# Management of Isolated Mandibular Body Fractures in Adults

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**Guideline Development Group*

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## ABSTRACT

### Objective

The mandible is the most common fractured craniofacial bone of all craniofacial fractures in the Philippines, with the mandibular body as the most involved segment of all mandibular fractures. To the best of our knowledge, there are no existing guidelines for the diagnosis and management of mandibular body fractures in particular. General guidelines include the American Academy of Otolaryngology – Head and Neck Surgery Foundation (AAOHNSF) Resident Manual of Trauma to the Face, Head, and Neck chapter on Mandibular Trauma, the American Association of Oral and Maxillofacial Surgeons (AAOMS) Clinical Practice Guidelines for Oral and Maxillofacial Surgery section on the Mandibular Angle, Body, and Ramus, and a 2013 Cochrane Systematic Review on interventions for the management of mandibular fractures. On the other hand, a very specific Clinical Practice Guideline on the Management of Unilateral Condylar Fracture of the Mandible was published by the Ministry of Health Malaysia in 2005. Addressing the prevalence of mandibular body fractures, and dearth of specific guidelines for its diagnosis and management, this clinical practice guideline focuses on the management of isolated mandibular body fractures in adults.

### Purpose

This guideline is meant for all clinicians (otolaryngologists – head and neck surgeons, as well as primary care and specialist physicians, nurses and nurse practitioners, midwives and community health workers, dentists, and emergency first-responders) who may provide care to adults aged 18 years and above that may present with an acute history and physical and/or laboratory examination findings that may lead to a diagnosis of isolated mandibular body fracture and its subsequent medical and surgical management, including health promotion and disease prevention.

It is applicable in any setting (including urban and rural primary-care, community centers, treatment units, hospital emergency rooms, operating rooms) in which adults with isolated mandibular body fractures would be identified, diagnosed, or managed.

Outcomes are functional resolution of isolated mandibular body fractures; achieving premorbid form; avoiding use of context-inappropriate diagnostics and therapeutics; minimizing use of ineffective interventions; avoiding co-morbid infections, conditions, complications and adverse events; minimizing cost; maximizing health-related quality of life of individuals with isolated mandibular body fracture; increasing patient satisfaction; and preventing recurrence in patients and occurrence in others.

**Action Statements**

The guideline development group made *strong recommendations* for the following key action statements: (6) pain management- clinicians should routinely evaluate pain in patients with isolated mandibular body fractures using a numerical rating scale (NRS) or visual analog scale (VAS); analgesics should be routinely offered to patients with a numerical rating pain scale score or VAS of at least 4/10 (paracetamol and a mild opioid with or without an adjuvant analgesic) until the numerical rating pain scale score or VAS is 3/10 at most; (7) antibiotics- prophylactic antibiotics should be given to adult patients with isolated mandibular body fractures with concomitant mucosal or skin opening with or without direct visualization of bone fragments; penicillin is the drug of choice while clindamycin may be used as an alternative; and (14) prevention- clinicians should advocate for compliance with road traffic safety laws (speed limit, anti-drunk driving, seatbelt and helmet use) for the prevention of motor vehicle, cycling and pedestrian accidents and maxillofacial injuries.

The guideline development group made *recommendations* for the following key action statements: (1) history, clinical presentation, and diagnosis - clinicians should consider a presumptive diagnosis of mandibular fracture in adults presenting with a history of traumatic injury to the jaw plus a positive tongue blade test, and any of the following: malocclusion, trismus, tenderness on jaw closure and broken tooth; (2) panoramic x-ray - clinicians may request for panoramic x-ray as the initial imaging tool in evaluating patients with a presumptive clinical diagnosis; (3) radiographs - where panoramic radiography is not available, clinicians may recommend plain mandibular radiography; (4) computed tomography - if available, non-contrast facial CT Scan may be obtained; (5) immobilization - fractures should be temporarily immobilized/splinted with a figure-of-eight bandage until definitive surgical management can be performed or while initiating transport during emergency situations; (8) anesthesia - nasotracheal intubation is the preferred route of anesthesia; in the presence of contraindications, submental intubation or tracheostomy may be performed; (9) observation - with a soft diet may serve as management for favorable isolated nondisplaced and nonmobile mandibular body fractures with unchanged pre - traumatic occlusion; (10) closed reduction - with immobilization by maxillomandibular fixation for 4-6 weeks may be considered for minimally displaced favorable isolated mandibular body fractures with stable dentition, good nutrition and willingness to comply with post-procedure care that may affect oral hygiene, diet modifications, appearance, oral health and functional concerns (eating, swallowing and speech); (11) open reduction with transosseous wiring - with MMF is an option for isolated displaced unfavorable and unstable mandibular body fracture patients who cannot afford or avail of titanium plates; (12) open reduction with titanium plates - ORIF using titanium plates and screws should be performed in isolated displaced unfavorable and unstable mandibular body fracture; (13) maxillomandibular fixation - intraoperative MMF may not be routinely needed prior to reduction and internal fixation; and (15) promotion - clinicians should play a positive role in the prevention of interpersonal and collective violence as well as the settings in which violence occurs in order to avoid injuries in general and mandibular fractures in particular.

**Keywords:** *Mandibular fractures; jaw fractures; maxillofacial fractures; classification; complications; history; diagnosis; diagnostic imaging; therapy; diet therapy; drug therapy; prevention and control; rehabilitation; surgery.*

## INTRODUCTION

The mandible is the most common fractured craniofacial bone, involving 32.3 - 40% of all craniofacial fractures in the Philippines[1,2] in contrast to nasal bone fractures in international literature.[3] The etiology and fracture patterns vary from country to country depending on various environmental and socioeconomic factors.[4] A 2010-2017 survey of eight local otorhinolaryngology – head and neck surgery (ORL-HNS) training institutions (University of the Philippines - Philippine General Hospital, East Avenue Medical Center, Jose R. Reyes Memorial Medical Center, University of Santo Tomas Hospital, Baguio General Hospital and Medical Center, Rizal Medical Center, and the University of the East – Ramon Magsaysay Memorial Medical Center Inc.) revealed the mandibular body as the most commonly involved segment (29%) of all mandibular fractures.[1]

However, to the best of our knowledge, there are no existing guidelines for the diagnosis and management of mandibular body fractures in particular. General guidelines include the American Academy of Otolaryngology – Head and Neck Surgery Foundation (AAOHNSF) Resident Manual of Trauma to the Face, Head, and Neck chapter on Mandibular Trauma[5] and the American Association of Oral and Maxillofacial Surgeons (AAOMS) Clinical Practice Guidelines for Oral and Maxillofacial Surgery section on the Mandibular Angle, Body, and Ramus.[6] Similarly, a 2013 Cochrane Intervention Review attempted to "provide reliable evidence of the effects of any interventions either open (surgical) or closed (non- surgical) that can be used in the management of mandibular fractures, excluding the condyles, in adult patients".[7] On the other hand, a very specific Clinical Practice Guideline on the Management of Unilateral Condylar Fracture of the Mandible was published by the Ministry of Health Malaysia.[8]

Addressing the prevalence of mandibular body fractures, and dearth of specific guidelines for its diagnosis and management, this clinical practice guideline focuses on the management of isolated mandibular body fractures in adults.

## Definitions of Terms

In this guideline, the mandibular body is defined as the lateral bony region between the first premolar and after the second molar. *(Figure 1)*

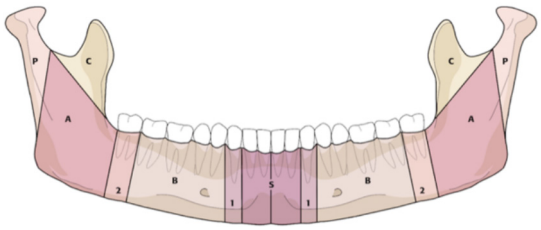


**Figure 1.** The mandibular body, B, lies between the first premolar and the second molar.[9] Reproduced with permission, from Ehrenfeld M, Manson PN, Prein J. Principles of Internal Fixation of the Craniomaxillofacial Skeleton. 2012. London: Thieme.

The anterior and posterior transition zones, regions bounded by vertical strips in the width of the crowns of the canine and third molar, respectively, are not included in this guideline. *(Figure 2)*

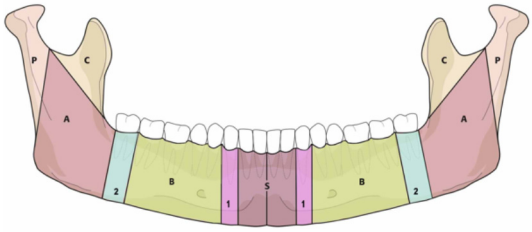


**Figure 2.** Anterior (pink) and posterior (blue) transition zones (numbered 1 and 2, respectively).[9] Reproduced with permission, from Ehrenfeld M, Manson PN, Prein J. Principles of Internal Fixation of the Craniomaxillofacial Skeleton. 2012. London: Thieme.

An isolated, or simple fracture is defined as a single fracture line producing two fracture fragments (*Figure 3)* as opposed to a complex fracture with one or more intermediate fragment(s) in which there is no contact between the main fragments after reduction or a fracture with more than one fracture line so that there are three pieces or more.

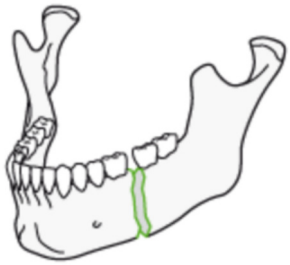

**Figure 3.** Diagram illustrating an isolated, or simple fracture of the mandible body.[10] Reproduced with permission, from the Arbeitsgemeinschaft für Osteosynthesefragen (AO) Surgery Reference Glossary. Online AO Surgery Reference. [cited 2015 August 8, 2015]. Available from *https://www2.aofoundation.org/wps/portal/surgery?showPage=diagnosis&bone=CMF&segment=Mandible)*

## Guideline Purpose

This guideline is meant for all clinicians in any setting who interact with adults aged 18 years and above, who may present with an acute history and physical and/or laboratory examination findings that may lead to a diagnosis of isolated mandibular body fracture and its subsequent medical and surgical management, including health promotion and disease prevention.

The guideline does *not* apply to mandibular body fractures with concomitant fractures elsewhere in the mandible, craniomaxillofacial, or cervical skeleton. It also does not apply to conditions associated with pathologic bone lesions/disease (osteoradionecrosis, pericoronitis, periodontal pockets, odontogenic cysts); gunshot injuries; iatrogenic mandibular fractures (intraoperative fracture associated with tooth removal); Langerhans cell histiocytosis and in patients who are unconscious, obtunded or neurologically unstable.

Other modifying factors such as edentulous mandible; congenital, developmental, structural, metabolic, infectious, neoplastic disorders / conditions affecting the mandible; atrophic mandible; tooth injuries/ periodontal trauma; alveolar fracture involvement; and bone loss/ defect fracture are not the primary focus of this guideline, but may be discussed relative to their impact on management.

In particular, this guideline is for the use of providers of health care to adults 18 years and older, including primary care and specialist physicians, nurses and nurse practitioners, midwives and community health workers, dentists and emergency first-responders.

It is applicable in any setting (including urban and rural primary-care, community centers, treatment units, hospital emergency rooms,

operating rooms) in which adults with isolated mandibular body fractures would be identified, diagnosed, or managed.

Although it was developed with input from other specialties and contains key action statements directed toward them, the intent is to provide guidance specifically for otolaryngologists – head and neck surgeons.

The primary outcome is to have a functional resolution of isolated mandibular body fractures. Additional outcomes include achieving premorbid form; avoiding use of context-inappropriate diagnostics and therapeutics; minimizing use of ineffective interventions; avoiding co-morbid infections, conditions, complications and adverse events; minimizing cost; maximizing health-related quality of life of individuals with isolated mandibular body fracture; increasing patient satisfaction; and preventing recurrence in patients and occurrence in others.

## METHODS

This guideline was commissioned by the Philippine Society of Otolaryngology – Head and Neck Surgery (PSOHNS) and undertaken by the Philippine Academy of Craniomaxillofacial Surgery (PACMFS). This guideline was developed with an explicit and transparent *a priori* protocol for creating actionable statements based on supporting evidence and the associated balance of benefit and harm, as outlined in the third edition of the *Clinical Practice Guideline Development Manual: A Quality-Driven Approach for Translating Evidence into Action* of the American Academy of Otolaryngology-Head and Neck Surgery Foundation (AAO-HNSF).[11]

A 19-member Guideline Development Group (GDG) was constituted, consisting of a chair, co-chair/methodologist, staff lead, content experts and stakeholders (2 maxillofacial surgeons, 2 dentists, an anesthesiologist, an orthopedic surgeon, a nurse practitioner, a radiologist, 2 family physicians, an ORL-HNS resident physician representative, 2 motorcyclists, a bicyclist/commuter/pedestrian as consumer advocate, and 1 liaison each of the PSO-HNS and PACMFS). *(Appendix A)* A Guideline Working Group (GWG) consisting of content experts (PACMFS consultants) and resident physicians of PSO-HNS training institutions was also convened. *(Appendix B)*

The GWG, together with the GDG Chair, Co-Chair/Methodologist, and Staff Lead conducted twice-monthly meetings from March 2015 to research, collect data, critically appraise evidence, review and grade literature, draft the scope, objectives, key action statements (KAS) and action statement profiles (ASP) of the proposed guideline. The GDG met monthly from August 2015 to April 2016 to discuss, evaluate, critique, revise, and agree on each KAS in the light of the ASP drafted by the GWG on each chapter topic.

The GDG initially brainstormed and listed topics they considered potentially relevant to the CPG, grouped into diagnosis, treatment, and prevention. *(Table 1)* Each participant ranked all the generated topics from 1 to 41. The rank averages were computed, and the top and bottom 10 interventions listed according to rank. Where no intervention was top-ranked for a certain category (prevention), or an important intervention (antibiotics) was not top-ranked for a certain category (treatment), these were added to the top-ranked interventions by consensus.

**Table 1.** Topics and issues considered in Mandibular Body Fractures guideline development[a]

| Diagnosis | Treatment | Prevention |
|---|---|---|
| Directed History | Stabilization | Environmental Controls |
| Symptoms of Mandibular Fracture | Immobilization | Pedestrian Protection |
| Physical Examination | Splinting/Bandaging | Motorist Education |
| Malocclusion | Analgesics | Traffic Law Enforcement |
| Signs of Mandibular Fracture | Steroids | Airbags |
| Bimanual Palpation | Anesthetics – local, topical | Seatbelts |
| Bite Test | Anesthetics – regional, general | Protective gear (helmets) |
| Imaging Procedures | Antibiotics | Road signs and international standards |
| CT Scans, X-Rays, Panoramic xray | Topical astringents, antiseptics | Safety barriers |
| Blood tests, ancillary labs | Appliances, other Alternatives | Alcohol and substance abuse/intoxication |
| Dental Impression | Closed/Open Reduction, Internal Fixation Arch Bars and IDW / MMF | Medications impairing ability to handle machinery |
| | | Strict implementation of driving license requirement |
| | Ernst Ligature | Safety advancements in the vehicles |
| | Ivy loop | |
| | Interosseous Wires | |
| | Plates and Screws | |
| | Absorbable plates | |

[a]This list was created by the guideline development group to refine content and prioritize action statements; not all items listed were ultimately included or discussed in the guideline.

**Literature Searches**

Literature searches were performed by the Guideline Working Group (GWG) from March through July 2015 using a validated filter strategy to identify all published clinical practice guidelines, manuals, systematic reviews, meta-analyses, randomized controlled trials, comparative studies and original research studies.

The initial PubMed MEDLINE search using "facial fractures" or "maxillofacial fractures" or "mandibular fractures" or "jaw fractures" in any field yielded 8752 potential articles. Original research studies were identified by limiting the MEDLINE search to articles on humans published in English until July 2015. The resulting data set of 1116 articles yielded 274 randomized controlled trials, 359 reviews, 58 systematic reviews, 1 guideline, and 424 studies that did not fall under the previous types.

Search of the National Guideline Clearinghouse (NGC) for any topic related to mandibular fractures yielded 3 systematic reviews.

Randomized controlled trials were identified by search of the Cochrane Controlled Trials Register, which identified 472 trials with "mandibular fracture" or "jaw fracture" or "mandibular trauma" or "maxillofacial fracture" in any field. Search of the Cochrane Library identified one relevant title. After eliminating articles that did not have mandibular fracture as the primary focus, only 1 systematic review met quality criteria of having explicit criteria for conducting the literature search and selecting source articles for inclusion or exclusion.

Using the same search parameters in the Global Index Medicus (GIM) yielded 21 case reports, 11 incidence studies, 6 prevalence studies, 6 screening studies, 3 systematic reviews, 1 evaluation study and 1 practice guideline.

A search in HERDIN yielded 4 descriptive studies and 3 case reports.

The literature was further narrowed using the standard literature review process including removal of topics without sufficient evidence; non original research; letters; commentaries; narrative reviews; non clinical research; irrelevant case reports; or irrelevant case series. Articles that were hit in multiple search engines were counted as one.

Search results were distributed to the GDG prior to each GDG meeting. Materials were supplemented, as needed, with targeted searches to address gaps identified in writing the guideline from August 2015 to April 2016. Relevant evidence was reviewed and analyzed by the GDG and integrated in the recommendations of this CPG. A sample search for the first KAS is shown in *Figure 4*.

