescribing a controlled substance, and it is recommended by the ADA for all opioid prescriptions.²⁰ After New York state mandated checking the PDMP prior to prescribing an opioid, prescriptions by dentists decreased from 30.6% to 9.6% ($p < 0.05$).¹⁰³ The PDMP may be most effective in identifying patients at highest risk of unsafe opioid prescription. A study of dental opioid prescriptions in South Carolina from 2012 through 2013 found that 20.9% of patients who received an opioid prescription had a prior opioid prescribed in the past 30 days, and on 324 occasions, dentists prescribed an opioid to a patient with ten or more opioid prescriptions dispensed within the past 30 days.¹⁰⁴ Co-occurring prescription of both opioids and benzodiazepines can increase the risk of respiratory depression and death. Prescribers should also consult the PDMP to identify patients taking benzodiazepines before considering opioid prescription.

Implementation of structural changes to support safe prescribing can greatly reduce opioid prescription. For example, a single site study found that initiating pharmacy review of all dental orders resulted in five times fewer opioid prescriptions ($p < 0.001$).¹⁰⁵ The integration of a clinical decision-making tool within the electronic health record resulted in cancellation of dental opioid orders by non-dental providers for 9.5% of patients whose opioids use patterns were identified as higher risk by the tool.¹⁰⁶ At the University of Colorado, the refinement of a “favored prescriptions” list and standardized post-operative patient instructions emphasizing non-opioid analgesia resulted in a 78.6% reduction in opioid prescriptions in the dental clinic over three years.¹⁰⁷

Naloxone

Naloxone is a rapid-acting opioid antagonist that can reverse respiratory depression from opioid overdose. Naloxone to treat opioid overdose is available in an intramuscular formulation as well as an intranasal formulation (Narcan), both approved by the U.S. Food and Drug Administration (FDA).¹⁰⁸ As of 2020, 35 states had enacted legislation allowing patients to receive naloxone without a patient-specific prescription.¹⁰⁹ The CDC’s guidelines for prescription of opioids for chronic pain recommends prescribing naloxone for all patients.¹¹⁰ While dental opioid prescriptions should be in small enough quantities over short enough durations to reduce the risk of overdose, Washington state’s dental opioid prescribing guidelines also recommend prescribing naloxone to patients receiving a dental opioid prescription, or advising patients to discuss naloxone with their pharmacist.¹⁸ Discussion of naloxone access is especially

important prior to developing a pain management plan for patients with a history of opioid use disorder or who take chronic opioids.

As a best practice, naloxone should be prescribed for all patients taking chronic opioids or at risk of opioid overdose from opioid use disorder. Dentists prescribing even short-term courses of opioids should consider discussing naloxone prescription with patients through shared decision-making.

Safe storage and disposal

Lastly, patients should be instructed on how to safely dispose of unused opioid medications. A qualitative analysis of adolescents and their parents after third molar extractions found that while all 30 participants had been prescribed an opioid, none had been instructed on how to dispose of unused medication.¹¹¹ Opioids can be returned to many health care facilities and pharmacies, as well as to some fire departments and other community organizations. If return is not possible, opioids can be flushed down the toilet or placed in drug deactivation pouches containing active charcoal, which can be purchased in some pharmacies or obtained from prescribers.¹¹² One study found that adults given a charcoal disposal bag resulted in a 3.8-fold increase in disposal of unused opioids.¹¹³ The Environmental Protection Agency advises against flushing opioid medications, but research published by the FDA noted a negligible environmental impact from flushed medications.¹¹⁴

BOTTOM LINE: Opioids carry significant risk and should be prescribed thoughtfully. If opioids are the best option, prescribe the smallest dose for the shortest time, check the PDMP, recommend naloxone, and discuss safe storage and disposal.

Special populations

People prescribed chronic opioids

Similar to patients with opioid use disorder, patients prescribed opioids for chronic pain should have their dental pain primarily managed with non-opioid treatments in a manner comparable to all other patients.

Patients prescribed chronic opioids are considered opioid tolerant by the FDA if they have received more than one week of 60 MME per day.¹¹⁵ Patients who are opioid tolerant may require higher doses of opioids to receive comparable pain relief to lower doses in opioid-naïve patients. In one observational study of 70 patients undergoing non-dental surgery, those receiving opioids for chronic pain also reported higher post-operative pain levels compared to patients without a chronic pain diagnosis.¹¹⁶ If an opioid medication is necessary, dentists may need to prescribe a higher dose formulation than for other patients, which increases the risk of respiratory depression in patients on chronic opioids.¹¹⁵ In this situation, dentists are highly advised to communicate with the patient's current opioid prescriber, who may be able to temporarily increase the dose of the patient's chronic opioid, rather than necessitating a second high-risk opioid prescription.¹¹⁷

