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Optimizing the Clinical Pathway for Acute Orofacial Trauma: A Comprehensive Evaluation of Prehospital Handoff, Emergency Assessment, Diagnostic Imaging, Rapid Laboratory Testing, Pharmacological Management, Rehabilitation Referral, and Health-Record Continuity to Improve Time-to-Definitive Care and Patient Outcomes

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Abstract

Acute orofacial trauma presents a unique constellation of diagnostic and management challenges that span prehospital care, emergency department (ED) triage, diagnostic imaging, laboratory evaluation, pharmacologic management, and onward rehabilitation and documentation. Delays or breakdowns at any step can prolong time-to-definitive care and worsen functional, aesthetic, and psychosocial outcomes. This article synthesizes current evidence and best practices to propose an optimized, integrated clinical pathway for acute orofacial trauma. Drawing on literature from orofacial pain and dental trauma, emergency imaging, analgesic practice, prehospital handoff research, care-pathway studies, and documentation quality improvement, we review (1) prehospital priorities and handoff models that improve ED readiness, (2) ED assessment and triage algorithms that balance airway/bleeding control with dental preservation, (3) targeted diagnostic imaging and rapid point-of-care testing strategies, (4) evidence-based multimodal analgesia and antimicrobial/anti-inflammatory pharmacotherapy for acute dental and orofacial injuries, (5) criteria and timing for early allied-health rehabilitation referral, and (6) essential components of health-record continuity and trauma documentation. We identify operational enablers (standardized handoff templates, imaging algorithms, analgesic bundles, and trauma documentation proformas) and barriers (ED crowding, variable documentation, interprofessional knowledge gaps). Finally, we propose measurable process and outcome metrics for implementation and research, and offer a pragmatic pathway intended to reduce time-to-definitive care and improve patient-centered outcomes.

Keywords: orofacial trauma, prehospital handoff, emergency assessment, diagnostic imaging, analgesia, documentation, rehabilitation, clinical pathway

1. Introduction

Orofacial trauma — including dental fractures, luxations, avulsions, soft-tissue lacerations, maxillofacial fractures, and associated soft-tissue and neurovascular injuries — is commonly encountered in prehospital and emergency settings. Timely, accurate initial management can preserve dentition and jaw function, minimize infection risk, and reduce long-term morbidity (Patel et al., 2014). However, patients with acute orofacial injuries frequently experience fragmented care because management involves

multiple disciplines (emergency medicine, dentistry/oral and maxillofacial surgery, radiology, laboratory medicine, pharmacy, physiotherapy, and medical records). In addition, diagnostic uncertainty—particularly distinguishing odontogenic pain from neuropathic or referred pain—can complicate early decisions (Labanca et al., 2023; Khan et al., 2019).

This review addresses the entire clinical pathway — from prehospital handoff to outpatient rehabilitation and health-record continuity — and collates evidence and practical recommendations to optimize time-to-definitive care and patient outcomes. We leverage recent reviews on emergency imaging in the prehospital context (Whitesell et al., 2024), orofacial pain and diagnostic nuance (Labanca et al., 2023; Khan et al., 2019), current analgesic strategies for emergency care (Nagpal et al., 2024), models of care pathways in persistent orofacial pain (Breckons et al., 2017), and contemporary studies of prehospital-to-ED handoff efficacy and documentation (Gross et al., 2025; Chua et al., 2025; Karaçor & Eden, 2026). Our aim is practical: present an evidence-informed, implementable pathway, identify gaps, and highlight metrics for evaluation.

2. Prehospital priorities and optimized handoff

2.1 Prehospital priorities for orofacial trauma

Prehospital providers must prioritize airway, breathing, circulation (ABC), cervical spine protection, hemorrhage control, pain control, immobilization, and early identification of injuries that require rapid intervention or specialist referral (Patel et al., 2014). Orofacial injuries may compromise airway patency through bleeding, foreign bodies, or maxillofacial structural disruption; early airway assessment and, when necessary, advanced airway maneuvers take precedence over tooth preservation. Hemorrhage control (pressure, packing, tourniquet for extremity sources where applicable) and stabilization of coexisting injuries are essential.