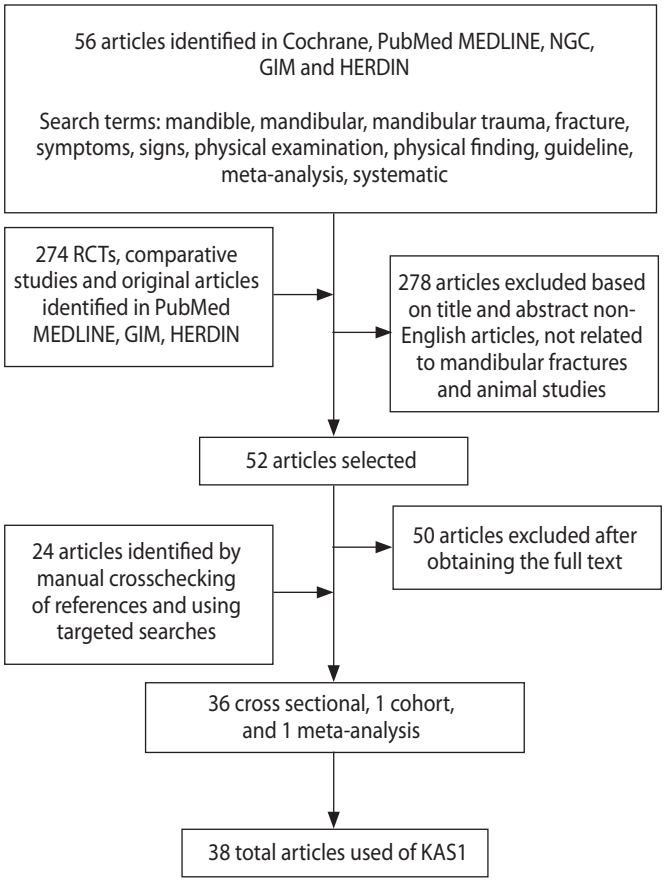


**Figure 4.** Search strategy for the first key action statement

In a series of meetings (held every 2 weeks), the working group defined the scope and objectives of the proposed guideline. During the 9 months devoted to guideline development ending in April 2016, the development group met once every month to discuss key action statements in the light of action statement profiles drafted by the GWG on each chapter topic. Consultants assigned to write each ASP reviewed the literature, met with their respective GWG resident members to critically appraise the literature, grade levels of evidence (A, B, C, D), and refine each drafted KAS and ASP. All literature was classified according to levels of evidence based on the Modified Evidence Pyramid illustrated in *Figure 5*.[12] They also submitted relevant articles via email and met with respective members of the development group prior to the monthly in-person GDG meetings.

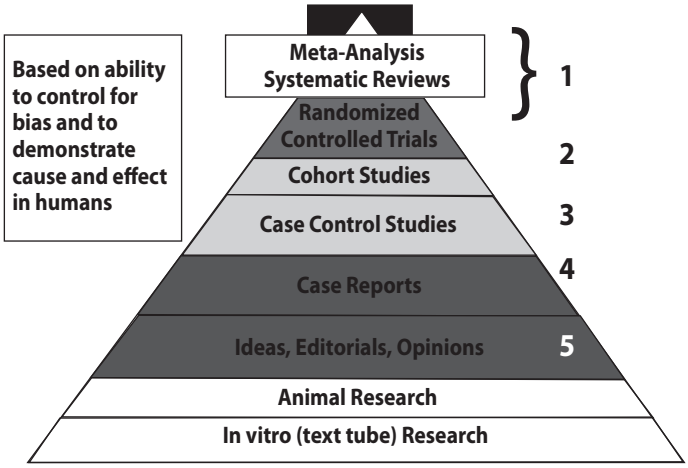


**Figure 5.** Levels of clinical evidence for therapy/prevention and etiology/harm. Modified Evidence Pyramid used with permission granted by SUNY Downstate Medical Center, Medical Research Library at Brooklyn, http://library.downstate.edu/EBM2/2100.htm.[12]

The GDG refined each drafted KAS and ASP, classifying each evidence-based action statement (strong recommendation, recommendation, option). The evidence profile for each statement was converted into an action statement profile, following each key action statement. Statements about the aggregate evidence quality (recommendation grade and level of evidence), benefit, risks, harms, cost, benefit - harm assessment, value judgements, intentional vagueness, role of patient preference, exceptions, policy level, and differences of opinion, were included in each ASP. The definitions for evidence-based statements were based on guidelines from the American Academy of Otolaryngology-Head and Neck Surgery.[11]

All GDG panel members participated in a Delphi Process in April 2016 to arrive at consensus on the final 15 key action statements and their respective action statement profiles. A sample of the instrument used is in *Appendix C.* Panelists individually rated their agreement with each key action statement on a 9-point Likert scale labeled at intervals (1 - strongly disagree, 3 – disagree, 5 – neutral, 7 – agree, 9 – strongly agree), and the mean scores were computed and projected for discussion.

Accepted criteria for consensus[9] were applied. Consensus meant statements achieving a mean score of ≥7.00 and having no more than 1 outlier (that is, any rating ≥2 Likert points from the mean in either direction); Near Consensus meant statements achieving a mean score ≥6.50 and having no more than 2 outliers (any rating ≥2 Likert points from the mean in either direction); No Consensus meant statements that did not meet the criteria of consensus or near consensus. For purposes of emphasis, Strong Consensus was defined as a mean Likert score ≥8.00 with no outliers.[9] The individual ratings and averages per item are seen in *Figure 6.*

| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| J. Lapena | X | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 |
| M. Lapena | X | 8 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 8 | 7 | 7 | 7 | 9 | 8 |
| Antonio | X | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 |
| David | X | 9 | 9 | 9 | 9 | 9 | 8 | 8 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 |
| Joves | X | 9 | 9 | 9 | 9 | 9 | 7 | 7 | 9 | 9 | 8 | 8 | 8 | 8 | 9 | 7 |
| Aninang | X | 8 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 |
| Laxamana | X | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 |
| Acluba | X | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 |
| Cruz | X | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 |
| Pascual | X | 8 | 8 | 8 | 8 | 8 | 7 | 7 | 8 | 8 | 7 | 8 | 8 | 8 | 8 | 8 |
| Donato | X | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 8 | 9 | 8 |
| De Castro | X | 8 | 7 | 8 | 9 | 8 | 7 | 8 | 8 | 8 | 8 | 8 | 8 | 7 | 8 | 8 |
| Ignacio | X | 9 | 9 | 7 | 9 | 7 | 7 | 8 | 8 | 9 | 9 | 9 | 9 | 9 | 9 | 9 |
| Esquillo | X | 8 | 9 | 9 | 9 | 8 | 8 | 9 | 9 | 8 | 9 | 9 | 9 | 5 | 9 | 8 |
| Blanes | X | 9 | 9 | 9 | 8 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 7 | 9 | 7 |
| Tan | X | 9 | 7 | 9 | 7 | 9 | 9 | 7 | 9 | 7 | 7 | 7 | 7 | 7 | 9 | 7 |
| Dizon | X | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 |
| Pineda | X | 9 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 9 | 9 |
| Lago | X | 9 | 7 | 5 | 7 | 7 | 7 | 7 | 8 | 7 | 8 | 8 | 7 | 7 | 9 | 9 |
| | | 166 | 161 | 160 | 162 | 161 | 156 | 157 | 164 | 161 | 162 | 162 | 161 | 153 | 169 | 160 |
| | | | | | | | | | | | | | | | | |
| **AVE** | | **8.8** | **8.5** | **8.4** | **8.5** | **8.5** | **8.2** | **8.2** | **8.6** | **8.5** | **8.5** | **8.5** | **8.5** | **8.1** | **8.9** | **8.4** |
| | | | | | | | | | | | | | | | | |
| Mean + 2 | | 10.8 | 10.5 | 10.4 | 10.5 | 10.5 | 10.2 | 10.2 | 10.6 | 10.5 | 10.5 | 10.5 | 10.5 | 10.1 | 10.9 | 10.4 |
| Mean - 2 | | 6.8 | 6.5 | 6.4 | 6.5 | 6.5 | 6.2 | 6.2 | 6.6 | 6.5 | 6.5 | 6.5 | 6.5 | 6.1 | 6.9 | 6.4 |

**Figure 6.** Individual ratings and average ratings per key action statement obtained from the Delphi process

### Financial Disclosure and Conflicts of Interest

A contract grid was accomplished by each Guideline Development Group (GDG) and Guideline Working Group (GWG) member for the 1st conference meeting; copies of the Policy for Management of Financial Conflicts of Interest in the Development of ATS Clinical Practice Guidelines, and Conflict of Interest Guidelines for Clinical Guidelines was also provided per panelist to stress the importance of COI disclosures. These included non-financial conflicts (intellectual passion, personal relationships, institutional and professional affiliations, political or religious beliefs). After review and discussion of their disclosures, panelists agreed to remind the panel of potential conflicts before any related discussion, and to recuse themselves from any discussion related to their potential conflict of interest if so requested. Panelists also agreed to maintain confidentiality about proceedings until the final CPG was publicized.

### Final Version of the Guideline

In the process of writing the final CPG, additional literature was retrieved and critically appraised by the GWG until September 2017, and included in the references for action statement profiles. As none of the additional evidence contradicted the key action statements and action statement profiles, the full GDG was not reconvened to appraise

these statements. This final version was rewritten by the two co-first authors (JFL, JFD) with the assistance of a Head and Neck Microvascular Reconstructive Surgery Fellow (MATG) and Craniomaxillofacial Surgery Fellows (ICSDG, ICA, VJBY, KMAT, DJCC), supported by an expanded GWG *(Appendix B),* who re-checked all statements, citations, and references. The publication of this version was delayed by the COVID-19 pandemic that began in early 2020.

The final key action statements and action statement profiles were pilot-presented to local clinicians in a provincial setting (Maxillofacial Seminar and Workshop on Mandibular and Midface Fractures, Philippine Academy of Craniomaxillofacial Surgery and Bicol ENT-HNS Chapter, Naga City, October 28, 2017), and before a national convention of otolaryngologists (PSO-HNS 61st Annual Convention and 10th International Symposium on Recent Advances in Rhinosinusitis and Nasal Polyposis, The Manila Hotel, December 1, 2017). This CPG was then presented at a national forum of family physicians and general practitioners (Philippine Academy of Family Physicians 57th Anniversary and Annual Convention, Philippine International Convention Center, March 2, 2018), and an international conference of otolaryngologists (10th International Academic Conference in Otology, Rhinology, and Laryngology, Fairmont Hotel, Makati City, March 2, 2018). It was also presented during the PACMFS Maxillofacial Seminar and Workshop on Mandibular and Midface Fractures at the Ilocos Training and Regional Medical Center, San Fernando, La Union on November 16, 2018; as part of the Basic Facial Plastic and Maxillofacial Course, PSO-HNS, Philippine Academy of Facial Plastic and Reconstructive Surgery (PAFPRS), and PACMFS at the Manila Doctors Hospital on April 26, 2019; the PACMFS Maxillofacial Seminar and Workshop at the Jose B. Lingad Memorial Regional Hospital in San Fernando, Pampanga, July 11, 2019; the PACMFS Maxillofacial Seminar and Workshop on Mandibulo-Maxillary Fixation (MMF) and Mandibular and Midface Fractures at the Paulino J. Garcia Memorial Research and Medical Center in Cabanatuan City, Nueva Ecija on February 7, 2020; and as a keynote lecture at the *Arbeitsgemeinschaft für Osteosynthesefragen* CranioMaxilloFacial (AOCMF) Asia Pacific Management of Facial Trauma course in Thiruvalla, Kerala, India on January 4, 2020.

The recommendations in this CPG are based on the best available published data through September 2017. Where data were lacking, a combination of clinical experience and expert consensus was used. A scheduled review process will occur 5 years from publication of this CPG or sooner if new compelling evidence warrants earlier consideration.

## GUIDELINE KEY ACTION STATEMENTS

This guideline has fifteen (15) key action statements, grouped into diagnosis (1-4), treatment (5-13) and disease prevention and health promotion (14-15). Each evidence-based statement is organized similarly: a key action statement in bold, followed by the strength of the recommendation in italics and an action statement profile that explicitly states the aggregate evidence quality, benefit, harms, risks, costs, and benefit-harm assessment. In addition, there are statements of any value judgments, the role of patient (caregiver) preferences, clarification of any intentional vagueness by the panel, exceptions to the statement, any differences of opinion, and a repeat statement of the strength of the recommendation. Supporting text subsequently discusses the evidence base supporting the statement. A summary of each key action statement in this guideline can be found in *Table 4.*

**Table 4.** Summary of guideline key action statements

| Statement | Action | Strength |
|---|---|---|
| 1. History, clinical presentation and diagnosis | Clinicians should consider a presumptive diagnosis of mandibular fracture in adults presenting with a history of traumatic injury to the jaw plus a positive tongue blade test, and any of the following physical findings: malocclusion, trismus, tenderness on jaw closure and broken tooth. | Recommendation |
| 2. Panoramic xray | Clinicians may request for panoramic x-ray as the initial imaging tool in evaluating patients with a presumptive clinical diagnosis of mandibular fractures | Recommendation |
| 3. Radiographs | In a setting where panoramic radiography is not available, clinicians may recommend plain mandibular radiography among patients with presumptive clinical diagnosis of mandibular fracture. | Recommendation |
| 4. Computed Tomography | If available, non-contrast Facial CT Scan may be obtained for the assessment of mandibular fractures. | Recommendation |
| 5. Immobilization | Isolated mandibular body fractures should be temporarily immobilized/splinted with a figure-of-eight bandage until definitive surgical management can be performed or while initiating transport during emergency situations. | Recommendation |

| Statement | Action | Strength |
|---|---|---|
| 6. Pain Management | Clinicians should routinely evaluate pain in patients with isolated mandibular body fractures using a numerical rating scale (NRS) or visual analog scale (VAS); analgesics should be routinely offered to patients with a numerical rating pain scale score or VAS of at least 4/10.<br>Patients may be initially managed with paracetamol and a mild opioid with or without an adjuvant analgesic. Reassessment should be done and adequate analgesia should be given until the numerical rating pain scale score or VAS is 3/10 at most. | Strong Recommendation |
| 7. Antibiotics | Prophylactic antibiotics should be given to adult patients with isolated mandibular body fractures with concomitant mucosal or skin opening with or without direct visualization of bone fragments.<br>In patients without mucosal or skin lacerations, prophylactic antibiotics can be given 1 hour prior to surgery and up to 24 hours post op.<br>Penicillin is the drug of choice while clindamycin may be used as an alternative for patients in whom penicillin is contraindicated. | Strong Recommendation |
| 8. Anesthesia | Nasotracheal intubation is the preferred route of anesthesia in patients diagnosed with isolated mandibular body fracture.<br>In the presence of contraindications to nasotracheal intubation, submental intubation or tracheostomy may be performed. | Recommendation |
| 9. Observation | Observation with a soft diet may serve as management for patients diagnosed with favorable isolated nondisplaced and nonmobile mandibular body fractures with unchanged pre - traumatic occlusion. | Recommendation |
| 10. Closed Reduction | Closed reduction with immobilization by maxillomandibular fixation for 4-6 weeks may be considered in patients with minimally displaced favorable isolated mandibular body fracture with stable dentition, good nutrition and who are willing to comply with post-procedure care that may affect oral hygiene, diet modifications, appearance, oral health and functional concerns (eating, swallowing and speech). | Recommendation |
| 11. Open Reduction with transosseous wiring | In patients with isolated displaced unfavorable and unstable mandibular body fracture who cannot afford or avail of titanium plates, transosseous wiring with maxillomandibular fixation is an option. | Recommendation |
| 12. Open Reduction with titanium plates | Open reduction and internal fixation using titanium plates and screws should be performed in isolated displaced unfavorable and unstable mandibular body fracture. | Recommendation |
| 13. Maxilllomandibular Fixation | Intraoperative MMF may not be routinely needed prior to reduction and internal fixation of isolated displaced unfavorable and unstable mandibular body fracture. | Recommendation |
| 14. Prevention | Clinicians should advocate for compliance with road traffic safety laws (speed limit, anti-drunk driving, seatbelt and helmet use) for the prevention of motor vehicle, cycling and pedestrian accidents and maxillofacial injuries. | Strong Recommendation |
| 15. Promotion | Clinicians should play a positive role in the prevention of interpersonal and collective violence as well as the settings in which violence occurs in order to avoid injuries in general and mandibular fractures in particular. | Recommendation |

**STATEMENT 1. HISTORY, CLINICAL PRESENTATION AND DIAGNOSIS: Clinicians should consider a presumptive diagnosis of mandibular fracture in adults presenting with a history of traumatic injury to the jaw plus a positive tongue blade test, and any of the following physical findings: malocclusion, trismus, tenderness on jaw closure and broken tooth.** *Recommendation.*

***Action Statement Profile for Statement 1***

- Aggregate evidence quality: Level II, Grade B

Level III. A cross sectional study of 449 patient records in Nigeria showed most fractures were caused by road crashes and involved the mandibular body (51%) followed by the angle (19%), with male preponderance (4.7 males:1 female).[13]

Level III. A cross sectional study of 314 patients from two urban centers in Nigeria noted "the commonest site of fracture … was the body of the mandible followed by the angle." Road traffic crashes were the leading cause (67.5%), followed by assault (18.8%). In contrast, assault was the commonest cause of injury in developed countries.[14]

Level II. A retrospective cohort study by the University of Pittsburgh from 2001 to 2005 involving a total of 13,142 patients showed "assault was the predominant mechanism of injury (42%), followed by motor vehicle accidents (31%);" with "male preponderance... similar to overall age distribution."[15]

Level III. A cross sectional study in the Quirino Memorial Medical Center from 1996 to 1997 involving 29 patients attributed the highest number of fractures to vehicular accidents at 44.8% followed by assault at 24.1%.[16]

Level III. A cross sectional study involving 768 patients in Shiraz Chamran Emergency Hospital, Iran between 2004 and 2010 observed that "isolated mandibular fracture due to road traffic accident was the most common type of maxillofacial injuries" and that the most common site of the mandible fractured was the body.[17]

