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ANESTHETIC AND PHARMACOLOGIC STRATEGIES FOR ACUTE DENTAL PAIN IN EMERGENCY SETTINGS: A SYSTEMATIC REVIEW OF COLLABORATIVE CARE BETWEEN DENTISTS, PHARMACISTS, AND EMERGENCY PHYSICIANS

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Abstract

Objectives: To synthesize evidence on anesthetic and pharmacologic strategies for acute dental pain in emergency settings and to outline how dentists, pharmacists, and emergency physicians can collaborate to provide opioid-sparing care. Methods: We conducted a systematic review following PRISMA 2020. Databases were searched for primary studies and systematic reviews on management of acute dental or odontogenic pain in hospital emergency departments, urgent-care services, or dental emergency clinics. Eligible primary studies reported at least one outcome related to pain, rescue medication, adverse events, or opioid prescribing. Data were extracted and summarized narratively. Results: Ten primary studies and eight systematic reviews/meta-analyses met the inclusion criteria. Most primary studies were observational analyses of emergency-department prescribing or single-centre interventions, while the secondary evidence mainly evaluated non-opioid regimens after dental procedures. Across settings, acute dental pain was often treated with opioids despite evidence that non-steroidal anti-inflammatory drugs, acetaminophen, selective COX-2 inhibitors, and multimodal combinations provide equal or superior analgesia with fewer harms. Guideline-based protocols and multimodal regimens were associated with reductions in opioid use without loss of pain control. Conclusion: Evidence supports NSAID-based and multimodal non-opioid strategies as first-line options for acute dental pain, with opioids reserved for selected cases within interprofessional, guideline-directed emergency care pathways.

Keywords: Acute Dental Pain; Emergency Department; Analgesic Strategies; Nsaids; Opioid Stewardship; Dentists; Pharmacists; Emergency Physicians; Interprofessional Collaboration.

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INTRODUCTION

Acute dental pain is a frequent reason for seeking urgent care, and a substantial proportion of these patients present to hospital emergency departments (EDs) rather than dental services. A systematic review showed that dental pain accounts for roughly 0.3–4% of ED workload, yet many emergency physicians report limited training and low confidence in managing dentofacial conditions, while between about one-third and four-fifths of dental patients receive an opioid at discharge (Barna et al. 2019). These patterns raise concern in the context of rising opioid-related harm and highlight the need for evidence-based, opioid-sparing strategies delivered collaboratively by dentists, pharmacists and emergency physicians. A large body of randomized trials and meta-analyses in dental settings shows that non-steroidal anti-inflammatory drugs (NSAIDs) and selective COX-2 inhibitors provide the most effective single-dose relief of acute postoperative dental pain, particularly after third-molar surgery (Barden et al. 2004; Moore et al. 2011). Etoricoxib demonstrates equal or superior analgesia compared with ibuprofen, diclofenac and naproxen, and reduces the need for rescue medication after third-molar removal (Franco-de la Torre et al. 2021). Combination regimens—such as ibuprofen with oxycodone or caffeine, or NSAIDs plus acetaminophen—achieve greater pain relief than monotherapy, with acceptable safety profiles (Au et al. 2015; Abou-Atme et al. 2019; Zanjir et al. 2020). More recent evidence in pediatric dentistry similarly supports ibuprofen, acetaminophen, and their combinations as first-line pharmacologic options, while questioning any added benefit of opioids for children with acute dental pain (Miroshnychenko et al. 2023). Collectively, these data suggest that well-designed NSAID-based and multimodal regimens can control acute dental pain effectively across age groups, whereas opioids should be reserved, if used at all, for carefully selected cases. However, translation of this evidence into ED practice remains inconsistent. This systematic review therefore aims to synthesize anesthetic and pharmacologic strategies for acute dental pain in emergency settings, with particular emphasis on collaborative roles of dentists, pharmacists and emergency physicians in delivering safe, effective, and opioid-sparing care.

METHODS

This systematic review was conducted to synthesize evidence on anesthetic and pharmacologic strategies for acute dental pain in emergency settings, with a focus on collaborative care between dentists, pharmacists and emergency physicians. The review followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA 2020) recommendations (Page et al. 2021).

Eligibility Criteria

We included primary quantitative studies (randomized controlled trials, cohort, case–control and cross-sectional designs) that reported on pharmacologic or anesthetic management of acute dental pain in emergency departments, hospital urgent care, or dedicated dental emergency clinics. Studies were eligible if they involved patients presenting with acute odontogenic pain or dental conditions requiring urgent pain

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management, and if they reported at least one relevant outcome such as type of analgesic, anesthetic used, dosing strategy, need for rescue medication, pain scores, adverse events, or opioid prescribing patterns. We excluded case reports, narrative reviews, editorials, letters without primary data, and studies focusing solely on elective dental procedures in outpatient settings.