2.2 Standardized handoff and team-based reporting

High-quality prehospital handoff to the ED shortens time to interventions and reduces information loss. Recent work demonstrates that structured, team-based reporting (SBAR variants and mnemonics adapted for trauma) can improve efficiency and readiness metrics in adult EDs (Gross et al., 2025). For orofacial trauma, a concise prehospital handoff template should include:

- Mechanism of injury and estimated time of injury/prehospital interventions.
- Airway status and any airway maneuvers/devices.
- Hemodynamic status and interventions (fluids, transfusions, tourniquet).
- Neurological status and GCS.
- Obvious or suspected facial/dental injuries (avulsion, mobility, open fractures, vision involvement).
- Pain severity and analgesics administered, allergies, and last oral intake.
- Photographs (if obtained by EMS) and brief scene video when available.

This focused dataset equips ED teams — including on-call dental/oral surgery services — to triage and prioritize imaging and operative planning quickly (Gross et al., 2025; Chua et al., 2025).

2.3 Overcrowding, diversion, and operational considerations

Prehospital systems and EDs face operational pressures (crowding, limited specialist availability) that can delay care. Qualitative analyses highlight upstream interventions (protocolized diversion, community triage, teleconsultation with dental/oral surgery specialists) as beneficial adjuncts to mitigate ED overload and ensure patients reach the appropriate receiving facility (Chua et al., 2025). Where feasible, prehospital teleconsultation with on-call dental specialists can guide immediate preservation steps (e.g., handling and storage of an avulsed tooth) that impact definitive outcomes.

3. Emergency department assessment and triage

3.1 Rapid primary survey and early dental-specific evaluation

After ABCs are secure, the secondary survey must integrate a targeted orofacial assessment: facial symmetry, occlusion, tooth mobility or avulsion, soft-tissue wounds, ocular involvement, vestibular function, and cranial nerve examination. Patel et al. (2014) emphasize quick determination of whether dentoalveolar injuries are isolated or part of multi-system trauma. Key decision nodes include:

- Immediate airway risk (if present, proceed to airway management).
- Open fractures, grossly displaced fractures, or ocular or intracranial involvement → urgent imaging and specialist activation.
- Avulsed permanent tooth within the extra-alveolar window (ideally <60 minutes) → prepare for reimplantation (after local and systemic considerations).

3.2 Pain assessment and differentiation

Accurate pain characterization is crucial. Orofacial pain may be nociceptive (traumatic, inflammatory), neuropathic, or referred (Labanca et al., 2023; Khan et al., 2019). Use of validated pain scales (NRS/VAS) and focused history (onset, triggers, character, alleviating/aggravating factors) helps guide analgesic choice and urgency for imaging or specialty referral. Persistent or atypical pain features should prompt consideration of neuropathic mechanisms and early referral for specialist pain evaluation

3.3 Triage acuity and disposition decisions

A practical triage stratification for orofacial trauma:

- Emergent (resuscitation bay): airway compromise, active severe hemorrhage, open facial fractures with airway/ocular involvement.
- Urgent (ED cubicle): displaced facial fractures, complicated dental avulsion with short extra-alveolar time, deep lacerations requiring layered repair.
- Non-urgent (fast track/urgent care): minor tooth fractures, superficial soft-tissue injuries without functional deficit.

This triage rubric aligns resources and imaging priorities.

4. Diagnostic imaging: targeted, timely, and radiation-aware

4.1 Imaging modalities and diagnostic aims

Diagnostic imaging objectives are to (1) identify facial fractures and displacements, (2) evaluate dental root and alveolar integrity, (3) detect foreign bodies, and (4) identify complications (pneumothorax in chest compressions, airway device malposition) that may be related to prehospital interventions (Whitesell et al., 2024). Imaging options include plain radiography (dental periapical/occlusal), panoramic radiography (OPG), cone-beam CT (CBCT), soft-tissue ultrasound, and CT (maxillofacial or whole-body non-contrast CT when polytrauma suspected). Whitesell et al. (2024) emphasize that many prehospital interventions produce recognizable signatures on ED imaging (e.g., endotracheal tube malposition, CPR-related thoracic injuries) and radiologists should be alert to iatrogenic features.