Level III. A cross sectional study of 532 patients in Turkey noted that different causes were involved in young and adult patients. "The most common cause of injury in young patients was falls (65%), while road traffic accidents predominated in adult patients (88%)." [18]

Level III. A cross sectional study performed among 11,728 patients in Brazil revealed that "the most frequent cause of maxillofacial injuries for both genders was traffic accidents (39.6%), followed by fights (21.6%). In women, the second most frequent cause was falls (22.4%)." [19]

Level III. A cross sectional study done in Italy (UNITO) and the Netherlands (VUMC) between January 2001 and December 2010 included 752 patients from Turin and 245 patients from Amsterdam. Assault was the main cause of fractures with "27% at VUMC, 29% at UNITO." "A statistically significant association was found between male gender and the aetiology of 'assault' in both study populations". They also noted that "the most frequently observed sign in both study populations was post-traumatic malocclusion, followed by facial lacerations in the chin region and inferior alveolar nerve paresthesia." [20]

Level III. A cross sectional study that reviewed records of 444 patients in the University Hospital of Freiburg, Germany noted that "road traffic accidents and fights were the leading causes of mandibular fractures, followed by falls. Bicycle accidents were the most common cause of all road traffic accidents". It was hypothesized to be related to the fact that a small university with a young population was involved. "Falls and sport accidents were also noted to be more common in larger cities." [21]

Level III. A cross sectional study in the Piracicaba Dental School, Brazil from 1999 to 2004 included a total of 1,024 patients with 1,399 facial fractures. Results revealed that "traffic accidents were the most frequent etiological factor of maxillofacial fractures irrespective of gender (46.2% for men and 40.3% for women)". [22]

Level III. A cross sectional study of 355 patient records from Brazil in 2010 revealed "interpersonal violence in 99 cases (27.9%, SD%=4.5) and car accidents in 59 cases (16.6%, SD%=5.2)". Young male adults were the most prevalent victims. [23]

Level III. A cross sectional study in Brazil from January 2000 to December 2002 showed that 2,736 of the patients had facial fractures,1,023 (37.39%) of whom had mandibular fractures. "The major cause of mandibular fractures in this study was

vehicle accidents, second most common was violence." "Gunshot wounds and traffic accidents were more common in males than in females. The opposite occurred with falls and violence." [24]

Level III. A cross sectional study in South America showed that 126 patients suffered a total of 201 mandibular fractures, associated or not with other maxillofacial fractures. The etiology most frequently observed was traffic accidents in 59 patients (47%). Symptoms of mandibular fractures include pain in 114 (91%), changed dental occlusion in 98 (78%), and mental nerve paresthesia in 35 (28%). Signs included facial swelling (74%), limitation of mouth opening (55%), and malocclusion (48%). [25]

Level III. A cross sectional study 138 cases of mandibular fracture in different government hospitals in the Philippines (East Avenue Medical Center, Jose R. Reyes Memorial Hospital, Philippine Orthopedic Hospital, and V. Luna Memorial Hospital) found the major cause of mandibular fracture was assault or mauling comprising 60 cases (43.5%) of the entire study. [26]

Level III. A cross sectional study in Scotland found that 4,711 patients had maxillofacial fractures of one or more facial bones; of which 2,137 had at least one mandibular fracture (with a total of 3,462 mandibular fractures). The patients were from a large industrialized area with high rates of unemployment. The mandible is one of the more common targets in altercations and, as the majority of this sample of patients sustained trauma during altercations, one could expect this finding. [27]

Level III. A cross sectional study of 790 cases of oral–maxillofacial trauma in South America found that 140 individuals (17.7%) had injuries stemming from interpersonal violence [(10.1%) due to urban violence and 42 (5.3%) due to domestic violence]. For urban violence, the most common types of injury were facial contusion and dental concussion (70; 87.5%), facial laceration (46; 57.5%), and mandibular fracture (26; 32.5%). For domestic violence, the most frequent types of injury were facial contusion (n = 41; 97.6%), facial laceration (16; 38.1%), and mandible fracture (10; 23.8%). [28]

Level III. A cross sectional study in the United States evaluated records from 1,067 patients sustaining 1,515 mandibular fractures. The major causes of mandibular fracture were altercations (47.5%), automobile accidents (27.3%) and motorcycle accidents (4.2%), accounting for approximately one third of fractures. The causes of the remainder of mandibular fractures could be grouped into four major categories: falls (7.1%), sports-related incidents (5.4%) work-related accidents (3.0%), and other causes (5.5%). [29]

Level III. A cross sectional study of records of 328 active military personnel and dependents treated for mandibular fractures at a tertiary military hospital in the Philippines showed varied causes: vehicular accidents (not work-related) in 190 (57.9%), combat-related (from gunshots) in 102 (31.1%), accidental falls in 17 (5.2%), violent assault in 13 (4.0%) and sports-related injuries in 6 (1.8%). The most commonly fractured site was the body (188 cases; 27.77%), followed by the parasymphysis (166 cases; 24.52%). The angle, symphysis, ramus and condyle had prevalence rates of 17.58%, 11.23%, 7.68%, and 7.38%, respectively. [2]

Level III. A cross sectional study that reviewed records of 512 patients at the Philippine General Hospital from January 2004 to December 2007 noted maxillofacial fractures were most common among young adults aged 21 to 30 years old (34.8%), followed by adults aged 31 to 40 years old (22.1%). Men were injured more than women with a 7:1 ratio (males = 87% females = 13%). The most common etiology was traffic-related accidents (63.7%) in contrast to physical assault in previous decades. Other causes were physical assault or mauling (14.5%), falls (11.5%), gunshot wounds (6.4%) and hacking (3.1%). Mandibular fractures were the most common (168; 32.8%). [4]

Level III. A cross sectional study of 2,094 patients with facial fractures from various accidents in a Tertiary Hospital in Korea revealed the most common age group was the third decade of life (29%), involving males more than females (3.98:1). The most common etiology was violent assault or nonviolent traumatic injury (49.4%) and the most common isolated fracture sites were nasal bone (37.7%), mandible (30%), orbital bones (7.6%), zygoma (5.7%), maxilla (1.3%) and frontal bone (0.3%). [30]

Level III. A cross sectional study of 134 patients with 225 mandibular fractures at a suburban trauma center in Illinois, USA. Study showed violent crimes (assault, gunshot wounds) accounted for the majority cause (50%) vs. motor vehicle accidents (29%). Overall, parasymphyseal fractures were most frequently involved (35%), followed by the body and angle fractures (21% and 15%, respectively). There was a statistically significant association of motor vehicle accidents with parasymphyseal fractures (45%), and gunshot wounds with body fractures (36%), whereas assault victims had a higher than predicted frequency of angle fractures (27%) and fewer parasymphyseal fractures (19%). Patients aged 17 to 30 were more likely to suffer from gunshot wounds, whereas older adults (age 31–50) were more likely to be assault victims. Patients over age 50 suffered fractures from falls at a higher than expected rate. [31]

Level III. A cross sectional study on epidemiology and patterns of injury in mandibular trauma based on the Parkland Memorial Hospital, Texas registry yielded 4,143 mandibular fractures in 2,828 patients between 1993-2010. Average age was 38 years with 33% in the third decade, 83.27% were male and most injuries occurred in summer (July highest). Mechanisms of injury were predominantly low-velocity blunt injuries (62%) vs. high-velocity blunt injuries (31%). Anatomical distribution of fractures was: angle (27%), symphysis (21.3%), condyle/subcondyle (18.4%), and body (16.8%). [32]

Level III. A cross sectional study reviewed records of 119 patients treated for mandibular fractures between 2006 and 2011 in Brazil revealed mandibular fractures mostly affect Caucasian (72.2%) men (80.7%). Road traffic accidents (RTA) caused the most fractures (49.5%), followed by physical violence, including gunshot wounds (21%). Motorcycle accidents were the most common cause of RTA (76.2%). And the most affected mandibular regions were the parasymphysis (26.9%) and the mandible angle (25.1%). [33]

Level III. A cross sectional study of 1,267 patients with clinical and radiological diagnosis of mandibular fractures at an urban level I trauma center in Washington, DC showed that 86% were male and 37% were in the 25 to 34-year-old age group. Use of an illicit substance at the time of trauma was seen in 55% of all cases. Interpersonal violence accounted for 79%, with prevalence in summer (31%) and winter (28%) months. The most common location was the angle (36%), followed by the body (21%) and parasymphyseal region (17%), and 52% had more than one fracture site. The evolving pattern of fractures in urban trauma centers showed an increasing trend of association with illicit substances and interpersonal violence as a major causative factor. [34]

Level III. A cross sectional study of 580 patients with mandibular fractures at the University of Iowa Hospitals and Clinics from 1972 to 1978 showed more fractures of the condyle (29.1%) and angle (24.5%), with correspondingly fewer parasymphysis/symphysis region (22%) and body (16%) fractures, in comparison to other reported studies. The site of fracture is related to the type of trauma involved. Altercations, in which most force is directed in a single blow to the lateral aspect of the jaw, tend to result more frequently in angle (37.3%) and body (19.4%) fractures. While automobile accidents, which more frequently involve trauma to the anterior mandible, result in more fractures of the symphysis region (27.7%), alveolus (4.5%) and condyle (30.9%). Motorcycle accidents produce many more alveolar fractures (9.1%), suggesting that the traumatic force in this kind of accident is often directed to the alveolus. 46.6% of those individuals involved in motor vehicle accidents had the highest incidence of concomitant other injuries in addition to the mandibular fractures.[35]

Level III. A cross sectional study of records and radiographs in maxillofacial units of two universities in Jordan showed a total of 703 patients with 892 mandibular fractures [502 (71%) male and 201 (29%) females]. There were 497 (71%) adults with 676 fractures, and 206 (29%) young patients with 216 fractures. In adults, the most common fracture site was the mandibular body (32%) often caused by road traffic accidents (47%), whereas in young patients, the condyle (38%) was the predominant fracture site and the most common etiology was a fall (49%).[36]

Level III. A cross sectional study of 266 patients with mandibular fractures in Sweden 1999-2008. The study revealed that 70% of fractures involve young men, aged 16 to 30 years old (50%). Interpersonal violence was the most common etiology (24%) followed by falls (23%) that had the highest incidence during the summertime and weekends. [37]

Level III. A cross sectional study of 509 patients treated at the University Hospital in Alexandria, Egypt from the year 1991 to 2000 reviewed a total of 755 mandibular fractures; 79% were composed of men with a 3.6:1 male:female ratio. Most fractures were sustained by men in the age group 21–30 years (26%) and girls between 0 and 10 years (43%). 198 of 509 (39%) patients sustained fracture due to road crashes, followed by falls (n=173, 43%) and assaults (n=83, 16%). Fractures of the angle (22%) were the most common followed by the parasymphyseal region (21%) and the lowest was in the coronoid region (1%). The largest monthly incidence was in January (13%) and least in October (6%).[38]

Level III. A cross sectional study of 213 patients with mandibular bone fracture in Amsterdam for a period of 10 years between January 2000 to January 2009 consisted of 146 male and 67 female patients with a ratio of 2.2:1, with a mean age of 32.5 (SD, 15.2) years. For male patients, violence (33.6%) was the main cause of injury while traffic accidents (50.7%) were the most common cause in female patients. Overall, the mandibular body (46.8%) was the main site involved regardless of the etiology.[39]

Level III. A cross sectional review of records of mandibular fractures in the United States and in Turkey between 1991 and 2000, wherein 210 Turkish patients had 252 mandibular fractures, whereas the 665 US patients had 1042 mandibular fractures. Majority of the patients were male, 84% in the US versus 76% in Turkey. Assault (53.7%) was the most common cause of mandibular fractures in the US, whereas in Turkey the most common cause was motor vehicular accident (36.2%). The angle of the mandible (27.57%) was the most common site of fracture in the US in contrast to Turkey, where the body (28.97%) was the most common fracture site. The study concluded that socioeconomic, cultural and environmental factors all play a part in determining the types of patients involved, sites of injury and the causes of the problem.[40]

Level III. A cross sectional study of 110 patients with complaints or physical findings suggestive of undiagnosed mandibular fracture seen at the emergency department of Kern Medical Center from February 1992 to March 1994 where 53 patients had mandibular fractures; 41 of 53 patients had at least one mandibular fracture while 12 appeared normal on x-ray. Among 42 patients scored negative on the tongue blade test, 2 patients proved to have fractures on radiograph. The study concluded the tongue blade test had a sensitivity of 95.7%, specificity of 63.5%, a positive predictive value of 66.2%, a negative predictive value of 95.2%, and an accuracy of 77.3%.[41]

Level III. A double blinded diagnostic cross sectional study of 57 subjects with facial trauma who were included over a non-consecutive 4-month period from June 2013 to April 2014. The study aimed to assess the predictive value of physical examination findings in detecting facial fractures in trauma patients. Dental malocclusion (31.6%) and tenderness (35.1%) showed the best diagnostic properties. And intraoral/gingival laceration (19.3%) showed relatively poor positive predictive value and sensitivity. The study concluded that physical examination findings of mandibular fractures have a 100% sensitivity rate and negative predictive value on correlation to CT scan findings. However, the mandible has a low positive predictive value of 55.6% and specificity of 71.4%.[42]

Level III. A diagnostic cross sectional study using the Manchester mandibular fracture decision rule to reduce the need for radiographs in mandibular trauma conducted at the city-centre emergency department between July 2000 and December 2001 included 280 patients in the study with 65 cases of mandibular fracture based on radiographs. The clinical predictors used in the decision rule for mandibular fracture had the following sensitivity rates: malocclusion (88%), pain with mouth closed (77%), trismus (63%), broken teeth (14%), and step deformity (18%). The decision rule showed 100% sensitivity and 37% specificity. The study concluded the decision rule successfully predicted a fracture in all 28 cases with clinical suspicion of fracture prior to the x-ray and 83 radiographs were avoided without missing any fracture.[43]

Level I. A meta-analysis of 269 papers on the utility of the tongue blade test for the diagnosis of mandibular fracture. Two diagnostic studies with best evidence reported high sensitivity (95.7 and 95%) of the tongue blade test as a useful screening tool in evaluating patient with mandibular fractures.[44]

Level III. A diagnostic cross-sectional study was conducted in an urban emergency department in Kansas City from January 1, 1993, to December 31, 1993, to evaluate the diagnostic accuracy of clinical signs and symptoms of mandibular fracture. A total of 119 subjects were included in the study and 44 subjects were diagnosed with mandibular fracture. Malocclusion (33 of 44 subjects) and facial asymmetry (21 of 44 subjects) were strong predictors of fracture. A negative result on the tongue blade test (2 of 44 subjects) was a strong predictor of non-fracture. In conclusion, the tongue blade test is a useful screening tool in evaluation of patients with mandibular trauma because of its high sensitivity and negative predictive value.[45]

Level III. A cross sectional study from August 1, 2010 to April 11, 2012 at a single urban academic emergency room to determine the sensitivity and specificity of the tongue blade test in comparison with CT scan in 190 patients. The tongue blade test showed a sensitivity of 95% and specificity of 68%. The test also demonstrated an accuracy rate of 82% in this study.[46]

Level III. A cross sectional study to evaluate the utility of the tongue blade bite test in predicting mandibular fracture in Louisiana from year 2011 to 2014. A chart review of 86 patients with facial trauma (with 12 pediatric patients) were included in the study. All subjects had a bite test done and underwent CT scan. Bite test revealed a sensitivity of 88.5%, specificity of 95%, positive predictive value of 88.5%, and negative predictive value of 95%. Among the pediatric group, the sensitivity was 100%, specificity was 88.9%, positive predictive value was 75% and negative predictive value was 100%.[47]

Level III. A cross sectional study of 144 patients with blunt trauma to the face were evaluated with tongue blade test and CT scan or plain radiograph of the face to determine the sensitivity and specificity of the tongue blade test on mandibular fracture and maxillary sinus fracture. 16 patients (11.1%) had mandibular fractures and positive tongue blade test. 37 patients (27.8%) had maxillary sinus or Lefort fractures and positive tongue blade tests. For mandibular fractures, the sensitivity was 100% and specificity was 74.8%, while in maxillary sinus fractures, tongue blade test sensitivity was 48.6% and specificity was 69.8%.[48]

- Benefit: Clinicians can presumptively rule out a diagnosis of mandibular fracture during the initial patient encounter; potential savings from avoiding unnecessary radiographs, medical treatment, and costly procedures for patients without mandibular fractures
- Risks, harms, costs: None
- Benefit-harm assessment: Preponderance of benefit over harm
- Value judgements: Although the GDG recognized that a conclusive diagnosis of mandibular fracture may be difficult without imaging, making a presumptive diagnosis of mandibular fracture based on history and physical examination alone is reasonable. Patients with high suspicion of mandibular fracture (based on clinical signs and positive tongue blade test) can be referred early to specialists.
- Intentional vagueness: None
- Role of patient preferences: Small; patients can refuse examination
- Exceptions: Airway compromise, loose dentition, uncooperative patients
- Policy level: Recommendation
- Differences of opinion: None

***Supporting Text***

There were 38 studies/articles included in our review: 36 cross sectional studies, 1 cohort study and 1 meta-analysis.