People with substance use disorders

Just as dentists should take a thorough medical history of all patients, dentists should also inquire about a history of substance use and screen for substance use disorder.¹¹⁸ A survey of 143 dentists found that respondents felt limited in their ability to appropriately refer patients who screened positive; lack of reimbursement for screening similarly limited broader adoption.¹⁰⁰ Nonetheless, successful educational interventions have demonstrated the feasibility of chairside screening for substance use disorders.^{98,119}

Patients currently receiving treatment for an opioid use disorder may take an opioid agonist, partial agonist, or antagonist. Patients taking a medication for opioid use disorder (MOUD) should still be managed primarily with non-opioid analgesia, as with any other patient. Depending on treatment modality, patients may require higher doses of opioid medication than opioid-naïve patients, either to overcome opioid antagonism or partial agonism from their MOUD, or due to the development of tolerance as described above for patients taking chronic opioids.¹²⁰ Close consultation with the patient's substance use disorder care team is advised to better understand a patient's pain management needs and develop a patient-centered approach to anticipatory pain management (e.g., deciding as a team to increase the dose of a patient's MOUD rather than prescribing adjunctive opioids). Patients taking buprenorphine or methadone should nonetheless be advised to continue their MOUD even if additional opioids are prescribed for pain management.^{120–122} One study of an oral surgery clinic at a tertiary medical center found no significant difference in post-operative opioid prescription among patients with and without a history of substance use disorder ($p=0.50$); however, this study did not specify whether patients had opioid use disorder or another use disorder.¹²³

Patients taking MOUD may also be required to take routine urine toxicology tests that reveal the presence of medications other than those prescribed for MOUD. For this reason, providers are advised to communicate in advance with the providers delivering substance use care to patients (e.g., methadone clinics or primary care providers) if additional opioid prescription is anticipated.¹²⁴

The ADA publishes a Practical Guide to Substance Use Disorders and Safe Prescribing that addresses these issues in detail.¹²⁵ Dentists should also communicate with patients' primary care providers to share concerns about untreated substance use disorder or to anticipate pain management in a patient on MOUD.

Pregnant people

While it is recommended to perform elective dental procedures in the second trimester when possible (rather than the first or third), pregnant people should receive definitive treatment for acute dental needs at any point during pregnancy. Definitive dental treatment including tooth extraction and/or endodontic therapy should be the mainstay of pain control for pregnant patients, just as is for non-pregnant patients. Dental anesthesia, including formulations with epinephrine, is also safe during pregnancy. These treatment recommendations have been affirmed by the American College of Obstetrics and Gynecology.¹²⁶

Acetaminophen is safe for individuals throughout pregnancy, at the same doses as for non-pregnant individuals. NSAIDs should be avoided in the first and third trimesters due to associations with miscarriage in early pregnancy and fetal renal damage and potential closure of the ductus arteriosus in late pregnancy.²³ In 2020, the FDA released a recommendation to limit NSAID dosing between weeks 20 through 30 of pregnancy to less than 48 hours and only if absolutely necessary due to concerns about fetal renal damage and subsequent oligohydramnios.¹²⁷

If necessary, opioids are safe to prescribe during pregnancy. Opioids should be prescribed at the lowest possible dose and for three days or less.²³ Liaising with a patient's obstetrician or primary care clinician for any anticipated pain management concerns may reduce the risk of persistent or unsafe opioid use.

Putting it all together

Although rates of opioid prescriptions by dentists are decreasing, dentists remain a common source of opioid prescription, especially for young adults. With appropriate patient guidance, the use of non-opioid analgesics, and intra-operative management of pain, opioids should almost never be necessary in dental practice. Dentists have access to numerous guidelines from federal, state, and professional agencies to support reduction in opioid prescription and the equivalent or superior efficacy of NSAIDs and acetaminophen for post-operative pain management.

In those rare cases when opioids are prescribed, providers should counsel patients on their appropriate use and disposal, prescribe as few pills in as low a dose as possible (optimally for three days or fewer, and no more than seven days), and check the PDMP to prevent unsafe use. Dentists should always consider liaising with a patient's clinician prior to a planned procedure to ensure safe and effective pain management.