4.2 Pragmatic imaging algorithm

We propose a pragmatic, stepwise imaging algorithm:

- Isolated dental trauma with intact occlusion: obtain dental periapical and occlusal radiographs or CBCT if available and if root evaluation is required.
- Suspected alveolar or mandibular fracture, malocclusion, or extraoral deformity: panoramic radiograph as an initial screen; progress to maxillofacial CT (axial with 3D reconstructions) if displaced fractures or multi-fragment injuries suspected.
- Penetrating facial injury or suspected intraorbital foreign body: CT with bone windows ± contrast per local protocol and urgent ophthalmology consult.
- Polytrauma or altered mental status: whole-body CT (pan-scan) to identify associated injuries and CPR-related complications (rib fractures, sternal fractures, pulmonary contusions) that may impact management (Whitesell et al., 2024).
- CBCT offers high resolution for dentoalveolar structures with lower radiation than conventional CT and is increasingly used when available. Radiation stewardship must balance diagnosis-driven need versus exposure, especially in pediatric patients.

4.3 Radiology reporting and communication

Rapid, prioritized radiology reporting is essential. Reports should clearly describe fracture displacement, tooth root status, alveolar bone loss, foreign bodies, and any evidence of iatrogenic injury. Timely verbal communication for critical or actionable findings (displaced fractures, airway device malposition) reduces time to corrective intervention. Integrating imaging with prehospital photos or videos can improve diagnostic accuracy.

5. Rapid laboratory testing and point-of-care diagnostics

5.1 Role of laboratory testing in acute orofacial trauma

While many orofacial injuries are localized, laboratory testing has important roles in patients with significant soft-tissue injuries, open fractures, suspected systemic infection, or clinical instability. Baseline studies may include CBC, coagulation profile (especially if anticoagulants are reported), blood type and screen (if hemorrhage), and inflammatory markers when infection suspected.

5.2 Point-of-care testing to accelerate decisions

Point-of-care tests (POCT) provide rapid turnaround: hemoglobin/hematocrit, glucose, blood type, and bedside coagulation markers can guide decisions about transfusion, reversal of anticoagulation, or urgent operative care. In settings where CT contrast is planned, renal function POCT (creatinine) can accelerate imaging decisions. Rapid microbiology (Gram stain of purulent wounds) can guide empiric antimicrobial selection pending culture results.

6. Pharmacological management: multimodal, evidence-based analgesia and infection prophylaxis

6.1 Principles of analgesia in orofacial trauma

Pain control is a priority for patient comfort and functional assessment. Multimodal analgesia reduces opioid reliance and improves outcomes in ED settings (Nagpal et al., 2024). A practical ED analgesic bundle for moderate–severe orofacial trauma includes:

• Nonopioid baseline: acetaminophen (oral or IV) and an NSAID (unless contraindicated) for nociceptive inflammation.
• Adjunctive neuropathic agents if neuropathic pain suspected (consider gabapentinoids for severe neuropathic features, though evidence for acute trauma is limited).
• Short-acting opioids reserved for severe pain not controlled with nonopioid multimodal therapy, using the lowest effective dose and clear plans for reassessment and short course only (Nagpal et al., 2024; Labanca et al., 2023).
• Local anesthesia for procedural analgesia (nerve blocks) is effective and decreases systemic analgesic need; ED providers and on-call dental/oral surgery teams should be proficient in regional techniques relevant to the injury.

6.2 Antibiotics, antiseptic measures, and tetanus prophylaxis
Open dental and facial wounds risk infection. Antibiotic prophylaxis is indicated for grossly contaminated wounds, avulsion with delayed reimplantation, or open fractures. Amoxicillin ± clavulanic acid is commonly recommended for odontogenic exposure; in penicillin allergy, doxycycline or clindamycin can be alternatives, depending on local antibiograms (Patel et al., 2014). Tetanus immunization status must be verified and updated per guidelines.