In several studies, motor vehicle accidents and interpersonal violence were the major causes of trauma resulting in mandibular fractures.[2,4,13-38, 40] In the US, the body of the mandible was the 2nd or 3rd most frequently fractured part of the mandible, after the angle and parasymphyseal areas.[31-33, 40] However, in other countries, the body of the mandible was the most frequently fractured region, whether caused by vehicular accidents, gunshot, falls, violent assaults or sports. The mandibular body was also found to be the most common site of fracture, whether as a single fracture or one among multiple fractures.[2, 4, 13, 14, 17, 36, 39] Variations on the cause of injury were noted depending on the age, sex, and socioeconomic conditions of the country or city as well as time of the year where the accident or assault occurred.[13, 15, 18, 20-21, 24, 30, 31, 34, 36-40] In Western Europe and the United States of America, interpersonal violence or altercations are considered the leading cause of trauma to the head and jaw.[15, 20, 29, 31, 32, 34, 37, 40] However, in Asia, Africa and South America, motor vehicle accidents were the leading cause of mandibular fractures,[2, 13, 14, 17-19, 22, 24, 25, 33, 36, 38, 40] although in a South Korean study as well as in a Brazilian study, violent assaults outnumber traffic accidents.[23, 30] In the Philippines, the etiology of mandibular fractures

appears to be conflicting, with studies showing motor vehicle accidents overshadow assault or interpersonal violence as the common cause of mandibular fractures, while another study reported assaults or mauling a major cause.[2, 4, 16, 26]

A history of blunt or sharp force to the jaw suggests the possibility of mandibular fracture.[15, 24, 27, 28, 31, 32, 40, 41] Patients with mandibular fractures complain of pain, change in occlusion and numbness, with or without lacerations, in the chin area, and commonly present with facial swelling, limitation of mouth opening, malocclusion and inferior alveolar nerve and/or mental nerve paresthesia.[20, 25, 42]

The absence of malocclusion, trismus, tenderness on jaw closure, broken tooth, and step-deformity, and a negative tongue blade test may rule out mandibular fracture and avoid further radiographic testing.[41-46] With the high sensitivity and negative predictive values of clinical signs and the tongue blade test, the clinician can presumptively rule out the diagnosis of mandibular fracture during the initial patient encounter.[41, 42, 44-46] A systematic review (short review in 2003 by Malhotra and Dunning of two diagnostic studies on the use of the tongue blade test) showed the high sensitivity and high negative predictive value (computed during appraisal) of the tongue blade test in ruling out the diagnosis of mandibular fracture.[44] The studies reviewed compared the tongue blade bite test to plain radiography which was the acceptable surrogate gold standard at that time.[41, 45] Newer diagnostic studies have been published that compared the utility of the tongue blade test to the new gold standard, computed tomography (CT), in diagnosing mandibular fractures. These studies affirm that the bite test or tongue blade test is highly sensitive and specific for predicting mandibular fractures.[46, 47] Another study corroborates their findings, however, only the study abstract was available at the time of this writing and thus could not be properly appraised.[48]

The clinical signs seen in patients with mandibular trauma have also been found to be useful in ruling out mandibular fractures.[42, 43, 45] One study developed a "maximally sensitive" clinical decision tool (absence of malocclusion, tenderness on jaw closure, broken tooth, trismus and step deformity) that will enable a clinician to rule out the diagnosis of fracture and obviate the need to request for radiographic studies.[43]

**STATEMENT 2. PANORAMIC X-RAY: Clinicians may request for panoramic x-ray as the initial imaging tool in evaluating patients with a presumptive clinical diagnosis of mandibular fractures.** *Recommendation.*

***Action Statement Profile for Statement 2***

- Aggregate evidence quality: Level III, Grade C

Level III. A diagnostic cross sectional comparison of panoramic tomography and mandibular series including advantages and disadvantages of each modality in 88 patients with known fractures of the mandible treated at the Medical College of Virginia Hospital from February 1981 through January 1985 concluded that the panoramic view is superior to the standard mandibular series for the diagnosis of mandibular fractures. 81 of 88 (92%) of the fractures were recognized in the panoramic view while only 58 of 88 (66%) were detected in plain views.[49]

Level III. A diagnostic cross sectional study conducted at an urban university health sciences school diagnostic radiology department compared the accuracy of mandibular series, panoramic radiography, digitized mandibular series, and panoramic radiography plus anteroposterior radiograph in the detection of induced fractures in 25 cadaver mandibles showed panoramic tomography is adequate for detection of fractures in the body of the mandible (88% sensitive, 94% specific).[50]

Level IV. The AOCMF training manual on a systematic approach to evaluation and diagnosis in craniomaxillofacial trauma stated that panoramic tomography is a useful screening tool in evaluating for mandibular fracture. It has similar or better sensitivity than standard mandibular series radiographs in detecting mandibular fracture especially the body region. It is also useful in evaluating the dentoalveolar region.[51]

Level III. A clinical trial study conducted at the University of Texas Health Science Center on adult female cadavers to assess the age- and sex specific risks in adult female patients from rotational panoramic radiography estimated risk by using a computer algorithm for simulation of radiation transport through the human anatomy. The study showed that radiation doses from panoramic radiography are less than those from the 21-film full-mouth (FMX), but greater than from a 4-film interproximal (BMX) examination.[52]

Level IV. A narrative review on radiation exposure from panoramic radiography using the 'As Low As Reasonably Achievable' (ALARA) principle. Between 4.7 to 14.9 uSv radiation doses per exposure was the calculated effective dose from various panoramic units used.[53]

Level IV. In a literature review, Panoramic x-ray is considered as the most informative radiograph used in diagnosing mandibular fractures. However, these are few of the disadvantages: 1) Technique requires patient to be in upright position; 2) Difficult to appreciate the buccal lingual bone displacement due it produces 2-dimensional image; 3) Lack of fine details in the symphysis region of the mandible due to thickness of the bone.[54]

- Benefit: Panoramic x-ray provides a single, comprehensive view of the mandible with less radiation exposure and faster results than mandibular series; easier interpretation due to decreased bone superimpositions with less missed fractures including status of existing dentition.[52]
- Risks, harms, costs: Panoramic x-rays may fail to detect symphyseal, condylar, subcondylar, coronoid fractures and fail to differentiate between inner and outer table fractures. Radiation doses range between 4.7-14.9uSv per exposure; Technique usually requires upright position unless zonography is available: Direct cost of procedure (around PhP 500.00-1000.00).
- Benefit - harm assessment: Preponderance of benefit over harm.
- Value judgements: Although the panel recognizes the superior role of CT scans in imaging mandibular fractures, superiority is not significantly better than Panoramic x-ray for simple mandible body fractures. Panoramic x-rays are more accessible, affordable, and entail less radiation exposure than mandibular series and CT scan. However, use is limited to patients who can stand or sit upright. In the Philippines, most trauma patients from middle to marginalized sectors are brought to government hospitals where plain radiographs and/or panoramic x-ray are readily available.
- Intentional vagueness: None
- Role of patient preferences: Small
- Exceptions: Unable to tolerate upright position
- Policy level: Recommendation
- Differences of opinion: None

***Supporting Text***

Six studies were reviewed which consisted of 3 narrative reviews, 2 cross sectional studies and 1 laboratory study.

Meticulous clinical examination of the mandibular area is critical when a mandibular fracture is suspected. When there is a presumptive clinical diagnosis of a mandibular fracture, imaging studies should be carried out. The modality should entail optimal preoperative and intraoperative case management, minimizing treatment failures and complication rates.[49, 50]

A standard panoramic radiograph is noted to show the most comprehensive view with a single film.[50] Panoramic radiography is also referred to as panographic view, pantomography and orthopantomography. It is also useful in examining dentition, presence of impacted teeth with respect to the fracture, alveolar process and portion of the mandibular canal. It has 92% diagnostic accuracy over standard radiographs.[49] Hence, it is the most suitable screening film for the radiographic examination of the mandible.[49-52] Panoramic x-ray provides less exposure to radiation [49] and presents faster results compared with other modalities. Effective Radiation doses ranged between 4.7-14.9 uSv for one exposure.[53] Several disadvantages were noted: 1) Patients are required to be positioned upright, which may be disadvantageous to patients with limited mobility. 2) The image produced is a 2-dimensional view, which results in a limited evaluation of buccal and lingual displaced fractures. 3) Details may not be appreciated in the symphyseal area.[54]

**STATEMENT 3. RADIOGRAPHS: In a setting where panoramic radiography is not available, clinicians may recommend plain mandibular radiography among patients with presumptive clinical diagnosis of mandibular fracture.** *Recommendation*.

***Action Statement Profile for Statement 3***

- Aggregate evidence quality: Level III, Grade C

Level III. A cross sectional study comparing panoramic and standard radiographs for the diagnosis of mandibular fracture involved 50 patients with known fractures of the mandible at the Medical College of Virginia Hospital from February 1981 to January 1985. Both panoramic radiograph and mandibular series were performed for all the patients within 12 hours of each other. Results of the radiograph were evaluated by two senior residents in the Oral and Maxillofacial Surgery Department. 92% of the fractures were identified from the Panoramic radiographs while 66% were detected in the mandibular series. In the mandibular series, 21 out of 29 fractures in the condylar region were better evaluated by using Towne's view. All 6 cases of fracture located in the symphysis region were recognized using the posteroanterior and Towne's view while the lateral oblique view was best used in identifying ramus, angle and body fractures.[49]

Level III. A cross sectional study comparing the diagnostic efficacies of panographic radiographs, mandibular trauma series, and digitized radiographs in detection of mandibular fractures where 25 cadaveric specimens were subjected to blunt trauma. Each specimen underwent all three imaging modalities and six observers recorded their diagnosis using a five-point confidence rating scale (1-fracture definitely absent; 2-fracture probably absent; 3-unsure whether fracture is present; 4-fracture probably present; and 5-fracture definitely present). The study stated that "location-wise differences in diagnostic accuracy were noted and possibly could be explained by the fact that visualization of the coronoid and condylar, with mean percentage of 65% on the mandibular series was relatively more difficult due to projection geometry issues and superimposition by overlying anatomy, compared with panoramic images where these were minimal to nonexistent."[50]

Level III. A diagnostic cross sectional study evaluated 54 patients presenting with acute mandibular injury examined at the urban university medical center emergency department and compared pantomography (Panelipse Panoramic XRay System #46181121G1) and mandibular series (postero-anterior, right and left oblique, and reverse Towne projections) in the detection of mandibular fracture. The films were read in a randomized fashion by 2 board-certified emergency physicians and a single staff radiologist without access to clinical information or identifying patient data. The sensitivity for fracture detection for each physician was 0.85, 0.77 and 0.89 with mandibular series and 0.79, 0.74, and 0.83 with pantomography. The specificity for fracture detection for each physician was 0.88, 0.92, and 0.96 for mandibular series and 0.96, 1.00 and 0.92 for pantomography. The study showed that standard mandibular series has been shown to have comparable sensitivity and specificity to pantomography in the detection of mandibular fractures.[55]

Level IV. A narrative review discussing the different imaging modalities in mandibular fracture stated that the plain mandibular series (which includes the postero-anterior, Towne's and lateral views) is still used as routine screening tool in the detection of mandibular fracture in comparison to other imaging modalities. The Towne's view was found particularly useful in assessing preoperative and postoperative subcondylar fractures.[56]

Level I. An evidence-based guideline authored by the SEDENTEXCT project stated that exposure to radiation is higher in mandibular radiographs versus panoramic x ray (<6 mSv versus 2.7-24.3 mSv), but much lower than CT scan (280 mSv - 1410 mSv).[57]

Level III. A diagnostic cross sectional study on 21 subjects with mandibular fractures managed by the plastic surgery service at a single institution in the United States examined all patients with a standard mandibular series (anteroposterior, right and left lateral oblique, Towne's), panoramic tomography and axial and coronal CT. Mandibular series x-ray ranked second in accuracy (93%) next to Coronal CT scan (97%), followed by panorex radiograph (90%) and axial CT (82%).[58]

- Benefit: Plain mandibular series have comparable sensitivity and specificity to panoramic x-rays in detection of mandibular fractures.[55] Also, they are widely available compared to other imaging modalities.
- Risks, harms, costs: Plain mandibular series may miss fractures on every site of mandible excluding fractures on the ramus.[49] Decrease in diagnostic accuracy of plain mandibular films versus panoramic x-ray and CT due to superimposition of bony structures and confusing spatial relationships.[50] Exposure to radiation is higher in mandibular radiographs versus panoramic x-ray (< 6 uSv vs. 2.7-24.3 uSv), but much lower than CT (280 - 1410 uSv) [57] Cost of standard mandibular radiographs around PhP 400-600 in government hospitals and around PhP 1,300-1,800 in private hospitals in the Philippines; lower than panoramic x-ray.
- Benefit - harm assessment: Preponderance of benefit over harm
- Value judgements: The group concurs that CT is the imaging gold standard for evaluating mandibular fractures. However, due to CT higher costs, panoramic x-ray is considered the best initial imaging modality for evaluating mandibular body fractures. Because panoramic x-ray is not widely available, plain mandibular series are deemed sufficient based on aggregate evidence and the ASP, which recommends it as the next best imaging modality after panoramic x-ray in the context of low- and middle-income patients. Plain mandibular series are widely available, affordable and have comparable sensitivity with panoramic x-ray and CT Scan.

- Intentional vagueness: none
- Role of patient preferences: Large. Patients may opt for CT Scan instead of plain mandibular series if they can afford its cost.
- Exceptions: No absolute contraindication. Inability to position the head properly may constitute a relative contraindication.
- Policy level: Recommendation
- Differences of opinion: None

***Supporting Text***

Six articles were reviewed for this statement: 4 cross sectional studies, 1 narrative review and 1 clinical guideline.

Plain mandibular series is a good screening examination among patients with suspected mandibular fractures since it is accurate, widely available and affordable compared to other modalities.[55, 56] One disadvantage of mandibular series is that it is limited by its 2-dimensional view. It may miss fractures of different sites of the mandible, except the ramus, due to the superimposition of bony structures and the confusing spatial relationships of one segment to the other.[50] The limitation, however, may be reduced by taking multiple radiographic views (postero-anterior, lateral oblique, and reverse Towne's).[49, 50, 56] The combination and simultaneous correlation of these films may be used to confirm a possible fracture in the mandible.

In comparison with other imaging modalities such as panoramic radiography and computed tomography, plain mandibular series ranks second after coronal computed tomography in terms of accuracy in the detection of fractures of the mandible, followed by panoramic radiography and axial computed tomography.[58]

**STATEMENT 4. COMPUTED TOMOGRAPHY: If available, non-contrast Facial CT scan may be obtained for the assessment of mandibular fractures.** *Recommendation.*

***Action Statement Profile for Statement 4***

- Aggregate evidence quality: Level III, Grade C

Level IV. A narrative review discussing the differences between cone beam CT and conventional CT including several applications of each method stated that CT studies are rarely used to evaluate isolated mandibular fractures. However, they are of value in the evaluation of complex mandibular fractures including condylar fractures.[64]

Level IV. The AAO-HNS Resident's Manual of Trauma to the Face, Head, and Neck discussed the strengths of different radiographic imaging for the mandible. Panorex is an excellent screening evaluation for patients who can sit or stand upright without motion. CT Scan is generally preferred for multiple mandibular fractures and especially helpful in multiply traumatized requiring images and when visualization is difficult especially for condylar head and high condylar neck.[5]

Level II. This clinical simulation study compares the diagnostic accuracies of panoramic radiograph, mandibular series, digitized mandibular series, and panoramic radiograph - anteroposterior view in detecting facial fractures inflicted among 25 cadavers. Results showed that panoramic radiographs are adequate in detecting mandibular fractures. Addition of anteroposterior view to panoramic radiographs augment diagnostic accuracy.
It was also mentioned that only in rare instances where there is extreme displacement of the fracture segments is CT indicated. An instance of such a condition is a high condylar fracture. Advanced imaging in such instances can provide multiplanar and 3-D examinations with relatively high-contrast images.
Furthermore, routine use of CT is not justified as standard of care for mandibular fractures due to the high cost, increased radiation burden of the examination, and potential for artifact generation of restorations within the oral cavity, in addition to the patient's having to remain motionless for the period of image acquisition.[50]

Level III. A diagnostic accuracy study of 164 patients with suspected mandibular trauma examined by 6 oral and maxillofacial surgeons. Initial radiographic examination comprised panoramic imaging (Orthophos XG Plus, Sirona, Bensheim, Germany) and a posteroanterior skull radiograph (Siemens Multix Pro/Vertix/ Poly-doros, Siemens, Erlangen, Germany). In instances wherein there was inconclusive radiologic data, CBCT (NewTom 3G MF12, NNT Viewer Software version 3.00, 12-in FOV) was done to confirm or rule out the presence of mandibular fracture. Results showed that CBCT can identify an additional 17.75% of mandibular fractures and 14.72% in fractures and a change in treatment in 9.52% of all examined cases.[59]

Level IV. A narrative review of different ER diagnostic imaging protocols for maxillofacial trauma proposed a 'mandibulo-facial series' (PA, oblique, occipito-mental and panorex)

for isolated mandibular fracture and a CT scan for cases of combined midface and mandibular fracture.[61]

Level V. A case report of a patient who sustained multiple fractures including C-1 vertebra and mandibular body determined that the positioning used for conventional films to diagnose mandibular fracture could not be done due to risk for added injury, hence CT scan was used.[62]

Level IV. A narrative review discussing the evolution of imaging in maxillofacial trauma stated that although image resolution is less than conventional plain film imaging, initial investigations demonstrated that CT provided superior diagnostic accuracy compared to radiography in the diagnosis of maxillofacial injury particularly with respect to soft tissue diagnosis. One study reviewed showed that coronal CT was the most accurate method for diagnosis of mandibular fractures, followed by mandibular series and panoramic radiography.[65]

Level IV. A narrative review mentioned that the introduction of computed tomography (CT) has increased the sensitivity and accuracy with which craniofacial fractures can be detected, facilitating more detailed analysis and classification of facial fractures.[72]