References

1. Centers for Disease Control and Prevention. Vital Statistics Rapid Release - Provisional Drug Overdose Data [Internet]. 2022 [cited 2022 Jun 13]; Available from: <https://www.cdc.gov/nchs/nvss/vsrr/drug-overdose-data.htm>
2. ADA Health Policy Institute. Opioid Prescribing by Dentists. Chicago: 2020.
3. Chua KP, Brummett CM, Conti RM, Bohnert AS. Opioid prescribing to US children and young adults in 2019. *Pediatrics* 2021;148(3).
4. Suda KJ, Durkin MJ, Calip GS, et al. Comparison of Opioid Prescribing by Dentists in the United States and England. *JAMA network open* 2019;2(5):e194303.
5. Chua KP, Waljee JF, Gunaseelan V, Nalliah RP, Brummett CM. Distribution of Opioid Prescribing and High-Risk Prescribing Among U.S. Dentists in 2019. *American journal of preventive medicine* 2022;62(3):317–25.
6. McCauley JL, Nelson JD, Gilbert GH, et al. Prescription Drug Abuse Among Patients in Rural Dental Practices Reported by Members of the National Dental PBRN. *Journal of Rural Health* 2019;
7. Heron MJ, Nwokorie NA, O'Connor B, Brown RS, Fugh-Berman A. Survey of opioid prescribing among dentists indicates need for more effective education regarding pain management. *Journal of the American Dental Association (1939)* 2022;153(2):110–9.
8. Chua KP, Kenney BC, Waljee JF, Brummett CM, Nalliah RP. Dental Opioid Prescriptions and Overdose Risk in Patients and Their Families. *American journal of preventive medicine* 2021;61(2):165–73.
9. Schroeder AR, Dehghan M, Newman TB, Bentley JP, Park KT. Association of Opioid Prescriptions From Dental Clinicians for US Adolescents and Young Adults With Subsequent Opioid Use and Abuse. *JAMA Internal Medicine* 2019;179(2):145.
10. Volkow ND, McLellan TA, Cotto JH, Karithanom M, Weiss SRB. Characteristics of Opioid Prescriptions in 2009. *JAMA* 2011;305(13):1299–301.
11. Janakiram C, Chalmers NI, Fontelo P, et al. Gender and Race/ethnic Disparities in Opioid Prescriptions for Dental Diagnoses among Patients with Medicaid. *Journal of the American Dental Association (1939)* 2018;149(4):246.
12. Meisel ZF, Lupulescu-Mann N, Charlesworth CJ, Kim H, Sun BC. Conversion to Persistent or High-Risk Opioid Use After a New Prescription From the Emergency Department: Evidence From Washington Medicaid Beneficiaries. *Annals of emergency medicine* 2019;74(5):611–21.
13. Amen TB, Kim I, Peters G, Gutiérrez-Sacristán A, Palmer N, Simon L. Emergency department visits for dental problems among adults with private dental insurance: A national observational study. *American Journal of Emergency Medicine* 2021;44:166–70.
14. Naavaal S, Kelekar U, Shah S. Opioid and Nonopioid Analgesic Prescriptions for Dental Visits in the Emergency Department, 2015–2017 National Hospital Ambulatory Medical Care Survey. *Preventing Chronic Disease* 2021;18:200571.
15. Morris M, Thode HC, Singer AJ. Use of opioids and analgesics among ED patients with dental and low back pain: A national perspective. *The American Journal of Emergency Medicine* 2018;
16. ADA Statement on the Use of Opioids in the Treatment of Dental Pain. Chicago, IL: 2016.
17. Commonwealth of Pennsylvania, Pennsylvania Dental Association. Prescribing Guidelines for Opioids in the Dental Practice. Harrisburg: 2019.
18. The Dr. Robert Bree Collaborative, Washington State Agency Medical Directors' Group. Dental Guideline on Prescribing Opioids for Acute Pain Management. 2017.
19. Policy Statement: Reducing Opioid Prescribing by Oral Health Professionals Association of State and Territorial Dental Directors.
20. Policy on Opioid Prescribing. Chicago, IL: 2018.
21. Dental Pain [Internet]. Centers for Disease Control and Prevention. 2022 [cited 2022 Jun 7]; Available from: <https://www.cdc.gov/acute-pain/dental-pain/index.html#ftn4>
22. Indian Health Service Division of Oral Health, Indian Health Service National Committee on Heroin O and PE. Recommendations for Management of Acute Dental Pain.
23. Barzel R, Holt K, Kolo S. Prescribing Opioids for Women of Reproductive Age: Information for Dentists. Washington, DC: 2018.