Information Sources and Search Strategy

Electronic databases (PubMed, MEDLINE, Embase, Scopus and Web of Science) were searched from inception to the most recent available date using combinations of controlled vocabulary and free-text terms related to “dental pain”, “odontogenic pain”, “emergency department”, “urgent care”, “analgesics”, “anesthetics”, “opioids”, “NSAIDs” and “pharmacologic management”. Reference lists of included articles and relevant reviews were screened to identify additional studies. No restrictions were placed on publication year; studies published in English were considered.

Study Selection

Two reviewers screened titles and abstracts to identify relevant studies. Full texts of selected records were then assessed in detail against the eligibility criteria. Discrepancies were resolved through discussion and, if necessary, consultation with a third reviewer. Reasons for exclusion at the full-text stage were documented, and the overall selection process will be summarized in a PRISMA flow diagram.

Data Extraction and Risk of Bias Assessment

A standardized data extraction form was used to collect study characteristics (country, setting, design, sample size, population), details of anesthetic and pharmacologic interventions, comparators, outcomes, and key results. Data extraction was performed independently by two reviewers and cross-checked for accuracy. Risk of bias in observational studies was assessed using an adapted Newcastle–Ottawa Scale, considering selection, comparability and outcome domains. Any disagreements in ratings were resolved by consensus. Given anticipated clinical and methodological heterogeneity, a narrative synthesis was planned, structured around setting, analgesic, anesthetic strategy, and patient outcomes.

RESULTS

Eight observational studies on pharmacologic management of acute dental pain in emergency settings were included, based on national surveys, electronic health records and single-centre cohorts from the United States and Europe (Okunseri et al. 2012; Okunseri et al. 2015; Naavaal et al. 2021; Morris et al. 2019; Fox et al. 2013; Dreyer et al. 2023; Huang et al. 2022; Larsen et al. 2025). Three analyses of National Hospital Ambulatory Medical Care Survey data showed that emergency dental visits are strongly associated with analgesic prescribing, particularly opioids. Okunseri et al. analysed 4,726 records representing 16.4 million nontraumatic dental condition visits and found that 74% received at least one analgesic and 56% an antibiotic, with prescribing increasing over

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time (Okunseri et al. 2012). A subsequent study reported opioid analgesics in 50.3% of nontraumatic dental condition visits versus 14.8% of non-dental visits, with highest exposure among young adults, self-pay patients and non-Hispanic Whites (Okunseri et al. 2015). Using 2015–2017 data, Naavaal et al. observed that among 57,098 emergency visits, dental presentations had 4.8-fold higher adjusted odds of opioid, 1.9-fold of non-opioid, and 3.4-fold of combination opioid, non-opioid prescribing compared with nondental visits (Naavaal et al. 2021). Morris et al. showed that, although discharge opioid prescribing for dental pain decreased from 59% to 50%, dental patients remained more likely than low-back-pain patients to leave with both analgesic and opioid prescriptions (Morris et al. 2019). Two studies evaluated system-level strategies to reduce opioid use. Fox et al. demonstrated that introducing an emergency department prescribing guideline reduced opioid prescribing for dental pain from 59% to 42% and was accompanied by a decrease in dental pain visit rates (Fox et al. 2013). Huang et al. reported that after implementing a multimodal regimen centred on ibuprofen and acetaminophen with selective gabapentin, no opioids were prescribed for 3,785 extractions in 2022 while failure of ibuprofen, acetaminophen remained low (Huang et al. 2022). Dreyer et al. showed that patients from dental professional shortage areas were more likely to have filled an opioid prescription in the 30 days preceding an emergency dental visit, highlighting the role of limited dental access in upstream exposure (Dreyer et al. 2023). In Danish dental emergency clinics, 82.8% of patients with acute dental pain reported using at least one analgesic and 9% exceeded recommended maximum doses, underscoring frequent self-medication and overdose risk (Larsen et al. 2025).

Table 1: Characteristics of included studies

Study	Design and data source	Setting and country	Population, sample	Aim, focus
Okunseri et al. 2012	Cross-sectional analysis of National Hospital Ambulatory Medical Care Survey (NHAMCS) emergency department data, 1997–2007.	United States hospital emergency departments.	4,726 records representing 16,379,580 nontraumatic dental condition (NTDC) visits.	To describe trends and factors associated with analgesic and antibiotic prescribing for NTDC visits in EDs.
Okunseri et al. 2015	Cross-sectional study using NHAMCS emergency department data, 2007–2010.	United States hospital emergency departments.	NTDC-related visits (approximately 1.7% of all ED visits; several thousand records).	To estimate rates and determinants of opioid analgesic prescriptions for NTDC visits compared with non-dental visits.
Naavaal et al. 2021	Cross-sectional analysis of NHAMCS 2015–2017 emergency department data.	United States hospital emergency departments.	57,098 sampled ED visits representing national dental and nondental visit estimates.	To compare opioid, non-opioid and combination analgesic prescribing between dental and nondental ED visits.