Level IV. This narrative review discussing the role of imaging in the evaluation of complex facial fractures including important considerations to look for depending on the site of facial fracture stated that accurate maxillofacial fracture detection by CT is important for surgical treatment to avoid undesirable functional and/or cosmetic sequelae.[73]

Level IV. This narrative review presented a treatment protocol utilized by oral and maxillofacial surgery departments of various military hospitals (Wilford Hall USAF Medical Center, the National Naval Medical Center–Bethesda, Walter Reed Army Medical Center, and the National Naval Medical Center– San Diego) for maxillofacial injuries. In this protocol, imaging and stereolithographic models are done following stabilization and identification of patient injuries. A CT scan should be the minimum information obtained before surgery (although patients in this review suffered from extensive facial trauma secondary to combat injuries rather than simple and isolated mandibular fractures).[75]

Level IV. A narrative review discussing the management of mandibular fractures states that in patients with multiple midface injuries, those wearing a cervical collar or unable to undergo panoramic radiography, maxillofacial CT is necessary. An algorithm showed that panorex plus low Towne's view should be used for low suspicion of mandibular fracture whereas CT scan with or without 3D reconstruction is advised if there is high suspicion, with or without other facial fractures.[60]

Level III. A diagnostic accuracy study comparing CT and plain radiographs' ability to detect facial fractures indicated that 3D CT was statistically more significant ($Z= 8.8$, $p<.001$) in terms of fracture site detection compared to conventional radiographs. Moreover, 3D CT was superior in displaying extent of fractures and comminution as well as displacement and it provided additional conceptual information compared to conventional radiographs in the majority of patients with maxillofacial trauma.[67]

Level III. A cross sectional study determining the clinical usefulness of 3D CT compared to 2D CT showed that in a majority of cases within each of the four clinical groups (including trauma), the clinicians believed that 2D or 3D reformatting of the CT images provided additional useful information for patient management. In most of the cases, 3D imaging provided information in addition to that provided by the axial or 2D reformatted images.[68]

Level IV. This narrative review mentioned that the advent of computed tomography (CT), thin-cut facial CT scans, and most recently three-dimensional CT reformations, have improved diagnosis, and have shifted the primary diagnostic modality of facial fractures from the physical exam and plain radiographs to CT.[70]

Level IV. A narrative review which presented a comprehensive classification of craniofacial fractures mentioned that the accurate analysis of thin axial CT slices with high-quality 2D and 3D-reconstructions guaranteed a good practical imaging approach.[71]

Level IV. A narrative review mentioned that the 3D extension of defects can be assessed accurately with CT. Important information concerning the amount and direction of fracture

dislocation becomes clear and localization of important structures can be determined accurately.[74]

Level III. A cross sectional study comparing the diagnostic sensitivity of mandibular series and axial CT in ruling out mandibular fractures showed that CT demonstrated higher image quality scores (87%) compared to mandibular series (66%) based on reviewers' subjective assessment of quality.[76]

Level I. This systematic review evaluated the data available regarding reliability and accuracy of skeletal CT landmark identification and stated that "the more complex the surgery, the more critical it is to have accurate CT data to minimize intraoperative risk and poor outcome. The acceptable degree of error will depend on the type and complexity of the surgical procedures being planned and the goals of the study".[66]

Level III. A retrospective case series discussed the indications of intraoperative cone beam computed tomography (CT) as the gold standard in preoperative diagnostics of maxillofacial fractures that is performed post-operatively as well as during follow-up. Fluoroscopy based cone beam CT has also been used for surgical navigation and intraoperative assessment of adequacy of reduction in complex mandibular fractures.[72]

Level IV. A narrative review discussing the advantages and disadvantages of CT and CBCT said that CT provides good resolution of soft and hard tissues but delivers the highest amount of radiation while CBCT is able to provide excellent information of bony structures but is not able to effectively assess the soft tissue components.[63]

Level IV. A narrative review discussing the advances in head and neck imaging in general stated the disadvantages of CT in the head and neck. Chief among them is radiation risk. Artifacts can also be an issue, especially in the head and neck, where the anatomy is complex and many different tissue types are in close proximity. Beam-hardening artifacts from bone, hardware, or dental amalgam, can obscure images of nearby soft tissues. Motion (eg, from swallowing or phonation) can also cause artifacts, although this is less of an issue with the most current 64-slice scanners, which require less scan time.[69]

Level IV. Basic Principles of SEDENTEXCT Guideline for Cone Beam CT states that "CBCT should only be used when the question for which imaging is required cannot be answered adequately by lower dose conventional (traditional) radiography."[57]

- Benefit: Image enhancing tools, better imaging quality (identify number and anatomic location of mandibular fractures), provide more accurate details on the fracture (extent, severity and degree of displacement of fractured segments), decreased interpretation error.
- Risks, harms, costs: Potential risk of unnecessary exposure to ionizing radiation for patients undergoing CT Scanning. A maxillo-mandibular multislice CT (MSCT) (effective dose 280-1,410 µSV) has higher radiation exposure vs. panoramic x-ray (effective dose 2.7-24.3 µSV) Plain CT (PhP 3,500-5,000) is more expensive than plain radiographs (PhP 240-1600).
- Benefit - harm assessment: Preponderance of benefit over harm
- Value judgements: Option for clinician to request CT scan because of higher sensitivity & accuracy in diagnosing mandibular fractures; important to adequately identify all fractures to preoperatively anticipate techniques that may or may not be applicable for safe and optimal surgical procedure. Affordability may be an issue for patients.
- Intentional vagueness: Type of CT scan (multislice, CBCT) not specified; availability and affordability have to be considered.
- Role of patient preferences: Moderate; patients who cannot afford CT may request alternative imaging (room for negotiation).
- Exceptions: None
- Policy level: Recommendation
- Differences of opinion: None

***Supporting Text***

Twenty-one (21) articles were reviewed, including 10 review articles, 5 cross-sectional studies, 2 prospective studies, 1 retrospective study, 1 case series, 1 case report, and 1 practice guideline.

The decision to use more advanced imaging modalities such as Computed Tomography or Cone Beam Computed Tomography to diagnose mandibular fractures should be decided after considering severity of the injury, structural superimposition, patient's functional restrictions, cost, availability, soft-tissue imaging requirements and the need for 3-dimensional views.[64]

CT is a better tool for a more definitive diagnosis and treatment planning of complex maxillofacial structures than traditional radiographs. It can identify the number and anatomical location of mandibular fractures, provide more accurate details on the extent of

the fracture, severity of comminution and degree of displacement of the fragments. A CT scan is therefore reserved and more advantageous for patients with complex mandibular injuries and other concomitant injuries of the maxillofacial skeleton.[5, 50, 59, 61,62, 64, 65, 72, 73, 75]

Three-dimensional reconstruction can be done in conjunction as it provides better visualization of the position, displacement and comminution of bone fragments.[50, 60, 63, 67, 68, 70, 71, 73, 74, 76] "The more complex the surgery, the more critical it is to have accurate CT data to minimize intraoperative risk and poor outcome."[66]

The disadvantages of CT include its cost, lack of accessibility, and immediate availability. It may also produce significant artifacts -- beam-hardening artifacts (bone, hardware, or dental amalgam) and motion artifacts (swallowing or phonation) that can obscure images. It also subjects the patient to high radiation exposure. As radiation has a cumulative effect on the human body, any reduction in exposure to radiation is considered beneficial.[63, 66, 69]

One advanced imaging modality that may be used as an alternative to CT is CBCT. One of the basic principles of SEDENTEXCT Guidelines for Cone Beam CT stated "CBCT should only be used when the question for which imaging is required cannot be answered adequately by lower dose conventional (traditional) radiography".[57]

CBCT increases diagnostic certainty to 90.5% in patients with suspected mandibular fracture. It provides additional fracture detection and leads to a change in the treatment plan in 9.52% of sites compared to plain radiographs. [59] It has reduced radiation exposure time and consequently reduced radiation exposure for patients. Another advantage is the different display modes unique to maxillofacial imaging, and smaller size and cost than conventional CT scan.[66, 69]

Although several studies have shown the diagnostic efficacy of CBCT in mandibular fractures, it has not yet been recommended as the primary diagnostic tool to use in a person suspected with multiple, severe facial injuries due to its limitations in soft tissue contrast. Unlike CBCT, CT may show the relations of a bone fragment and the adjacent muscle, bleeding, and existence of some foreign bodies in a traumatic injury. CBCT may be recommended as an alternative to the CT scan for ambulatory patients without loss of consciousness with suspected mandibular fractures.[76]

**STATEMENT 5. IMMOBILIZATION: Isolated mandibular body fractures should be temporarily immobilized/splinted with a figure-of-eight bandage until definitive surgical management can be performed or while initiating transport during emergency situations.** *Recommendation.*

***Action Statement Profile for Statement 5***

- Aggregate Evidence Quality**:** Level II, Grade B

  Level II. A quasi-experimental study compared the effectiveness of simple splinting and traction splinting in patients with femoral fracture on pain intensity measured in visual analog scale immediately after the 1st hour, 6th hour and 12th hour of splinting. The pain intensity decreased significantly in both groups. The reduction in pain intensity was far more superior in traction splints than simple splinting.[77]

  Level IV. Guidelines on casting and splinting mentioned that casting is the mainstay of treatment for most fractures and generally provide more effective immobilization.[78]

  Level V. A case report of a 28-year-old man presenting with a history of painful swollen wrist following a fall on both outstretched arms who was treated with a cast due to an undisplaced scaphoid wrist fracture and proximal pole fracture on the right and left. Conservative cast immobilization had a positive effect on early return to full activity.[79]

  Level I. A systematic review on management of mandibular condyle fractures compared conservative management (closed reduction) and open reduction and fixation. Conservative management in this study includes either soft diet, analgesics, and antibiotics, with or without maxillary-mandibular fixation. A total of 102 references were retrieved, however, none of these studies met the inclusion criteria. Therefore, this systematic review showed there is still lack of evidence regarding the indications for either surgical or non-surgical treatment of the mandibular condyle.[80]

  Level IV. A US patent recorded on Sept. 18, 1973, invented by Joseph E. O' Malley illustrates the precise immobilization of mandible fractures using a one-piece device. It is made of velcro connections that support the harness around the chin to the occiput. A head strap on top also uses Velcro Connection. This invention was based on a splint for mandibular injuries, the Barton's Bandage.[81]

  Level IV. A simplified splint for precise immobilization of the mandible or lower jawbone in mandibular injuries having a main or supporting harness of a single piece of material with a chin support and an occiput engaging support connected

by curved portions passing over the ears on either side of the patient's head.[82]

- Benefit: Reduction of pain and prevention of further complication while waiting for definitive treatment.
- Risks, Harm, Cost: Undue pressure may result on the forehead and ears if the bandage is not properly applied. This may be avoided with minimal traction.
- Benefit-Harm Assessment: There is preponderance of benefit over harm.
- Value Judgements: In general, the initial treatment for mandibular fractures is immobilization. This is necessary until definitive surgical management can be performed or while initiating transport during emergency situations. The reduction of pain and the reduction of further complications can improve the quality of life of patients with isolated mandibular body fractures. In developing countries, patients in low socioeconomic brackets who cannot undergo immediate surgical treatment may benefit from this type of immobilization.
- Intentional Vagueness: None
- Role of patient preference: None
- Exception: None
- Policy Level: Recommendation
- Differences of Opinion: None

***Supporting Text***

Six articles were included in this review, composed of 1 quasi-experimental study, 1 practice guideline, 1 case report, 1 systematic review, 2 patents. Immobilization has always been the mainstay of treatment for all types of fractures in general.[77-82] Literature reviews since the World War II era described the use of Barton's Bandage as a means for immobilization of the mandible. They noted that the benefits of immobilization in fractures included lessening of the pain and prevention of further displacement of fractures.[77-80]

**STATEMENT 6. PAIN MANAGEMENT: Clinicians should routinely evaluate pain in patients with isolated mandibular body fractures using a numerical rating pain scale or visual pain analog scale. Analgesics should be routinely offered to patients with numerical rating pain scale score or VAS of at least 4/10. Patients may be initially managed with paracetamol and a mild opioid with or without an adjuvant analgesic. Reassessment should be given until the numerical rating pain scale score or VAS is 3/10 at most.** *Strong Recommendation.*

***Action Statement Profile for Statement 6***

- Aggregate Evidence Quality: Level I, Grade A

Level IV. The Emergency Care Acute Pain Management Manual formulated by the National Institute of Clinical Studies of Australia states that pain is a subjective experience and should be assessed using a validated pain scale. The Numerical Rating Score may be used on adults, and is a ten-point scale rated from 0 (no pain) to 10 (worst pain possible). Moderate pain ranges from 4 to 6.[83]

Level I. According to the health care protocol (acute pain assessment and opioid prescribing protocol) used in Minnesota, while pain screening using a numeric pain scale increases the rate of pain assessments used, this does not affect the level of pain or treatment prescription.[84]

Level I. The WHO Cancer Pain Relief monograph states that in patients with mild pain, non-opioid drugs such as aspirin, paracetamol, or any of the non-steroidal anti-inflammatory drugs will be adequate. In patients with moderately severe pain, if non-opioids do not provide adequate relief when given on a regular basis, codeine or an alternative weak opioid should be prescribed.[85]

Level III. A cross sectional study of 101 Dutch Hospitals that were requested to submit their protocols for post-operative pain management, showed that 22 different analgesics were used in 135 administration schemes. Paracetamol, diclofenac, and morphine were mentioned in the majority of treatment schemes. All of the protocols mentioned the use of a visual analogue scale or numeric rating scale to assess pain. It also found no specialized pain protocols for the treatment of post-surgical fracture pain and that there was great variability in postoperative fracture pain; and highlights a need for the improvement of protocols used for the management of postoperative pain, as many of the pain protocols for the management of post-surgical fracture pain were incomplete and inefficient, and non-specific to postoperative fracture pain, emphasizing the importance of developing an evidence-based, clear, and specific protocol for the treatment of pain after surgical treatment of traumatic fractures.[86]

Level III. A cross sectional study was conducted at the Emergency Department (ED), Division of General Pediatrics, The Children's Hospital of Philadelphia (CHOP) and the

Department of Emergency Medicine, Medical College of Pennsylvania, Philadelphia (MCP) to see whether children received analgesic treatment similar to adults with the same acute, painful conditions. Charts of 112 pediatric patients from CHOP ED and 156 patients from the MCP ED were reviewed. The data suggest that physicians need additional education about management of acute pain.[87]

Level III. A cross sectional study used data from the Emergency department component of the National Hospital Ambulatory Medical Care Survey directed by the Centers for Disease Control and Prevention National Center for Health Statistics for 1997 to 2000. Of 2,828 patients with isolated closed fractures of the extremities or clavicle, 64% received any analgesic and 42% received a narcotic analgesic. The scales used (e.g. Modified Infant Pain Scale; Face, Legs, Activity, Cry, Consolability pain rating scale; and the Wong-Baker Faces pain rating scale) have been validated in infants and young children. They also concluded that additional effort and resources are needed to address the issue of undertreatment of pain in children and adults with fractures in the ED setting. Special attention should be given to analgesia in the very old and very young. Educating providers on nonverbal options for measuring pain, especially in young children, may improve measurement and documentation of pain status and facilitate recognition and treatment of pain in these vulnerable populations.[88]

Level III. A descriptive cross sectional study of consecutive patients admitted to four surgical wards of a major 550-bed regional hospital in Denmark between November 2005 and May 2006 measured pain by numerical rating scales, and means and standard deviations were used to describe data. To aid interpretation of data, ratings were categorized into no pain (0), mild 1–3), moderate (4–7) and severe (8–10). The study highlights that further work is required to develop better approaches for patient assessment of pain management needs, and to ensure that patients are recognized as having an important, mutually identified clear role in their pain management to ensure their needs are met.[89]

Level I. A meta-analysis of 1,080 patients from 11 controlled double-blinded randomized trials that investigated the analgesic effects of various drugs in postoperative pain found that with a baseline VAS score in excess of 30 mm they would probably have recorded at least moderate pain on a 4-point categorical scale. The initial level of pain has historically been measured with a standard categorical scale (none, mild, moderate or severe). However, visual analogue scales (VAS) are often used in the belief that the measurement continuum produces greater sensitivity than the discrete points of the categorical scale.[90]

Level III. A cross sectional review participated in by 14 accident and emergency departments in England with 100 senior house officers as respondents found a large percentage of the respondents would use an inappropriate route of administration (intramuscular 50% rather than intravenous 50%), some would use an inappropriate drug and often wait too long (90min) before giving a further dose of analgesic. Results suggest that a) there is need for further teaching on pain relief at medical schools, b) casualty officers need to be taught about analgesia when they start working in accident and emergency departments, and (c) it may be beneficial for accident and emergency departments to have an analgesic policy.[91]

- Benefit: Reduction of pain
- Risks, Harm, Cost: Patients with allergies to analgesics
- Benefit-Harm Assessment: There is a preponderance of benefit over harm
- Value Judgement: Patients who are adequately immobilized usually do not present with pain. It is also dependent on a patient's pain threshold, so there is a need for a numerical pain scale to better control pain or give comfort to the patient. Based on our literature review, it has been shown that most institutions do not have proper emergency room assessment of fracture pain, nor do patients receive adequate pain management.

  Based on the WHO analgesic ladder, paracetamol in conjunction with tramadol or any other mild opioid may be used to manage pain initially while an adjunct analgesic may be given if pain management is inadequate.

  While the panel recognizes that the parenteral and intramuscular route may be more efficacious, we leave the administration route to the discretion of the primary healthcare provider.
- Intentional Vagueness: The analgesic, dosage, duration and route are not specified.