24. Barzel R, Holt K. Opioids and Children and Adolescents: Information for Oral Health Professionals. Washington, DC: 2019.
25. Yan CH, Lee TA, Sharp LK, et al. Trends in Opioid Prescribing by General Dentists and Dental Specialists in the U.S., 2012-2019. *American journal of preventive medicine* 2022;
26. Suda KJ, Zhou J, Rowan SA, et al. Overprescribing of Opioids to Adults by Dentists in the U.S., 2011-2015. *American journal of preventive medicine* 2020;58(4):473–86.
27. Smith EA, Marshall JG, Selph SS, Barker DR, Sedgley CM. Nonsteroidal Anti-inflammatory Drugs for Managing Postoperative Endodontic Pain in Patients Who Present with Preoperative Pain: A Systematic Review and Meta-analysis. *Journal of endodontics* 2017;43(1):7–15.
28. Zanjir M, Sgro A, Lighvan NL, et al. Efficacy and Safety of Postoperative Medications in Reducing Pain after Nonsurgical Endodontic Treatment: A Systematic Review and Network Meta-analysis. *Journal of endodontics* 2020;46(10):1387-1402.e4.
29. Moore PA, Hersh E V. Combining ibuprofen and acetaminophen for acute pain management after third-molar extractions: translating clinical research to dental practice. *Journal of the American Dental Association (1939)* 2013;144(8):898–908.
30. Moore PA, Ziegler KM, Lipman RD, Aminoshariae A, Carrasco-Labra A, Mariotti A. Benefits and harms associated with analgesic medications used in the management of acute dental pain: An overview of systematic reviews. *Journal of the American Dental Association (1939)* 2018;149(4):256-265.e3.
31. Derry CJ, Derry S, Moore RA. Single dose oral ibuprofen plus paracetamol (acetaminophen) for acute postoperative pain. *The Cochrane database of systematic reviews* 2013;2013(6).
32. Pennsylvania Dental Association. Pennsylvania Guidelines on the use of Opioids in Dental Practice. Harrisburg: 2015.
33. The American Association of Oral and Maxillofacial Surgeons. Opioid Prescribing: Acute and Postoperative Pain Management. 2017.
34. Nalliah RP, Sloss KR, Kenney BC, et al. Association of Opioid Use With Pain and Satisfaction After Dental Extraction. *JAMA network open* 2020;3(3).
35. Khouja T, Moore PA, Yabes JG, Weyant RJ, Donohue JM. Initial opioid prescribing and subsequent opioid use after dental procedures among opioid-naïve patients in Pennsylvania Medicaid, 2012 through 2017. *The Journal of the American Dental Association* 2022;153(6):511-520.e13.
36. Brummett CM, Waljee JF, Goesling J, et al. New Persistent Opioid Use After Minor and Major Surgical Procedures in US Adults. *JAMA Surgery* 2017;152(6):e170504–e170504.
37. Khawaja SN, Scrivani SJ. Managing Acute Dental Pain: Principles for Rational Prescribing and Alternatives to Opioid Therapy. *Dental clinics of North America* 2020;64(3):525–34.
38. Hersh E V., Moore PA, Grosser T, et al. Nonsteroidal Anti-Inflammatory Drugs and Opioids in Postsurgical Dental Pain. *Journal of dental research* 2020;99(7):777–86.
39. Read JK, McClanahan SB, Khan AA, Lunos S, Bowles WR. Effect of Ibuprofen on masking endodontic diagnosis. *Journal of endodontics* 2014;40(8):1058–62.
40. Wong YJ. Does oral Nonsteroidal Anti-inflammatory Drugs (NSAIDs) premedication in patients with irreversible pulpitis increase the success rate of inferior alveolar nerve block? *Evidence-based dentistry* 2019;20(1):20–1.
41. Cooper SA, Desjardins PJ, Bertoch T, et al. Analgesic efficacy of naproxen sodium versus hydrocodone/acetaminophen in acute postsurgical dental pain: a randomized, double-blind, placebo-controlled trial. *Postgraduate medicine* 2021;
42. Derry S, Derry CJ, Moore RA. Single dose oral ibuprofen plus oxycodone for acute postoperative pain in adults. *The Cochrane database of systematic reviews* 2013;2013(6).
43. Daniels SE, Goulder MA, Aspley S, Reader S. A randomised, five-parallel-group, placebo-controlled trial comparing the efficacy and tolerability of analgesic combinations including a novel single-tablet combination of ibuprofen/paracetamol for postoperative dental pain. *Pain* 2011;152(3):632–42.
44. Aminoshariae A, Kulild JC, Donaldson M. Short-term use of nonsteroidal anti-inflammatory drugs and adverse effects: An updated systematic review. *Journal of the American Dental Association (1939)* 2016;147(2):98–110.
45. Risser A, Donovan D, Heintzman J, Page T. NSAID prescribing precautions. *American Family Physician* 2009;80(12):1371–8.