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Morris et al. 2019	Secondary analysis of NHAMCS data, 2010–2015.	United States hospital emergency departments.	Estimated 16 million dental pain and 49 million low-back-pain visits.	To compare trends in ED and discharge analgesic and opioid use for dental pain versus low back pain.
Fox et al. 2013	Single-centre before-and-after chart review of a prescribing guideline.	Community hospital emergency department, United States.	668 ED dental pain visits (515 before and 153 after guideline implementation).	To evaluate the effect of an ED controlled-substance prescribing guideline on opioid use and dental pain visit rates.
Dreyer et al. 2023	Retrospective cohort using statewide electronic health records, 2015–2021.	Emergency departments participating in the Indiana Network for Patient Care, United States.	Patients with ED dental diagnoses drawn from 6,306,972 unique individuals receiving care.	To compare prevalence of filled opioid prescriptions in the 30 days before ED dental visits between dental professional shortage areas and non-shortage areas.
Larsen et al. 2025	Cross-sectional questionnaire and interview study.	Two dental emergency clinics in Copenhagen, Denmark.	180 adult patients presenting with acute dental pain.	To describe patterns of pre-presentation analgesic use and the frequency of exceeding recommended maximum doses.
Huang et al. 2022	Single-centre before-and-after study of an opioid reduction initiative.	University dental urgent-care clinic, United States.	3357 extractions in 2012 versus 3785 extractions in 2022.	To compare analgesic prescribing patterns and pain outcomes before and after implementation of a multimodal, largely non-opioid regimen.

Table 2: Analgesic strategies and main outcomes of included studies

Study	Analgesic, pharmacologic strategy	Comparator	Key outcomes
Okunseri et al. 2012	Any analgesic and antibiotic prescriptions recorded at ED discharge for NTDC visits.	Trends over time and patient, visit characteristics, including age, payer type and race, ethnicity.	Overall, 74% of NTDC visits received an analgesic and 56% an antibiotic; prescribing of both drug classes increased over the 1997–2007 period.
Okunseri et al. 2015	Prescription of opioid analgesics for NTDC versus non-dental ED visits.	Non-NTDC emergency visits and sociodemographic factors.	Opioid analgesics were prescribed in 50.3% of NTDC visits versus 14.8% of non-dental visits; exposure was highest in

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			young adults, self-pay patients and non-Hispanic Whites.
Naavaal et al. 2021	Opioid, non-opioid and combination opioid, non-opioid prescriptions for ED visits.	Dental versus nondental presentations with adjustment for sociodemographic and visit variables.	Dental visits had 4.8-fold higher adjusted odds of receiving an opioid, 1.9-fold for non-opioid and 3.4-fold for combination therapy compared with nondental visits.
Morris et al. 2019	Analgesic and opioid administration during the ED visit and prescriptions at discharge.	Dental pain versus low-back-pain presentations across survey years.	Opioid prescribing at discharge for dental pain decreased from 59% to 50%, yet dental patients remained more likely than low-back-pain patients to receive opioids at discharge.
Fox et al. 2013	Departmental guideline favouring non-opioid analgesics and limiting opioid prescriptions for dental pain.	Twelve-month periods before and after guideline implementation.	Opioid prescribing for dental pain fell from 59% (302, 515) to 42% (65, 153), with a concurrent reduction in dental pain visit rates per 1,000 ED visits.
Dreyer et al. 2023	Filled outpatient opioid prescriptions within 30 days before the ED dental visit.	Residents of dental professional shortage areas versus non-shortage areas.	Residence in a dental professional shortage area was associated with a significantly higher adjusted probability of a recent opioid prescription before an ED dental visit.
Larsen et al. 2025	Self-administered analgesics (paracetamol, ibuprofen, opioids and others) before emergency dental consultation.	Patients with versus without analgesic use and dosing relative to recommended maximums.	Among 180 patients, 82.8% had used analgesics and 9% exceeded recommended maximum doses; 75.6% used paracetamol, 54.4% ibuprofen, 10% opioids and 11.1% other agents.
Huang et al. 2022	Opioid-containing regimens in 2012 versus non-opioid multimodal analgesia centred on ibuprofen, acetaminophen with selective gabapentin in 2022.	Pre-initiative (2012) versus post-initiative (2022) extraction visits.	By 2022, no opioid prescriptions were recorded; acetaminophen, ibuprofen had a 2.2% failure rate, significantly lower than gabapentin-containing regimens (4.4%).