- Role of patient preference: Moderate; especially patients with allergies to analgesics.
- Exceptions: Patients with allergies to analgesics
- Policy Level: Recommendation
- Differences of Opinion: None

***Supporting Text***

There were 9 articles used in this section: 6 guidelines, 1 textbook chapter, 1 prospective study and 1 individual patient meta-analysis.

The practice guidelines and emergency protocols included in the formulation of this key action statement all state that a numerical pain rating scale or visual analogue scale is imperative in the initial assessment of patients with pain.[83, 84, 86, 88-91] They may not necessarily be specific to mandibular fractures, but they reiterate the need for proper management of pain at the emergency room.

Adequate analgesia for moderate pain, described as a numerical score of 4/10, is managed via the WHO analgesic ladder. This guideline states that patients should be initially managed with paracetamol plus a mild opioid with or without an additional analgesic until adequate analgesia is achieved.[85]

There is room for improvement in the management of pain as evinced by our literature review which shows that hospitals vary in the way pain is managed, and that pain is usually overlooked once patients are seen at the emergency room.[86-91]

**STATEMENT 7. ANTIBIOTICS: Prophylactic antibiotics should be given to adult patients with isolated mandibular body fractures with concomitant mucosal or skin opening with or without direct visualization of bone fragments. In patients without mucosal or skin lacerations, prophylactic antibiotics can be given 1 hour prior to surgery and up to 24 hours postoperatively. Penicillin is the drug of choice while Clindamycin may be used as an alternative for patients in whom Penicillin is contraindicated.** *Strong Recommendation.*

***Action Statement Profile for Statement 7***

- Aggregate Evidence Quality**:** Level I, Grade A
  Level I. This CPG states that in certain circumstances, oral antimicrobial rinses and systemic antibiotics may be indicated to lower the probability of infections related to surgery. It also states that prophylaxis is recommended because endothelialization of prosthetic material occurs within 6 months after the procedure. Prophylaxis should also be considered for patients with total joint replacement.[92]

Level I. Clinical practice guidelines on Antibiotic Prophylaxis against Wound Infections for Oral Procedures published by the Ministry of Health Malaysia (2002) classified ORIF of mandibular fractures with concomitant mucosal or skin laceration as Class III surgery requiring prophylactic antibiotics. Penicillin alone has adequate coverage for the bacterial flora causing surgical site and/or implant infection.[93]

Level II. A prospective cohort study conducted a regional 2-stage prospective audit involving 5 different maxillofacial units in the Yorkshire region of the UK to evaluate the effectiveness of perioperative antimicrobial prophylaxis in the treatment of mandibular fractures. The first stage (145 patients) surveyed current practice concerning antimicrobial prophylaxis and found out the current infection rate after open reduction and internal fixation (ORIF) of mandibular fractures. The second stage (157 patients) implemented a common antimicrobial protocol in all units and recorded the infection rates using the new regimen. A systematic review by Andreasen et al. found a 3-fold reduction in infection in groups given antibiotic prophylaxis. The published infection rates for open reduction and internal fixation (ORIF) of mandibular fractures with antimicrobial prophylaxis range from 2% to 14%. They recommend short perioperative antimicrobial prophylaxis with a maximum of 2 postoperative doses after ORIF of mandibular fractures.[94]

Level I. A randomized controlled trial at the University of Miami Medical School randomized 90 patients with compound mandible fracture to two antibiotic regimens. The surgical procedures were performed by oral/maxillofacial surgery. Standard treatment consisted of open reduction with either bone plates or wires with all patients receiving 6 weeks of maxillomandibular fixation. The patients were monitored at 2-week intervals for 8 weeks by two of the authors, who were blinded to which antibiotic regimen the patient was assigned. Two patients in each group had postoperative infections within the first 2 weeks of treatment. The infections resolved with local wound care, removal of internal fixation devices, and oral antibiotics. After resolution of the infection each patient had a malunion, which was managed without additional complications.[95]

Level I. A randomized double-blind clinical study in India involving 60 patients undergoing BSSO (premised on the basic purpose of antibiotic prophylaxis to provide an adequate drug level in the tissues before, during, and for the shortest possible time after the procedure) randomly divided patients into two groups: group I, given a single injection of amoxicillin 1.0 g administered preoperatively followed by two postoperative doses of saline four hourly (single dose group); and group II, given a single injection amoxicillin 1.0 g administered preoperatively followed by two postoperative doses of amoxicillin 0.5 g four hourly. There was a statistical difference in the rates of infection between the two groups. The findings indicate that a short postoperative course of antibiotics is more effective than a single preoperative dose for the prevention of infection following BSSO.[96]

Level I. A randomized, double-blind placebo-controlled pilot clinical study of 98 patients with zygomatic or Le Fort fractures, who were treated by open reduction and internal fixation at the Department of Cranio-Maxillofacial Surgery, University Hospital of Bern, Switzerland, from January 2008 to July 2011 corroborated the Surgical Infection Prevention Guideline Writers Work-group in the United States 2005 consensus paper that advised antimicrobial prophylaxis be given within 60 min before the incision is made, and then discontinued within 24 h postoperatively, as prolonged use of prophylactic antimicrobial agents showed no additional benefit, and is associated with emergence of resistant bacterial strains.[97]

Level I. A randomized, double-blind, and placebo-controlled clinical study in the Medical College of Virginia Hospital of Virginia Commonwealth University from January 1, 1997 to December 31, 1997 randomly assigned 30 patients with uncomplicated mandibular fractures into 2 groups: group 1 (14 patients) and group 2 (16 patients). According to the classification of wounds based on their risk for infection, those associated with fractures of the mandible involving the tooth-bearing region (angle and body fractures) could be classified as Class III, contaminated wounds. If the patient presented with evidence of infection of the fracture or the fracture was delayed in receiving treatment, the wound could be classified as a Class IV (infected) wound. The risk of potential infection of these wounds without the use of prophylactic antibiotics ranges from 22% to 50%. However, this risk can be reduced to as low as 10% with the use of prophylactic antibiotics. In this study, the rate of infection in both groups was comparable to that of previous studies on the rate of infection in mandibular fractures when perioperative antibiotics were used. This represents further evidence that the use of prophylactic perioperative antibiotics has a benefit in reducing the rate of postoperative infection in mandibular fractures.[98]

Level III. A cross sectional study of 79 patients with mandible fractures treated with ORIF at the Plastic Surgery Department of the Brigham and Women's Hospital, Boston, MA, from June 2007 to June 2012 revealed an overall infection rate with use of antibiotic prophylaxis of 7.59%, but patients treated with clindamycin had an infection rate of 19.35%. The infection rate when using ampicillin/sulbactam was significantly lower than clindamycin. On the basis of this review, proper antibiotic prophylaxis should cover both potential aerobes and anaerobes.[99]

Level I. A prospective randomized trial of 291 patients presented for evaluation and treatment of open mandibular fractures at Parkland Memorial Hospital, Dallas, TX from June 1999 to May 2003, where 181 patients of 291 patients met the inclusion criteria and were randomly divided into 2 groups based on whether or not they received postoperative antibiotics. Both groups received preoperative antibiotics of various regimens as well as intraoperative antibiotics on the day of surgery. The use of antibiotics in the preoperative period is standard practice in the treatment of mandibular fracture. Given the fact that mandibular fractures involving the tooth-bearing segments of the mandible are contaminated at the time of the fracture, as well as at the time of surgery, the use of preoperative/intraoperative or postoperative antibiotics when dealing with these injuries is intended to prevent infection in a contaminated wound.[100]

Level I. A systematic review of 4 studies concerning the possible benefit of prophylactic antibiotics in the treatment of maxillofacial fractures combined the evidence from all 4 studies and concluded that there was a significant 3-fold decrease in infection rate with administration of antibiotics.[101]
Level I. A systematic literature review of 44 studies from eight countries addressing antibiotics and facial fracture management was performed in June 2013 to identify published studies evaluating the use of antibiotics in craniofacial trauma including the upper, middle, and

lower thirds of the craniofacial skeleton. Prophylactic antibiotic use was evaluated by higher level of evidence studies for mandible fractures: preoperative antibiotic use in comminuted mandible fractures was supported, but postoperative antibiosis in mandible fractures was not.[102]

Level I. A systematic review and meta-analysis of 4 RCT's with a total of 2063 implants and 1002 patients found that antibiotic use significantly lowered the implant failure rate (p = .003), with an odds ratio of 0.331, implying that antibiotic treatment reduced the odds of failure by 66.9%. Based on the results of this meta-analysis, and pending further research in the field, it can be concluded that there is evidence in favor of systematic antibiotic use in patients receiving dental implants, since such treatment significantly reduces implant failure. In contrast, antibiotic use does not exert a significant preventive effect against postoperative infection.[103]

Level II. A retrospective (cohort) chart review of 150 patients treated operatively for both complicated and uncomplicated mandibular fractures at University of New Mexico Health Sciences Center in Albuquerque, NM, between January 1, 2000 and June 12, 2007 found that the use of postoperative prophylactic antibiotics does not have a statistically significant effect on postoperative infection rates in surgical management of complicated or uncomplicated mandibular fractures.[104]

Level II. A retrospective cohort study of 789 case histories regarding treatment results and nature of complications developed at the Maxillofacial Department of the National Medical University (Kyiv, Ukraine) from 1999 to 2003 found that the incidence of infection in patients with mandibular fractures located in tooth bearing areas was determined by the following risk factors: social and organizational conditions of medical care, trauma pattern, pre-existing medical status and treatment tactics. The main contributory factors were delayed medical care, accompanying pathological disorders, angular location, multiple and comminuted fractures and the type of antibiotic used.[105]

Level IV. This guideline states that one milliliter of saliva typically contains over 100 million anaerobic microorganisms and 10 million aerobes. The implication is that virtually all surgery in the pharynx, nasopharynx, hypopharynx, and larynx, as well as in infected ears and sinuses, is contaminated. Surgical prophylaxis requires antibiotics active vs. anaerobes. Primary prophylaxis used for oral and pharyngeal surgeries are Ampicillin/Sulbactam OR oral Amoxicillin/clavulanate 1-hour pre op. Alternatives include IV Clindamycin OR Cefazolin + Metronidazole pre-anesthesia.[106]

Level I. This guideline stated that for 50 years, the American Heart Association (AHA) has recommended a penicillin as the preferred choice for dental prophylaxis for infective endocarditis (IE). During these 50 years, the committee was unaware of any cases reported to the AHA of fatal anaphylaxis resulting from the administration of a penicillin recommended in the AHA guidelines for IE prophylaxis. The Committee believes that a single dose of amoxicillin or ampicillin is safe and is the preferred prophylactic agent for individuals who do not have a history of type I hypersensitivity reaction to a penicillin, such as anaphylaxis, urticaria, or angioedema. Fatal anaphylaxis from cephalosporin is estimated to be less common than from penicillin, at approximately 1 case per 1 million patients. Fatal reactions to a single dose of a macrolide or clindamycin are extremely rare. There has been only 1 case report of documented *Clostridium difficile* colitis after a single dose of prophylactic clindamycin.[107]

- Benefit: Prophylactic antibiotics reduce the incidence of surgical wound infection and therefore reduce the morbidity to the patient.
- Risks, Harm, Cost**:** There is potential harm of having a reaction to the administration of Penicillin and Clindamycin.
- Benefit-Harm Assessment: Preponderance of benefit over harm.
- Value Judgement: Prophylactic antibiotics should be given to patients with open mandibular body fractures. They have the benefit of reducing the incidence of surgical site and implant infection. In the setting of underdeveloped and developing countries where patients with mandibular fracture may have poor oral hygiene, prophylactic antibiotics are beneficial.
- Intentional vagueness: The dose, duration, and route of antibiotic administration are not specified in this guideline for isolated mandibular body fractures with concomitant mucosal or skin opening with or without direct visualization of bone fragments.
- Role of patient preference: None
- Exception: None

- Policy Level: Strong Recommendation
- Differences in Opinion: None

***Supporting Text***

There were 16 studies/articles included in our review: 4 clinical practice guidelines, 3 systematic reviews, 5 observational studies, and 4 randomized controlled trials. Antibiotic prophylaxis is indicated in patients with mandibular trauma accompanied by extensive oral laceration and/or skin laceration[92-99] and even without visualized mucosal lacerations or bone fragments, fractures in tooth-bearing regions are considered contaminated.[98-100] Prophylactic antibiotics reduce the incidence of surgical wound infection and therefore reduce morbidity of the patient.

Antibiotics should be given immediately at the emergency room and extended up to 1 day after definitive management.[93, 97, 100-105] In cases of closed mandibular fractures, prophylactic antibiotics may be given 1 hour prior to procedure and up to 24 hours post operatively.[93-94]

Penicillin is the drug of choice while Clindamycin can be given in cases where Penicillin is contraindicated.[93, 106-107] In support of the use of Clindamycin as an alternative to Penicillin, we included a guideline from the American Heart Association as infective endocarditis shares the same bacterial flora as the oral cavity.[107]

**STATEMENT 8. ANESTHESIA: Nasotracheal intubation is the preferred route of anesthesia in patients diagnosed with isolated mandibular body fracture. In the presence of contraindications to nasotracheal intubation, submental intubation or tracheostomy may be performed.** *Recommendation.*

***Action Statement Profile for Statement 8***

- Aggregate Evidence Quality: Level III, Grade C

Level IV. A narrative review from the Department of Otolaryngology and Communication Sciences, State University of New York recommended nasotracheal intubation followed by submental or retromolar intubation while avoiding tracheostomy to allow operative access for patients undergoing ORIF wherein occlusion should be established.[108]

Level IV. A narrative review presented 2 advantages of nasotracheal intubation for procedures that would entail access to oral cavity and face: improved patient tolerance and inability of the patient to bite the ETT.[109]

Level IV. A narrative review stated that a nasotracheal tube may be preferred to an oral tube for better field of vision, but may have significant failure rates when attempted blind.[110]

Level IV. A narrative review stated that nasal endotracheal tubes provide surgeons with good surgical access and of particular importance in maxillofacial trauma surgery was the usefulness of preformed north-facing tubes which can be secured to the forehead without obscuring the facial bony contour.[111]

Level IV. A narrative review emphasized that a simple and straightforward approach for airway management is important during emergency situations. Various available options include orotracheal intubation, nasotracheal intubation or a surgical airway such as tracheostomy or cricothyroidotomy.[112]

Level IV. A case report from the Surgery and Integrated Clinic Department, Aracatuba Dental School, Sa˜o Paulo State University, Araraquara, Sa˜o Paulo, Brazil, described the efficiency of submental intubation in management of a case with panfacial fracture wherein dental occlusion and nasal pyramid assessment was necessary.[113]

Level III. A cross-sectional study in the division of Oral and Maxillofacial Surgery, Piracicaba Dental School, State University of Campinas, UNICAMP, Piracicaba, SP, Brazil over a 10-year period from April 1999 to July 2009 found 3,149 patients with facial trauma; 2,090 of which had facial fractures with 674 subjected to general anesthesia. Fifteen patients underwent submental intubation because of a combination of fractures affecting the midface and dental occlusion. The study concluded that submental intubation is a simple, safe technique with low morbidity in operative airway management of maxillofacial trauma patients requiring access to dental occlusion and the nasal pyramid.[114]

Level III. A cross-sectional study at the Oral and Maxillofacial Surgery Unit, Al-Adam Hospital in Kuwait from January 1, 2004 to September 15, 2007 included a total of 356 patients admitted due to maxillofacial trauma, with 222 operated on under general anesthesia and 8 subjected to submental intubation. The study concluded that it is technically easier, less time consuming and has lower morbidity compared to tracheostomy.[115]

Level III. A cross-sectional study at the School of Dental Sciences, Sharda University, Greater Noida between April 2006 and March 2014 on maxillofacial trauma patients showed that the majority (449 patients) had nasotracheal intubation, 204 had oral intubations, 6 had tracheostomies, and 15 had submental intubations. The study concluded that in instances where the nasal route of intubation was contraindicated, submental intubation was a viable alternative.[116]

Level III. A cross-sectional study at Al-Nahdha Hospital from July 2008 to December 2009 reviewed 177 facial trauma patients and showed that in majority (57%) of patients, nasal intubation was used and the main indication was evaluation and establishment of occlusion.[117]

Level IV. A case series at the Rohilkhand Medical College and Hospital, Bareilly, Uttar Pradesh, India from November 2006 to November 2009 described 25 out of 310 patients that were selected for submental intubation and operated on under the faciomaxillary surgery department. All of the patients selected had midfacial fractures (Le Fort I and II) panfacial fractures (midfacial and mandibular fractures) in which orotracheal and nasotracheal intubation were contraindicated. Results showed that submental tracheal intubation is an effective and useful technique for airway control and is a reliable route with no safety issues.[118]

Level III. A narrative review with case series from the Division of Plastic and Craniofacial Surgery, Children's Mercy Hospital, Kansas elaborated the advantages of submental intubation when orotracheal and nasotracheal intubation is not feasible. Of great importance to oral and maxillofacial surgeons was the ability to ensure dental occlusion throughout the procedure.[119]

- Benefit: For adequate reduction, establishment of occlusion and in aid of maxillomandibular fixation during surgery.
- Risks, Harm, Cost: There are risks in patients who have undergone nasal surgery and those with skull base and cervical fractures. Epistaxis may arise due to trauma. There is also the need for an experienced anesthesiologist and the use of Magill forceps; an armored tube is necessary for those undergoing submental intubation, and tracheostomy tube for those undergoing tracheostomy.
- Benefit-Harm Assessment: Preponderance of benefit over harm.
- Value Judgement: The need for free manipulation of the mandible for adequate reduction and fixation can be best achieved if there is no oral obstruction; the airway is more secure when a nasotracheal route is used.