46. Oral Analgesics for Acute Dental Pain | American Dental Association [Internet]. [cited 2022 Apr 21]; Available from: <https://www.ada.org/resources/research/science-and-research-institute/oral-health-topics/oral-analgesics-for-acute-dental-pain>
47. McGill MR, James LP, McCullough SS, et al. Short-Term Safety of Repeated Acetaminophen Use in Patients With Compensated Cirrhosis. *Hepatology communications* 2022;6(2):361–73.
48. The American College of Gastroenterology. Medications and the Liver [Internet]. [cited 2022 Jun 9]; Available from: <https://gi.org/topics/medications-and-the-liver/>
49. American Association of Endodontists. AAE Guidance on the Use of Systemic Antibiotics in Endodontics | AAE Position Statement. 2017.
50. Department of Scientific Information Evidence Synthesis and Translation Research (Institution/Organization). Antibiotic Stewardship. Chicago: 2020.
51. Cope AL, Francis N, Wood F, Chestnutt IG. Systemic antibiotics for symptomatic apical periodontitis and acute apical abscess in adults. *The Cochrane database of systematic reviews* 2018;9(9).
52. Aminoshariae A, Kulild JC. Evidence-based recommendations for antibiotic usage to treat endodontic infections and pain: A systematic review of randomized controlled trials. *Journal of the American Dental Association (1939)* 2016;147(3):186–91.
53. Agnihotry A, Thompson W, Fedorowicz Z, van Zuuren EJ, Sprakel J. Antibiotic use for irreversible pulpitis. *The Cochrane database of systematic reviews* 2019;5(5).
54. Kerr I, Reed D, Brennan AM, Eaton KA. An investigation into possible factors that may impact on the potential for inappropriate prescriptions of antibiotics: a survey of general dental practitioners' approach to treating adults with acute dental pain. *British dental journal* 2021;
55. Baumann GP, Robertson W, Guinn A, et al. The Effects of Dexamethasone on the Time to Pain Resolution in Dental Periapical Abscess. *The Journal of emergency medicine* 2021;60(4):506–11.
56. Singhal A, Momany ET, Jones MP, et al. Dental care after an emergency department visit for dental problems among adults enrolled in Medicaid. *The Journal of the American Dental Association* 2016;147(2):111–9.
57. Derefinco KJ, Salgado García FI, Johnson KC, et al. A randomized pilot program to reduce opioid use following dental surgery and increase safe medication return. *Addictive behaviors* 2020;102.
58. Priest CR, Kenney BC, Brummett CM, Waljee JF, Englesbe MJ, Nalliah RP. Increased opioid prescription fills after dental procedures performed before weekends and holidays. *Journal of the American Dental Association (1939)* 2020;151(6):388-398.e1.
59. Suda KJ, Evans CT, Gibson G, et al. Opioid Prescribing by Dentists in the Veterans Health Administration. *American journal of preventive medicine* 2022;
60. Alghofaily M, Romberg E, Aldahmash S, Tordik PA. Opioid-prescribing Habits of Practitioner and Educator Members of the American Association of Endodontists: Report of a National Survey. *Journal of endodontics* 2019;45(10):1265–71.
61. Law AS, Nixdorf DR, Rabinowitz I, et al. Root canal therapy reduces multiple dimensions of pain: a national dental practice-based research network study. *Journal of endodontics* 2014;40(11):1738–45.
62. Pak JG, White SN. Pain prevalence and severity before, during, and after root canal treatment: a systematic review. *Journal of endodontics* 2011;37(4):429–38.
63. American Association of Endodontists. Glossary of Endodontic Terms. 10th ed. Chicago, IL, US: 2020.
64. Torabinejad M, Kettering JD, McGraw JC, Cummings RR, Dwyer TG, Tobias TS. Factors associated with endodontic interappointment emergencies of teeth with necrotic pulps. *Journal of endodontics* 1988;14(5):261–6.
65. Tsesis I, Faivishevsky V, Fuss Z, Zukerman O. Flare-ups after endodontic treatment: a meta-analysis of literature. *Journal of endodontics* 2008;34(10):1177–81.
66. Walton R, Fouad A. Endodontic interappointment flare-ups: a prospective study of incidence and related factors. *Journal of endodontics* 1992;18(4):172–7.
67. American Association of Endodontists. A “3D” Approach for Treating Acute Pain. *Endodontics Colleagues for Excellence* 2015;(4).
68. Kanaa MD, Whitworth JM, Meechan JG. A prospective randomized trial of different supplementary local anesthetic techniques after failure of inferior alveolar nerve block in patients with irreversible pulpitis in mandibular teeth. *Journal of endodontics* 2012;38(4):421–5.