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DISCUSSION

Our findings support a clear shift toward multimodal, non-opioid–based regimens as the cornerstone of acute dental pain management across emergency and dental settings. The pediatric systematic review by Miroshnychenko et al. found that ibuprofen and ibuprofen–acetaminophen combinations probably provide greater post-extraction pain reduction than acetaminophen alone or placebo, with few reported adverse events (Miroshnychenko et al. 2023). This aligns with the predominance of NSAID-based strategies in our included studies and supports using similar combinations for older adolescents and adults in urgent and emergency care.

Evidence from adult populations further reinforces the superiority of combination and NSAID-based regimens over opioid-centered approaches. Au et al. showed that several fixed-dose combinations after third molar surgery achieved substantial pain relief, with ibuprofen–opioid and ibuprofen–caffeine regimens ranking highly for efficacy, but opioid-containing combinations also showing more frequent adverse effects (Au et al. 2015). Zanjir et al. reported in a network meta-analysis of postendodontic pain that NSAIDs, NSAID–acetaminophen combinations and certain corticosteroid regimens were among the most effective options across early and late postoperative time points (Zanjir et al. 2020). Together with our primary studies, these data support recommending NSAID-based multimodal therapy as first-line, reserving opioids for carefully selected rescue use.

Selective COX-2 inhibition and adjuvant strategies provide additional options in complex or high-risk patients. Franco-de la Torre et al. showed that etoricoxib, particularly at 120 mg, was associated with high probabilities of achieving at least 50% maximum pain relief after third molar surgery with a favourable benefit–risk profile (Franco-de la Torre et al. 2021). Abou-Atme et al. found that acetaminophen–caffeine combinations were more effective than placebo and acetaminophen alone and had efficacy comparable to ibuprofen in managing dental pain, although the small number of trials and heterogeneous comparators limit strong conclusions (Abou-Atme et al. 2019). These findings complement our review by highlighting non-opioid alternatives when NSAIDs are contraindicated or when additional analgesic effect is required.

At the same time, the broader literature underscores the public-health implications of relying on opioids for dental pain, particularly in emergency departments. Okunseri et al. demonstrated that non-traumatic dental conditions accounted for a small proportion of ED visits, yet opioids were prescribed for a substantial share of these encounters and prescribing patterns varied by age, payer and race (Okunseri et al. 2015). Barna et al. systematically reviewed emergency-department practice and found that many physicians report limited training in managing dentofacial emergencies and that between 29.6% and 81% of dental pain patients in some studies received an opioid at discharge (Barna et al. 2019). These results mirror the variability and opioid exposure seen in our included ED-based studies and highlight a critical gap in provider confidence and guideline-concordant care.

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Taken together, the evidence base used in our review suggests that collaborative protocols between dentists, pharmacists and emergency physicians are essential. Dentists can define condition-specific first-line regimens (ibuprofen with or without acetaminophen, selective COX-2 inhibitors, or acetaminophen–caffeine) based on the systematic reviews above (Miroshnychenko et al. 2023; Au et al. 2015; Zanjir et al. 2020; Franco-de la Torre et al. 2021; Abou-Atme et al. 2019). Pharmacists are well positioned to screen for contraindications, reinforce correct dosing, identify high-risk combinations and provide counselling on over-the-counter use. Emergency physicians, who often see patients without access to definitive dental care, can align their prescribing with this evidence and with institutional opioid-stewardship initiatives, while using local anesthetic techniques and non-pharmacologic measures where feasible (Barna et al. 2019).

Both our review and the underlying systematic reviews highlight important limitations. Many trials enroll highly selected populations, use short follow-up and heterogeneous pain scales, and provide limited safety data, particularly in children and medically complex adults (Miroshnychenko et al. 2023; Abou-Atme et al. 2019). Future research should prioritize pragmatic, interprofessional trials in real-world emergency and urgent-care settings, comparing collaborative care pathways that integrate evidence-based non-opioid regimens, pharmacist-led stewardship and timely referral to definitive dental treatment.

CONCLUSION

This systematic review shows that evidence consistently favours NSAID-based and multimodal non-opioid regimens over routine opioid prescribing for acute dental pain in emergency settings. When combined with timely local anesthetic techniques and definitive dental treatment, these strategies provide effective analgesia with fewer harms. Our findings highlight the importance of collaborative, guideline-driven pathways linking dentists, pharmacists and emergency physicians to optimise analgesic selection, screen for contraindications and reduce opioid exposure.

Future research should evaluate pragmatic interprofessional models of care and implementation strategies that embed opioid stewardship into routine management of dental pain in emergency and urgent-care services across diverse health systems.

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