6.3 Anti-inflammatory and anti-edema therapy
Systemic corticosteroids may be considered to reduce edema in severe facial trauma with risk to airway compromise, orbital compartment syndrome, or significant soft-tissue swelling — weighing benefits against immunosuppression and wound healing considerations. NSAIDs remain mainstays for inflammatory pain but require judicious use when surgical hemostasis or bone healing concerns exist.

7. Early rehabilitation and allied health involvement
7.1 Early referral criteria and timing
Early involvement of rehabilitation specialists (physiotherapy, occupational therapy, speech and language therapy, and dental prosthodontics/orthodontics) supports functional recovery. Referral triggers include:
• Temporomandibular joint (TMJ) dysfunction or trismus.
• Occlusal disturbance after fracture reduction.
• Facial nerve or sensory deficits requiring neuromuscular retraining.
• Functional swallowing, speech, or mastication impairment.
• Timely referral (within days to weeks depending on injury severity) prevents chronic dysfunction and supports return to normal activities (Labanca et al., 2023).

7.2 Rehabilitation interventions
Rehabilitation interventions include jaw-mobilization exercises, manual therapy for myofascial pain, neuromuscular reeducation, scar management, and, when necessary, prosthodontic planning for tooth loss. Evidence supports manual and physical therapy for TMJ-associated musculoskeletal dysfunction (Labanca et al., 2023). Multidisciplinary pain management pathways are essential when neuropathic or persistent pain emerges (Breckons et al., 2017).

8. Health-record continuity and documentation
8.1 Essential documentation elements
High-quality documentation in acute dental and orofacial trauma is a medico-legal and clinical imperative. Karaçor & Eden (2026) highlight that optimized documentation improves care continuity and medico-legal defensibility. Core elements include:
• Precise injury chronology and mechanism.
• Prehospital interventions and times (extra-alveolar time for avulsed teeth).
• Detailed clinical findings: tooth numbering, mobility grades, wound dimensions, and neurovascular status.
• Imaging obtained and key findings, with time stamps.
• Analgesics, antibiotics, tetanus status, and consent for procedures.
• Photographs (informed consent permitting) with standardized views and scaling.
• Clear disposition plan and follow-up arrangements (specialist contact, timeframe).

8.2 Standardized templates and interoperability
Use of structured trauma documentation templates or proformas within the electronic health record (EHR) ensures consistent capture and improves handover to specialists. Interoperability (sharing prehospital records, images, and ED documentation) reduces repetition and expedites definitive care. Embedding checklists (e.g., avulsed tooth management checklist) into EHR workflows reduces variation and improves guideline adherence.

9. Implementation enablers, barriers, and quality metrics

9.1 Operational enablers

- Protocolized prehospital handoff templates and training, including team-based reporting methods (Gross et al., 2025).
- ED triage algorithms with dental trauma decision nodes and rapid access to dental/oral surgery on call.
- Imaging pathways with prioritized CT/CBCT access for displaced fractures.
- Analgesic bundles and regional anesthesia competencies in ED teams (Nagpal et al., 2024).
- Structured documentation templates and routine capture of prehospital photos.
- Early rehabilitation referral pathways and integrated outpatient scheduling.

9.2 Barriers

- ED overcrowding and specialist availability constraints (Chua et al., 2025).
- Variable clinician familiarity with dental trauma preservation techniques (avulsion handling, storage media).
- Inconsistent documentation standards, limited interoperability, and variable photo capture policies (Karaçor & Eden, 2026).
- Limited access to CBCT in some ED settings and concerns over radiation exposure in children.

9.3 Quality and outcome metrics

Process measures:

- Time from ED arrival to imaging report (targeted goal e.g., <60 minutes for urgent maxillofacial CT).
- Time from ED arrival to dental/oral surgery consultation.
- Proportion of avulsed permanent teeth reimplanted within 60 minutes.
- Frequency of structured prehospital handoff completion.