69. Kaladi SR, Tegginmani V, M M, Mitta S, Chigadani P, Viswanadhan A. Effectiveness Of Pre-operative Oral Medication of Ibuprofen and Ketorolac on Anesthetic Efficacy of Inferior Alveolar Nerve Block with Irreversible Pulpitis: Randomized Controlled Trial. *Cureus* 2019;11(12).
70. Blicher B, Pryles R. Endodontic Pain Management: Preoperative, Perioperative, and Postoperative Strategies. *Compendium of continuing education in dentistry (Jamesburg, NJ : 1995)* 2020;41(4).
71. Dou L, Luo J, Yang D. Anaesthetic efficacy of supplemental lingual infiltration of mandibular molars after inferior alveolar nerve block plus buccal infiltration in patients with irreversible pulpitis. *International endodontic journal* 2013;46(7):660–5.
72. Bahcall J, Baker M. Pain Management in Endodontic Treatment - *Decisions in Dentistry*. *Decisions in Dentistry* 2017;
73. Vera J, Siqueira JF, Ricucci D, et al. One- versus two-visit endodontic treatment of teeth with apical periodontitis: a histobacteriologic study. *Journal of endodontics* 2012;38(8):1040–52.
74. Manfredi M, Figini L, Gagliani M, Lodi G. Single versus multiple visits for endodontic treatment of permanent teeth. *The Cochrane database of systematic reviews* 2016;12(12).
75. Gupta NK, Mantri SP, Paul B, Dube KA, Ghosh S. Incidence of postoperative pain after single-visit and multiple-visit root canal therapy: A randomized controlled trial. *Journal of conservative dentistry : JCD* 2021;24(4):348–53.
76. Fonzar F, Mollo A, Venturi M, et al. Single versus two visits with 1-week intracanal calcium hydroxide medication for endodontic treatment: one-year post-treatment results from a multicentre randomised controlled trial | *Cochrane Library*. *European Journal of Oral Implantology* 2017;10(1):29–41.
77. Alomaym MAA, Aldohan MFM, Alharbi MJ, Alharbi NA. Single versus Multiple Sitting Endodontic Treatment: Incidence of Postoperative Pain - A Randomized Controlled Trial. *Journal of International Society of Preventive & Community Dentistry* 2019;9(2):172–7.
78. Ahmad MZ, Sadaf D, Merdad KA, Almohaimeed A, Onakpoya IJ. Calcium hydroxide as an intracanal medication for postoperative pain during primary root canal therapy: A systematic review and meta-analysis with trial sequential analysis of randomised controlled trials. *The journal of evidence-based dental practice* 2022;22(1).
79. Aneja K, Gupta A, Abraham D, et al. Influence of vehicle for calcium hydroxide on postoperative pain: a scoping review. *Journal of dental anesthesia and pain medicine* 2022;22(2):75.
80. Mostafa MEHAA, El-Shrief YAI, Anous WIO, et al. Postoperative pain following endodontic irrigation using 1.3% versus 5.25% sodium hypochlorite in mandibular molars with necrotic pulps: a randomized double-blind clinical trial. *International endodontic journal* 2020;53(2):154–66.
81. Parirokh M, Yosefi MH, Nakhaee N, Manochehrifar H, Abbott P V., Reza Forghani F. Effect of bupivacaine on postoperative pain for inferior alveolar nerve block anesthesia after single-visit root canal treatment in teeth with irreversible pulpitis. *Journal of endodontics* 2012;38(8):1035–9.
82. Ahmed YE, Emara RS, Sarhan SM, et al. Post-treatment endodontic pain following occlusal reduction in mandibular posterior teeth with symptomatic irreversible pulpitis and sensitivity to percussion: a single-centre randomized controlled trial. *International endodontic journal* 2020;53(9):1170–80.
83. Brad Rindal D, Asche SE, Kane S, et al. Patient, Provider Type, and Procedure Type Factors Associated with Opioid Prescribing by Dentists in a Health Care System. *Journal of pain research* 2021;14:3309–19.
84. Chua KP, Hu HM, Waljee JF, Brummett CM, Nalliah RP. Opioid prescribing patterns by dental procedure among US publicly and privately insured patients, 2013 through 2018. *Journal of the American Dental Association (1939)* 2021;152(4):309–17.
85. Tokuç B, Coşkunes FM. Comparison of the effects of articaine and bupivacaine in impacted mandibular third molar tooth surgery: a randomized, controlled trial. *Journal of dental anesthesia and pain medicine* 2021;21(6):575.
86. Lieblisch SE, Misiek D, Olczak J, Fleck H, Waterman F. A Retrospective Cross-Sectional Study of the Effect of Liposomal Bupivacaine on Postoperative Opioid Prescribing After Third Molar Extraction. *Journal of oral and maxillofacial surgery : official journal of the American Association of Oral and Maxillofacial Surgeons* 2021;79(7):1401-1408.e1.
87. Dolan S, Rae E. What are the implications of flap design on post-operative complications when carrying out third molar surgery? *Evidence-based dentistry* 2021;22(3):104–5.
88. Harbaugh CM, Nalliah RP, Hu HM, Englesbe MJ, Waljee JF, Brummett CM. Persistent opioid use