  An alternative means of airway access may be used in special cases such as when complex facial fractures are present. Tracheostomy should be considered in patients with massive craniofacial injury and in those who are expected to be intubated for more than 5 days.
- Intentional vagueness**:** The choice between submental intubation and tracheostomy as an alternative to nasotracheal intubation is highly influenced by the operator's skill and training.
- Role of patient preference: Small
- Exceptions**:** None
- Policy level: Recommendation
- Differences of Opinion: None

***Supporting Text***

There were 12 articles included in our review: 6 narrative review articles, 4 cross sectional studies, 1 case series, and 1 case report. Nasotracheal intubation is widely used in maxillofacial surgery.[108-112] Submental intubation is a safe alternative to tracheostomy for those not requiring prolonged ventilation.[113-116, 119] The review of literature recommends the use of nasotracheal intubation as the standard in managing patients with facial trauma wherein manipulation of the jaw and establishment of occlusion is necessary.[108-115, 117-119]

**STATEMENT 9. OBSERVATION: Observation with soft diet may serve as management for patients diagnosed with favorable isolated nondisplaced and nonmobile mandibular body fractures with unchanged pre - traumatic occlusion.** *Recommendation.*

***Action Statement Profile for Statement 9***

- Aggregate Evidence Quality**:** Level II, Grade B

Level III. A cross sectional study on mandibular fractures at the Oral and Maxillofacial Surgery Unit, Canniesburn Hospital, Glasgow, Scotland from January 1, 1974 to December 31, 1983 included a total of 3,462 mandibular fractures in 2,137 patients with complete records, wherein 687 patients (32.1% of the total sample of 2,137) did not undergo surgical intervention and the fractures were observed for 4 to 6

weeks. Likewise, for 1,038 who sustained only 1 fracture, 485 (46.7%) were kept under observation. In these cases treated without surgical intervention, the patients obtained their pre-trauma centric occlusion with minimal difficulty or functional limitation.[27]

Level III. A cross sectional study in the University Hospital, Basel, Switzerland between January 1996 and January 2001 treated 28 patients (nine females, nineteen males) with 35 fractures by observation and soft diet only for 4 weeks. Patients were selected based on criteria of: a. non displaced fractures by clinical and radiographic examination; b. unchanged pretraumatic occlusion; c. willingness to participate in the study. Patients with isolated high condylar neck fractures were not included. No treatment was given, but patients were instructed to reduce mouth opening and maintain a soft diet for 4 weeks. Radiographic examinations obtained at 4, 8, and 12 weeks revealed spontaneous healing of all fractures.[120]

Level II. A prospective cohort study on the non-surgical management of mandibular fractures at the Maxillofacial Surgery Unit of Aminu Kano Teaching Hospital (AKTH) Kano, Nigeria from January to December 2012 had a total of 153 patients with mandibular fractures seen but only 10 patients meeting inclusion criteria. The study evaluated the quality of life of patients using the General Oral Health Assessment Index (GOHAI) questionnaire, accomplished via interview on day 1, 6 weeks and 8 weeks post-trauma, and showed that there was acceptable healing of all fractures with a significantly improved mean quality of life outcome from 41.42 at presentation to 59.90 at 8 weeks post op.[121]

Level II. A prospective cohort study at the Maxillofacial Surgery Unit of Aminu Kano Teaching Hospital (AKTH) Kano, Nigeria from January to December 2012 on quality of life after treatment showed no significant differences in the mean scores of those treated by closed reduction/MMF and those treated by ORIF. There was, however, a significant difference in QoL between subjects treated conservatively and those treated by either closed reduction/MMF or ORIF techniques ($p = .000$) at all the review times. The significant difference at 8 weeks in the QoL of subjects who were treated conservatively compared with those treated surgically may be related to the type of fractures managed conservatively, which were simple, undisplaced fractures. These patients did not have the added stress of an operation.[122]

- Benefit**:** Observation and conservative management has been shown to achieve satisfactory healing and acceptable quality of life; management through observation and soft diet may result in spontaneous and satisfactory healing of favorable isolated nondisplaced and nonmobile mandibular body fracture. Cost-effectiveness and avoidance of the burden of unnecessary operation and surgical pain and stress are the primary advantages of this management.
- Risks, Harm, Cost**:** Frequent clinical follow up and cost of serial radiographs.
- Benefit-Harm Assessment**:** There is a preponderance of benefit over harm.
- Value Judgements**:** Non-surgical interventions including observation and soft diet have been shown to be beneficial in non-displaced mandibular body fractures in terms of morbidity and cost. Thus, they serve as an option for uncomplicated cases. Observation accompanied by a soft diet is an adequate management of a favorable isolated nondisplaced and nonmobile mandibular body fracture. It is not costly and it avoids unnecessary surgical procedures.
- Intentional Vagueness**:** The duration of observation with soft diet is not specified in this guideline. The basis for conversion to other forms of management is not included either.
- Role of patient preference:** None
- Exception**:** None
- Policy Level**:** Recommendation
- Differences of Opinion:** None

***Supporting Text***

There were 4 studies reviewed, 2 cross sectional studies and 2 prospective cohort studies, all showing that patients with favorable isolated nondisplaced nonmobile body of mandibular fractures managed with observation on a soft diet had spontaneous healing of fractures and had no complications.[27, 120-122]

**STATEMENT 10. CLOSED REDUCTION: Closed reduction with immobilization by maxillomandibular fixation for 4-6 weeks may be considered in patients with minimally displaced favorable isolated mandibular body fracture with stable dentition, good nutrition and who are willing to comply with post-procedure care that may affect oral hygiene, diet modifications, appearance, oral health and functional concerns (eating, swallowing and speech).** *Recommendation.*

***Action Statement Profile for Statement 10***

- Aggregate Evidence Quality**:** Level II, Grade B

Level I. A Cochrane meta-analysis on interventions for the management of mandibular fracture included 12 studies involving 689 participants (830 fractures). Different interventions were examined and the included studies involved a limited number of participants with low number of events. The authors report inadequate evidence to support the effectiveness of a single approach in the management of mandibular fractures without condylar involvement. Treatment decisions should be based on clinician experiences and patient individual circumstances.[7]

Level II. A prospective cohort study of health-related quality of life (QoL) after treatment of mandibular fractures at Aminu Kano Teaching Hospital, Kano, Nigeria, from January to December 2012 illustrates a significant difference in QoL between subjects treated conservatively and those treated by either closed reduction/MMF or ORIF techniques (p = .000) at all review times. Regarding the psychosocial, physical, and pain domains - patients treated with ORIF reported significantly more pain, while MMF patients scored higher in the psychosocial and physical domains. Patients managed conservatively recorded a significant improvement across all three domains. The authors concluded that treatment of mandibular fracture with the use of a conservative approach in preference to ORIF to MMF, combined with adequate analgesia, showed an improved quality of life.[122]

Level I. A randomized controlled trial at the Oral Surgery Department, Faculty of Dentistry, Mansoura University, Egypt over the course of 2 years included 30 patients with 43 mandibular fractures, who had no other facial fractures. Patients were divided into 2 groups: 22 fractures in 15 patients in group A treated with conventional MMF for 6 weeks, and 21 fractures in 15 patients in group B treated with MMF for a short period of 2 weeks followed by splinting the lower jaw with an arch bar. Results showed that there was no significant difference between both patient groups with regards to mean time for fracture healing, postoperative infection, or malocclusion.[123]

Level IV. A narrative review from the Department of Oral and Maxillofacial Science, Faculty of Dentistry, Dalhousie University, Nova Scotia, Canada on the management of mandibular body and symphysis fractures mentioned different treatment options and discussed the advantages and disadvantages of each. The review emphasized the importance of a combination of correct diagnosis, proper treatment plan, and appropriate intervention for a specific case and type of patient.[54]

Level II. A retrospective cohort study at the Oral and Maxillofacial Surgery Service of San Francisco General Hospital included 85 patients treated for mandibular fractures from January 1 to December 31, 1993. The patients were divided into 2 groups: 1) patients treated by closed reduction with MMF; and 2) patients treated with open reduction and internal fixation using plates and screws. The treatment time, length of hospital stay, intraoperative time and charge analysis showed that the use of closed reduction with MMF in the management of mandibular fractures provided considerable savings over treatment by using ORIF. The use of ORIF should be reserved for patients and fracture types with specific indications.[124]

Level IV. A textbook chapter on the Management of Mandibular Fractures from the Textbook of Advanced Oral and Maxillofacial Surgery further elaborated on advantages of closed reduction such as simplicity, reduced operative time, cost-effectiveness and avoidance of damage to adjacent structures as well as disadvantages including inability to directly visualize the reduced fracture, the need to keep the patient on a liquid diet and difficulties with speech and respiration. Evidence-based studies cited in this chapter mentioned that 75-80% of mandibular fractures treated with open and closed reduction and maxillomandibular fixation showed clinical union by 4 weeks.[125]

Level I. An algorithm for treatment of non-condylar mandibular fractures at the Department of Oral and Maxillofacial Surgery, University of Texas Health Science Center in San Antonio mentioned closed treatment for mandibular fractures and stated that closed reduction works very well when applied to appropriate fractures; IMF/MMF application restores occlusion, aids in fracture reduction and fixation and allows healing to progress.[126]

Level I. A randomized controlled trial by the Department of Oral and Maxillofacial Surgery, Vidya Shikshan Prasarak Mandal Dental College and Research Centre, Nagpur, Maharashtra, India included 50 patients with minimally displaced mandibular fractures from November 2009 to October 2011. Patients were divided into 2 groups: 1) the study group, treated using intermaxillary fixation screw technique; and 2) the control group, treated using eyelet interdental wiring technique. Parameters such as time for placement and removal of both, postoperative occlusion, stability of IMF wire, intraoperative pain, anesthesia, oral hygiene status, glove perforation rate and complications were evaluated. Results showed IMF screws were a viable alternative to eyelets and interdental wiring in terms of significant reduction in operating time, negligible pain and infection, trauma to marginal gingiva, and maintenance of oral hygiene. IMF screws were well tolerated both by patients and surgeons, and IMFS application is an uncomplicated and rapid technique, useful for intraoperative ORIF and long term for closed reduction.[127]

Level II. A prospective cohort study of 208 patients with 256 mandibular fractures treated with MMF at the provincial hospital in Kandy, Sri Lanka from January 1978 through December 1983 assessed union of fractures once a week and followed all patients for a period of 6 months after removal of fixation. The study revealed that a shorter period of 3-4 weeks would suffice than what has been advocated in standard texts, and age has an influence in terms of duration of immobilization, observed to be shorter in children. This must be considered during planning of maxillomandibular fixation.[128]

Level II. A prospective cohort study at the Department of Plastic and Reconstructive Surgery, Pakistan Institute of Medical Sciences (PIMS), Islamabad, Pakistan, over a three-year period from September 1997 to October 2000 included 270 patients with maxillofacial injuries. Two hundred twenty eight (228) had mandibular fractures with a total of 344 fractures (single and multiple fractures per patient) found through clinical evaluation, radiographs and CT scans. There were 2 treatment modalities used in the study: 1) closed reduction with MMF in isolated body and angle fractures; and 2) open reduction with internal fixation for symphyseal, parasymphyseal, displaced body and angle fractures, or multiple fractures. Results showed good healing in all patients as seen in the follow up orthopantomogram at 6 weeks post treatment and repeated after 3 months to determine the progress of bone healing.[129]

- Benefit**:** Restores preoperative stable occlusion, good healing of fracture,[7,54, 123] simpler, faster, cheaper, less painful than open reduction techniques.[54, 122, 124, 125]
- Risks, Harm, Cost**:** Medically unstable patients who cannot tolerate/comply with immobilization with MMF[125]; poor nutrition, unstable dentition near the fracture site.[54, 125]
- Benefit-Harm Assessment**:** There is a preponderance of benefit over harm.
- Value Judgements: Although maxillomandibular fixation is less invasive and is associated with lower pain and cost, patient nutrition and quality of life may be affected over the duration of treatment.
- Intentional Vagueness**:** higher level evidence is still needed to recommend whether to manage patients with closed reduction or open reduction.[7]
- Role of patient preference: Small
- Exception**:** Medically unstable patients who cannot tolerate/comply with immobilization with MMF; poor nutrition[54,125]; unstable dentition near the fracture site.[54, 125, 126]
- Policy Level**:** Recommendation
- Differences of Opinion: None

***Supporting Text***

Based on our review of 10 articles: 1 meta-analysis, 2 randomized controlled trials, 3 prospective cohort studies, 1 narrative review article, 1 book chapter, and 1 algorithm; most cases of isolated minimally displaced mandibular body fractures that underwent closed reduction with maxillomandibular fixation achieved healing and union.[7,54, 123-124, 126-129] And closed reduction with MMF is simpler, faster, cheaper and less painful than open reduction techniques.[54, 122, 124-125]

Important prerequisites to achieve good occlusion and better healing include the presence of stable dentition and good nutrition. However, the level of evidence for studies supporting this statement was grade B at most, and higher level evidence is still needed to recommend whether to manage patients with closed reduction or open reduction.[7]

In comparison with open reduction techniques, closed reduction with maxillomandibular fixation seemed to be simpler, associated with lower pain and cost.[54, 122,124-125] However, plaque occurrence, poor oral hygiene, maintenance, worries in appearance and functionality were

some of the disadvantages associated with closed reduction with MMF.[127-129]

**STATEMENT 11. OPEN REDUCTION WITH TRANSOSSEOUS WIRING: In patients with isolated displaced unfavorable and unstable mandibular body fracture who cannot afford or avail of titanium plates, transosseous wiring with Maxillomandibular Fixation is an option.** *Recommendation.*

***Action Statement Profile for Statement 11***

- Aggregate Evidence Quality**:** Level II, Grade B

  Level I. A randomized controlled trial of 40 patients who sustained mandibular fractures selected from the outpatient department of the dental college of Yamunanagar divided them into 3 groups: 20 were managed with intraosseous wiring (group I) and 20 were managed with titanium plate fixation; 10 with postoperative immobilization (group IIA) and 10 without postoperative immobilization (group IIB). The radiographic gap between fractured ends of those managed with fixation with titanium plates was less than the gap in patients managed with intraosseous wiring. The average gap in group I patients was 16.1 sq.mm, in group IIA, 9.1sq.mm and in group IIB, 7.6sq.mm. Differences in postoperative pain (p>.1) and occlusion (p>.05) between the two groups were not statistically significant.[130]

  Level II. An interventional quasi-experimental study of 60 patients with mandibular fractures at the King Edward Medical College, Mayo Hospital, Lahore from 2004 to 2005 studied three modalities of mandibular osteosynthesis with 20 patients in each group: MMF, transosseous wiring (TOW) and miniplates. Maxillomandibular fixation and transosseous wiring are still commonly used methods today. The most common complication was infection, common in TOW and mini-plating due to direct intraoral contamination. The differences were not found to be statistically significant with infection occurring in 5% of the MMF group, 15% of the TOW group and 10% of the plating group.[131]

  Level III. A cross sectional study of 84 patients with mandibular fractures at the San Francisco General Hospital found infectious complications in 3 of the 25 patients who were repaired after 7 or more days. Delayed repair of mandibular fractures increases the incidence of infectious complications; perhaps the increased risk of infectious complications results from treatment of compound fractures older than 72 hours because medullary bone is acutely infected and has potentially impaired blood supply (the incidence of technical complications was remarkably higher in patients repaired after 3 days).[132]

  Level II. A cohort study of 148 patients with mandibular fractures operated on using transosseous wiring from 1963 to 1972 describes that a fifth of the fractures were operated on more than 10 days after injury, and half of the complications occurred in this group. Complication rates were about three times higher than the group that had early treatment. The study concluded that transosseous wiring technique is well proven and at least as good as treatment with titanium plates.[133]

  Level II. A cohort study involving 204 patients with mandibular body fractures who were treated with internal wire fixation from 1968 to 1976 in the Academic Hospital and Diakonessen Hospital, Groningen, Netherlands showed uneventful bone healing in 197 patients. There was delayed union in 4 patients and deep infection in 3 patients. The study concluded that internal wire fixation is suitable for treatment of mandibular body fractures.[134]

- Benefit**:** Lower Cost; reduced days lost out of work; avoidance or reduction of IMF duration postoperatively.
- Risks, Harm, Cost**:** Relatively increased morbidity in terms of surgical malocclusion, delayed union, higher infection rates and mental nerve injury; wider fracture gap post-operatively; delayed restoration of function.
- Benefit-Harm Assessment**:** There is preponderance of benefit over harm
- Value Judgements**:** Transosseous wiring is another form of maxillomandibular fixation in place of traditional plating methods. However, it is associated with higher infection rates, postoperative malocclusion and mental nerve injury. While the panel recognizes the superiority of titanium plates, the group also recognizes that not all patients can afford it. The delays in the surgery in such cases may lead to surgical and technical difficulties, making early establishment of treatment using transosseous wires an option.
- Intentional Vagueness**:** The type of wire and wiring technique and duration of MMF are not specified.