Outcome measures:

- Tooth survival/reimplantation success at 6 and 12 months.
- Functional outcomes (occlusion, TMJ range of motion) at 3–6 months.
- Patient-reported pain scores and quality-of-life metrics (baseline and follow-up).
- Rates of ED revisits and unplanned secondary procedures.

Balancing measures:

- Imaging utilization rates and radiation exposure monitoring.
- Opioid prescribing metrics (initial prescriptions and refill rates).

10. Research gaps and future directions

Important gaps persist: high-quality prospective trials evaluating prehospital teleconsultation impact on dental outcomes, randomized implementation studies of handoff templates, and comparative effectiveness research on imaging algorithms (CBCT vs panoramic vs CT) for specific clinical presentations. The intersection of orofacial pain mechanisms and acute trauma outcomes merits further study (Khan et al., 2019; Labanca et al., 2023) — particularly how early recognition of neuropathic features might alter analgesic strategy and improve long-term pain trajectories. Implementation science approaches can evaluate scalable models in diverse health systems (Gross et al., 2025; Chua et al., 2025).

Conclusion

Optimizing the clinical pathway for acute orofacial trauma requires integration across prehospital care, ED assessment, targeted imaging, rapid laboratory support, evidence-based pharmacologic management, early rehabilitation referral, and high-quality documentation. Standardized handoff templates, imaging algorithms, multimodal analgesic bundles, and structured EHR proformas are practical enablers that can reduce delay, improve decision-making, and enhance patient outcomes. Implementation should be accompanied by robust process and outcome measurement, iterative quality improvement, and interdisciplinary education. Future research should test specific pathway elements in pragmatic trials and evaluate long-term functional and patient-reported outcomes.

References

1. Breckons M, Bissett SM, Exley C, Araujo-Soares V, Durham J. Care Pathways in Persistent Orofacial Pain: Qualitative Evidence from the DEEP Study. JDR Clin Transl Res. 2017;2(1):48–57. https://doi.org/10.1177/2380084416679648
2. Chua E, Ji S, Kok HW, Lai YF, Chua C. Exploring prehospital emergency care challenges and interventions to reduce emergency department overcrowding: a qualitative meta-synthesis. BMJ Open. 2025;15(8):e097457. https://doi.org/10.1136/bmjopen-2024-097457
3. Gross CL, Cowgill CD, Selph BA, Cowgill JM, Saqr Z, Allen BR, Southwick FS, Hwang CW. Prehospital to emergency department handoff: can team-based reporting improve markers of clinical efficiency in an adult emergency department? BMJ Open Qual. 2025;14(2):e002948. https://doi.org/10.1136/bmjoq-2024-002948

4. Karaçor G, Eden E. Optimizing Documentation in Dental Trauma Cases: Quantitative and Qualitative Analysis. Dent Traumatol. 2026;42(3):407–417. https://doi.org/10.1111/edt.70035
5. Khan J, Zusman T, Wang Q, Eliav E. Acute and Chronic Pain in Orofacial Trauma Patients. J Endod. 2019;45(12S):S28–S38. https://doi.org/10.1016/j.joen.2019.05.010
6. Labanca M, Gianò M, Franco C, Rezzani R. Orofacial Pain and Dentistry Management: Guidelines for a More Comprehensive Evidence-Based Approach. Diagnostics (Basel). 2023;13(17):2854. https://doi.org/10.3390/diagnostics13172854
7. Nagpal AK, Gadkari C, Singh A, Pundkar A. Optimizing Pain Management in Emergency Departments: A Comprehensive Review of Current Analgesic Practices. Cureus. 2024;16(9):e69789. https://doi.org/10.7759/cureus.69789
8. Patel PB, Stanton DC, Granquist EJ. Common dental and orofacial trauma: evaluation and management. Med Clin North Am. 2014;98(6):1261–1279. https://doi.org/10.1016/j.mcna.2014.08.003
9. Whitesell RT, Burnett AM, Johnston SK, Sheafor DH. Pre-hospital emergency medicine: a spectrum of imaging findings. Emerg Radiol. 2024;31(3):405–415. https://doi.org/10.1007/s10140-024-02223-3