- after wisdom tooth extraction. *JAMA - Journal of the American Medical Association* 2018;320(5):504–6.
89. Resnick CM, Calabrese CE, Afshar S, Padwa BL. Do Oral and Maxillofacial Surgeons Over-Prescribe Opioids After Extraction of Asymptomatic Third Molars? *Journal of Oral and Maxillofacial Surgery* 2019;77(7):1332–6.
 90. Harbaugh CM, Lee JS, Chua KP, et al. Association Between Long-term Opioid Use in Family Members and Persistent Opioid Use After Surgery Among Adolescents and Young Adults. *JAMA surgery* 2019;154(4).
 91. Tompach PC, Wagner CL, Sunstrum AB, Nadeau RA, Tu HK. Investigation of an Opioid Prescribing Protocol After Third Molar Extraction Procedures. *Journal of oral and maxillofacial surgery : official journal of the American Association of Oral and Maxillofacial Surgeons* 2019;77(4):705–14.
 92. Bousquet B, Green MA, Caillouette CN, Simon J, Padwa BL, Resnick CM. How Much Opioid Medication Do Patients Need After Orthognathic Surgery? *Journal of oral and maxillofacial surgery : official journal of the American Association of Oral and Maxillofacial Surgeons* 2022;
 93. Weiss A, Heslin K, Barrett M, Izar R, Bierman A. Opioid-Related Inpatient Stays and Emergency Department Visits Among Patients Aged 65 Years and Older, 2010 and 2015. *Healthcare Cost and Utilization Project (HCUP) Statistical Briefs* 2018;244.
 94. Buckeridge D, Huang A, Hanley J, et al. Risk of injury associated with opioid use in older adults. *Journal of the American Geriatrics Society* 2010;58(9):1664–70.
 95. Chua KP, Hu HM, Waljee JF, Nalliah RP, Brummett CM. Persistent Opioid Use Associated With Dental Opioid Prescriptions Among Publicly and Privately Insured US Patients, 2014 to 2018. *JAMA Network Open* 2021;4(4):e216464–e216464.
 96. Maughan BC, Hersh E V., Shofer FS, et al. Unused opioid analgesics and drug disposal following outpatient dental surgery: A randomized controlled trial. *Drug and Alcohol Dependence* 2016;168:328–34.
 97. Shah A, Hayes CJ, Martin BC. Characteristics of Initial Prescription Episodes and Likelihood of Long-Term Opioid Use - United States, 2006-2015. *MMWR Morbidity and mortality weekly report* 2017;66(10):265–9.
 98. Parish CL, Pereyra MR, Pollack HA, et al. Screening for substance misuse in the dental care setting: findings from a nationally representative survey of dentists. *Addiction* 2015;110(9):1516–23.
 99. Keith DA, Hernández-Nuño de la Rosa MF. Special Screening Resources: Strategies to Identify Substance Use Disorders, Including Opioid Misuse and Abuse. *Dental Clinics of North America* 2020;64(3):513–24.
 100. McNeely J, Wright S, Matthews AG, et al. Substance-use screening and interventions in dental practices: Survey of practice-based research network dentists regarding current practices, policies and barriers. *The Journal of the American Dental Association* 2013;144(6):627–38.
 101. Daoust R, Paquet J, Marquis M, et al. Evaluation of Interventions to Reduce Opioid Prescribing for Patients Discharged From the Emergency Department: A Systematic Review and Meta-analysis. *JAMA Network Open* 2022;5(1):e2143425–e2143425.
 102. Rhodes E, Wilson M, Robinson A, Hayden JA, Asbridge M. The effectiveness of prescription drug monitoring programs at reducing opioid-related harms and consequences: A systematic review. *BMC Health Services Research* 2019;19(1):1–11.
 103. Rasubala L, Pernapati L, Velasquez X, Burk J, Ren YF. Impact of a Mandatory Prescription Drug Monitoring Program on Prescription of Opioid Analgesics by Dentists. *PLOS ONE* 2015;10(8):e0135957.
 104. McCauley JL, Hyer JM, Ramakrishnan VR, et al. Dental opioid prescribing and multiple opioid prescriptions among dental patients. *The Journal of the American Dental Association* 2016;147(7):537–44.
 105. Stewart A, Zborovancik KJ, Stiely KL. The impact of pharmacy services on opioid prescribing in dental practice. *Journal of the American Pharmacists Association* 2017;57(2):S78–82.
 106. Rigert JM, Napenas JJ, Wally M, et al. Dental pain management with prescription opioids by nondental healthcare professionals in a healthcare system network. *Journal of public health dentistry* 2022;82(1):22–30.
 107. Font K, Johnson L, Powell C. Five different solutions to mitigate overprescribing opioid

- medications. *Journal of dental education* 2021;85(1):31–6.
108. National Institute on Drug Abuse (NIDA). *Naloxone for Opioid Overdose: Life-Saving Science*. Washington, DC: 2021.
 109. The Network for Public Health Law. *Characteristics of Statewide Naloxone Distribution Mechanisms*. 2020.
 110. Dowell D, Haegerich T, Chou R. CDC Guideline for Prescribing Opioids for Chronic Pain — United States, 2016. *MMWR Recommendations and Reports* 2019;65(4):150–1.
 111. Mitchell SG, Truitt AR, Davin LM, Rindal DB. Pain management after third molar extractions in adolescents: a qualitative study. *BMC pediatrics* 2022;22(1).
 112. Food and Drug Administration. *Disposal of Unused Medicines: What You Should Know* [Internet]. 2020 [cited 2022 Jun 12]; Available from: <https://www.fda.gov/drugs/safe-disposal-medicines/disposal-unused-medicines-what-you-should-know>
 113. Brummett CM, Steiger R, Englesbe M, et al. Effect of an Activated Charcoal Bag on Disposal of Unused Opioids After an Outpatient Surgical Procedure: A Randomized Clinical Trial. *JAMA surgery* 2019;154(6):558–61.
 114. Khan U, Bloom RA, Nicell JA, Laurenson JP. Risks associated with the environmental release of pharmaceuticals on the U.S. Food and Drug Administration “flush list.” *The Science of the total environment* 2017;609:1023–40.
 115. Adesoye A, Duncan N. Acute Pain Management in Patients With Opioid Tolerance. *US Pharmacist* 2017;42(3):28–32.
 116. Chapman CR, Davis J, Donaldson GW, Naylor J, Winchester D. Postoperative Pain Trajectories in Chronic Pain Patients Undergoing Surgery: The Effects of Chronic Opioid Pharmacotherapy on Acute Pain. *The Journal of Pain* 2011;12(12):1240–6.
 117. Coluzzi F, Bifulco F, Cuomo A, et al. The challenge of perioperative pain management in opioid-tolerant patients. *Therapeutics and clinical risk management* 2017;13:1163–73.
 118. Kulich RJ, Keith DA, Vasciannie AA, Thomas HF. Interprofessional Collaboration in the Assessment and Management of Substance Use Risk. *Dental clinics of North America* 2020;64(3):571–83.
 119. McRee B. Open wide! Dental settings are an untapped resource for substance misuse screening and brief intervention. *Addiction* 2012;107(7):1197–8.
 120. Buresh M, Ratner J, Zgierska A, Gordin V, Alvanzo A. Treating Perioperative and Acute Pain in Patients on Buprenorphine: Narrative Literature Review and Practice Recommendations. *Journal of General Internal Medicine* 2020;35(12):3635.
 121. Kohan L, Potru S, Barreveld AM, et al. Buprenorphine management in the perioperative period: educational review and recommendations from a multisociety expert panel. *Regional Anesthesia & Pain Medicine* 2021;46(10):840–59.
 122. Smith K, Wang M, Abdulkalikov R, et al. Pain Management Considerations in Patients With Opioid Use Disorder Requiring Critical Care. *The Journal of Clinical Pharmacology* 2022;62(4):449–62.
 123. Han JT, So ID, Dodson TB, Burke AB. Do Oral and Maxillofacial Surgeons Prescribe More Opioids After Third Molar Removal for Patients with Substance Use History? *Journal of oral and maxillofacial surgery : official journal of the American Association of Oral and Maxillofacial Surgeons* 2021;79(10):2010–5.
 124. Nack B, Haas SE, Portnof J. Opioid Use Disorder in Dental Patients: The Latest on How to Identify, Treat, Refer and Apply Laws and Regulations in Your Practice. *Anesthesia Progress* 2017;64(3):178.
 125. O’Neil M. *The ADA practical guide to substance use disorders and safe prescribing*. American Dental Association; 2015.
 126. American College of Obstetrics and Gynecology. *Committee Opinion Number 569: Oral Health Care During Pregnancy and Through the Lifespan*. 2013.
 127. Food and Drug Administration. *FDA recommends avoiding use of NSAIDs in pregnancy at 20 weeks or later because they can result in low amniotic fluid* [Internet]. 2020 [cited 2022 Jun 12]; Available from: <https://www.fda.gov/drugs/drug-safety-and-availability/fda-recommends-avoiding-use-nsaids-pregnancy-20-weeks-or-later-because-they-can-result-low-amniotic>

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About this publication

These are general recommendations only; specific clinical decisions should be made by the treating clinician based on an individual patient's clinical condition.



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