- Role of patient preference: Moderate.
- Exception: When medical illness or systemic injury add undue risk to an extended general anesthesia.
- Policy Level: Recommendation.
- Differences of Opinion: None

***Supporting Text***

Based on our review of 5 articles, 1 randomized controlled trial, 2 cohort studies, 1 quasi experimental study, and 1 cross sectional study, the use of transosseous wiring with maxillomandibular fixation remains an option in the treatment of isolated displaced unfavorable and unstable mandibular body fracture in patients who are financially constrained. Although it provides less stable fixation as shown by having a greater gap at the fractured ends at 3 months post-op, it is comparable to titanium fixation systems in terms of achieving the correct post-operative occlusion, eventual fracture healing and complication rate.[130-131,133-134]

The purpose of this statement is to address the need for reasonable treatment options for financially constrained patients with mandibular fractures. It has been observed that many of these patients have a delay in the treatment of their condition and several days delay will lead to technical difficulties and a higher complication rate in terms of healing and achieving proper occlusion.[132-133]

**STATEMENT 12. OPEN REDUCTION WITH TITANIUM PLATES: Open reduction and internal fixation using Titanium plates and screws should be performed in isolated displaced unfavorable and unstable mandibular body fractures.** *Recommendation.*

***Action Statement Profile for Statement 12***

- Aggregate Evidence Quality: Level II, Grade B

  Level I. A randomized controlled trial selected 40 patients who sustained mandibular fractures from the outpatient department of the dental college of Yamunanagar and divided them into 3 groups: 20 patients were managed with intraosseous wiring (group I) and 20 patients were managed with Titanium plate fixation, 10 with postoperative immobilization (group IIA), and 10 without postoperative immobilization (group IIB). Overall surgical morbidity of patients managed with titanium plate fixation was 60% with post operative immobilization and 40% in patients without postoperative immobilization compared to 65% in patients managed with intraosseous wiring. Group I patients had a gap of 16.1 sq.mm; IIA, 9.1sq.mm and IIB, 7.6sq.mm. Differences in postoperative pain (p>.1) and occlusion (p>.05) between the groups were not statistically significant.[130]

  Level II. An interventional quasi-experimental study of sixty patients with mandibular fractures at the King Edward Medical College, Mayo Hospital, Lahore from 2004 to 2005 compared 3 modalities of mandibular osteosynthesis among 20 patients in each group: MMF, transosseous wirings and miniplates. Rigid internal fixation in the form of plates was advantageous as it allowed immediate or early mandibular mobility, with good functional and aesthetic results and a low rate of complications. The major operative morbidity proved to be infection followed by malocclusion. Miniplate osteosynthesis had reduced complication rates at 20% compared to MMF at 30% and transosseous wiring at 50%.[131]

  Level II. A retrospective cohort study of 205 patients seen at the Maxillofacial Unit of The Royal Melbourne Hospital from 1985 to 1990 assigned the data of the patients into 3 groups: 83 patients managed with miniplate fixation according to Champy's principles (Group I), 40 patients underwent miniplate fixation ignoring Champy's principles (Group II), and 82 had transosseous wiring (Group III). Patients managed with transosseous wiring had a significantly longer hospital stay and IMF duration, increasing the cost of treatment and patient debility; 72% of those in group III had hospital stay more than 3 days while only 44% of those in group I and II stayed over 3 days.[135]

- Benefit: Better and more stable fixation; reduced days lost out of work; [130] avoidance or reduction of IMF duration postoperatively; [135] early restoration of normal function; better approximation of fracture ends; lower overall cost compared to interosseous wiring in an ideal setting; shorter hospital stays in an ideal setting; avoidance or reduction of IMF duration postoperatively.[135]
- Risks, Harm, Cost: Overall cost associated with ORIF.
- Benefit-Harm Assessment: There is preponderance of benefit over harm.
- Value Judgements: displaced, unfavorable and unstable mandibular body fractures require stable fixation that only titanium plates are able to provide. This is also associated with lesser hospital stay, faster recovery and minimal affectation in daily living. The panel recognizes that internal fixation with titanium plates is a superior method of fixation

over intraosseous wiring. The intraoral approach is preferred for ORIF of isolated displaced unfavorable and unstable mandibular body fracture; the use of Titanium plates allows more stable fixation and assures early restoration of normal form and function with lower overall cost for the patient. Although the initial cost of ORIF may seem more expensive than intraosseous wiring, the cost of managing complications of intraosseous wiring may be more expensive in the long term.

- Intentional Vagueness**:** The type of titanium plate is not specified in this guideline; the intraoral approach is not specified either, recognizing surgeon preference and the need for complete intraoral instrumentation.
- Role of patient preference: None.
- Exception**:** When medical illness or systemic injury add undue risk to an extended general anesthetic.
- Policy Level**:** Recommendation.
- Differences of Opinion: None.

***Supporting Text***

Three studies reviewed, 1 randomized controlled trial, 1 quasi experimental study, and 1 retrospective cohort study showed that the use of bone plates assures early restoration of normal form and function, compared to intraosseous wiring which was associated with extended periods of maxillomandibular immobilization.[130-131] Overall cost and charges associated with treating mandibular fractures with ORIF, such as operating room time and expenses, hardware charges, charges related to overall hospital length of stay and charges related to treatment complications, and loss of income due to absence from work are significantly lower when titanium plates are used.[131,135]

Patients who underwent ORIF with titanium plates and screws regained confidence faster by not being conscious of the awkward looking dental wiring used for immobilization.[131] Furthermore, maxillomandibular immobilization is not essential post-operatively after internal fixation with titanium plates.[130]

**STATEMENT 13. MAXILLOMANDIBULAR FIXATION: Intraoperative MMF may not be routinely needed prior to reduction and internal fixation of isolated displaced unfavorable and unstable mandibular body fracture.** *Recommendation.*

***Action Statement Profile for Statement 13***

- Aggregate evidence quality: Level II, Grade B

Level II. A retrospective cohort study of all patients with isolated mandibular fracture managed at the Maxillofacial Unit at Newcastle General Hospital over a 1-year period from 1995 to 1996 included 115 patients who fulfilled the criteria: 66 patients had their fractures reduced manually by anatomical reduction and 49 patients were reduced with pre-operative intermaxillary fixation. Results revealed no difference in the final occlusion of the patients. The study concluded that manual anatomical reduction was more economical in time and cost, safer for the operator, and more comfortable for the patient.[136]

Level I. A randomized controlled trial conducted among 80 patients with isolated mandibular fractures managed by open reduction and internal fixation using two titanium miniplates in Zagazig, Egypt from 2008 to 2014 classified patients into two groups: a control group (40 patients) whose occlusion was reduced with intraoperative rigid maxillomandibular fixation (MMF) with wires and archbars, and a study group (40 patients) whose occlusion was reduced with temporary intraoperative manual MMF until plate fixation. Mouth opening was normal in 26 patients (65%) and functional in 14 patients (35%) in the study group, and it was normal in 11 patients (27.5%) and functional in 29 patients (72.5%) in the control group. The study concluded that temporary manual MMF had the advantages of shorter operative time and less risk of blood-transmitted diseases to the surgical team and the patient in addition to the benefits of immediate postoperative mandible mobilization.[137]

Level I. A randomized controlled trial among 50 patients who presented with isolated mandibular fractures in Queensland, Australia, from 2009 to 2010 compared Intermaxillary fixation (IMF) and manual reduction. Patients admitted on an even date were managed with IMF, while patients admitted on an odd date were assigned to manual reduction. IMF was associated with an increased duration of procedure ($p < .001$) and increased complication rate ($p = .063$), without any observable benefit with regard to either radiographic outcome or occlusal outcome.[138]

- Benefits: Shorter operative time; comparable occlusal outcome; lower cost; less risk of blood borne diseases for patients and surgeons.
- Risks, harms, costs: Malocclusion, dependent on skill of surgeon.

- Benefit - harm assessment: Preponderance of benefit over harm.
- Value judgements: The panel recognizes that in treatment of isolated displaced unfavorable and unstable mandibular body fractures, establishment of proper occlusion is essential. The panel concedes that use of intra-operative MMF may not be routinely done by a skilled surgeon, and intraoperative manual MMF may be performed instead prior to plate fixation.
- Intentional vagueness: The type of manual MMF is not specified.
- Role of patient preferences**:** None
- Exceptions: When medical illness or systemic injury add undue risk to an extended general anesthesia
- Policy level: Recommendation
- Differences of opinion: None

***Supporting Text***

The purpose of this statement is to emphasize that restoration of the premorbid occlusion is essential to the treatment of mandibular fracture. However, it also concedes that in skilled hands, maintenance of proper occlusion can be achieved by manual reduction based on 3 articles that we reviewed, 2 randomized controlled trials and 1 retrospective cohort study.[136-138] This method of open reduction has economic benefits: faster operation time and cheaper total cost.[136-138] It is also safer for both the patient and the surgical team due to decreased associated injuries and blood-borne disease transmission.[136-138] For the patient, manual reduction is associated with decreased discomfort and has similar occlusal outcomes in the early postoperative period with earlier return of function.[136]

**STATEMENT 14. PREVENTION: Clinicians should advocate for compliance with road traffic safety laws (speed limit, anti-drunk driving, seatbelt and helmet use) for the prevention of motor vehicle, cycling and pedestrian accidents and maxillofacial injuries.** *Strong Recommendation.*

***Action Statement Profile for Statement 14***

- Aggregate evidence quality: Level I, Grade A

Level III. A cross sectional review of records of 119 patients treated for mandibular fractures between 2006 and 2011 in Brazil revealed mandibular fractures mostly affect Caucasian (72.2%) men (80.7%). Road traffic accidents (RTA) caused the most fractures (49.5%), followed by physical violence, including gunshot wounds (21%). Motorcycle accidents were the most common cause of RTA (76.2%). The most affected mandibular regions were the parasymphysis (26.9%) and the mandible angle (25.1%).[33]

Level III. This cross sectional study reviewed records of 444 patients with mandibular fracture from the year 2000 to 2005 in the University Hospital of Freiburg, Germany. There was a higher male:female ratio with regards to mandibular fractures. Road traffic accidents caused 32% of injuries followed by fights at 28%. The mandibular condyle was the most common fracture site, occurring 42% of the time.[21]

Level III. A cross sectional study at the Royal Hobart Hospital, Tasmania from 1993 to 1999 involving 251 patients revealed that assaults were the most common cause of fractures at 55%, followed by motor vehicle accidents at 18.3%.[139]

Level III. A cross sectional review of records of 310 motorcycle crash victims admitted to the Trauma Division, Department of Surgery, of the Philippine General Hospital from 2004 to 2006 showed that the majority of victims were young adults with a mean age of 27.7 and 83.8% were males, with maxillofacial involvement in 78%, and helmet use in only 11 of 84 (13%) injured motorcyclists. Alcohol consumption prior to the crash was documented in 88%.[140]

Level III. A cross sectional study of 2,581 patients at Christchurch Hospital, New Zealand over an 11-year-period from 1996 to 2006 comparing interpersonal violence and motor vehicle accidents in the etiology of maxillofacial fractures revealed that interpersonal violence was the main etiology of maxillofacial fractures. Alcohol involvement occurred in 87% of fractures caused by interpersonal violence, and 58% with motor vehicular accidents.[141]

Level III. A cross sectional review of alcohol involvement in cases of maxillofacial trauma among 94 patients at St. Anna Hospital during a 5-year period from 2005 to 2010 noted that 47% of trauma referrals involved alcohol. The association rose to 72% when considering assault cases alone.[142]

Level II. A prospective cohort study of 83 fractures of the mandible in 252 facial trauma cases at the Canberra Hospital, Australia during a 16 month period concluded that mandible fractures caused by interpersonal violence are more severe and more likely to require surgery, especially when alcohol

intoxication is involved. Alcohol involvement in mandible fracture presentation for oral maxillofacial trauma review increased the relative risk of requiring surgical intervention by 2.68 (CI 1.11–9.47).[143]

Level III. A cross sectional study of records of 2,581 patients seen at the oral and maxillofacial Surgery Unit at Christchurch Hospital, New Zealand from 1996 to 2006 revealed that alcohol was the main contributing factor for facial fractures associated with interpersonal violence and emphasized the important role of medical professionals in the rehabilitation process of patients and prevention programs.[144]

Level III. A cross sectional study at Christ Church hospital, New Zealand, over an 11-year period from 1996 to 2006 examined data on demographics, fractures, mode of injuries, and treatment for maxillofacial trauma patients. A total of 1,264 patients were identified to have alcohol related facial fractures; 90% were males and 66% were in the 15 to 29 year-age group. Assault was the most common cause of injury (73% in the first period and 83% in the second period). The study also concluded that alcohol related injuries were the main problem in young male adults.[145]

Level III. A cross sectional study of 350 maxillofacial trauma patients secondary to road traffic accidents in India from 2011 to 2012 revealed that 95.75% of victims did not wear helmets and that the most common cause for accidents was not following traffic rules (24%). The study concluded that "low utilization of safety devices and negligence of traffic rules" are etiologic factors in facial trauma.[146]

Level I. A Cochrane systematic review on the effects of helmets for preventing injury in motorcycle riders included 61 observational studies. From four higher quality studies helmets were estimated to reduce the risk of death by 42% (OR 0.58, 95% CI 0.50 to 0.68) and from six higher quality studies helmets were estimated to reduce the risk of head injury by 69% (OR 0.31, 95% CI 0.25 to 0.38).[147]

Level III. A cross sectional study in the Quirino Memorial Medical Center from 1996 to 1997 involving 29 patients attributed the highest number of fractures to vehicular accidents at 44.8% followed by assault at 24.1%. The study suggested that the government should conduct campaigns for the use of automotive safety devices and compliance by occupants.[16]

Level I. A systematic review on the effectiveness of road traffic prevention in low- and middle-income countries which included 18 articles for the qualitative synthesis on road traffic policies found that "legislation-based interventions had the strongest evidence for road traffic crash, injury, and death prevention." Legislative measures implementing a single road safety measure may also be effective; one study in Brazil suggested that legislation decreasing the legal blood alcohol content (BAC) level from 0.06 g/L to 0.02 g/L was associated with a significant ($p<0.05$) reduction in both traffic fatalities (7.2% to 16%) and injuries (1.8% to 2.3%). As expected, areas with higher levels of police enforcement demonstrated higher levels of effective legislation. Similarly, in 2010, Mexico also implemented legislation to reduce the legal BAC to 0.05 g/L, with increasing penalties with increasing BAC.[152]

Level III. A cross sectional study of 998 cases of maxillofacial trauma over a 6 month period from June 2007 in the emergency department of Government Dental College, Calcutta, India reported that the total number of motorcycle accident cases was 191 compared to 289 in the pre helmet law period (34 % decrease in incidence of motorcycle accidents from the prelaw to postlaw period). The study concluded that helmets are effective in reducing severity of injuries from road traffic accidents, and that health and medical professionals are responsible for the safety of patients, while public awareness campaigns can help improve issues on road traffic accidents.[153]

Level III. A cross sectional study of 512 patients admitted at the Philippine General Hospital for a 4-year period from 2004 to 2007 revealed that young adults aged 21 to 30 years old were the most affected age group. The most common cause of facial fractures was road traffic accidents at 63.7%. The study suggested that a prevention protocol must be developed based on traffic–related injuries.[4]

Level IV. A narrative review article from the Royal Colleges of Surgeons of Edinburgh and Ireland studied the trends in violence and emphasized the important role of physicians in patient care and violence prevention through data collection and sharing. Physicians can also contribute through

community safety partnerships with the local government and police.[154]

- Benefit: Adherence to road traffic safety laws, use of helmets and seatbelts and driving without the influence of alcohol reduces risk of morbidity and mortality. Land Transportation and Traffic Code (RA 4136), Motorcycle Helmet Act of 2009 (RA 10054), Seat Belts Use Act of 1999 (RA 8750) and Anti-Drunk and Drugged Driving Act of 2013 (RA10586) legislations that encourage abidance to speed regulation, increase use of helmets, seatbelts and prevent driving under the influence of alcohol, decreasing incidence of road traffic accidents and preventing maxillofacial injuries.
- Risks, harms, costs: Advocating compliance with road traffic safety laws requires clinicians to work beyond their role in diagnosis and management, entailing time and cost of educational materials.
- Benefit - harm assessment: Preponderance of benefit over harm.
- Value judgements: Several studies support the need for increased public awareness regarding traffic laws, mandating helmet/seatbelt use and avoidance of alcohol intake when driving. Implementation of these policies significantly reduce the incidence of road traffic accidents and violent crime in general and consequently, the reduction of mandibular trauma. The socio-economic impact of CMF trauma on health care systems and industry in terms of hospital costs, lost workdays, decreased productivity and increased resource utilization should be realized.
- Intentional vagueness: None.
- Role of patient preferences**:** None.
- Exceptions: None.
- Policy level: Strong Recommendation.
- Differences of opinion: None.

***Supporting Text***

Based on the review of 16 articles, 2 systematic reviews, 1 prospective cohort, 12 cross sectional studies, and 1 narrative review article, the data shows road traffic accidents and assaults are the most common causes of mandibular fractures.[21, 33, 139]

Several factors contribute to the prevalence of road traffic accidents, particularly alcohol consumption. Motorists under the influence of alcohol have a higher likelihood of injury or are more likely to be involved in trauma. Alcohol intoxication is associated with interpersonal violence and correlates with the severity of mandibular fractures.[140-145] Helmet use was only found in a minority of injured motorcyclists, among whom maxillofacial involvement was seen in the majority.[140]

Preventive practices (i.e., mandatory use of seat belts and helmets) likewise reduces the risk for mortality and head and neck injuries following vehicular accidents.[146,147] The Land and Transportation Code (RA 4136)[148], Motorcycle Helmet Act of 2009 (RA 10054)[149], Seat Belts Use Act of 1999 (RA 8750) [150] and Anti-Drunk and Drugged Driving Act of 2013 (RA10586)[151] are Philippine laws drafted to protect individual and public safety. Similar laws are also present in other countries and have been proven effective to decrease incidence and severity of maxillofacial injuries.[16] The extremely low percentages of road traffic accidents in most European countries could be associated with strict adherence to road traffic laws and implementation of preventive practices like mandatory use of seat belts, air bags and helmet, setting of speed limits, and strict policies against alcohol consumption and driving.[152]

Health and medical professionals have an ethical responsibility to educate and arrange for the safety of individuals.[153] Efforts to educate and promote road safety especially among young adults are warranted.[4] Efforts to protect those who are exposed to the risk of road traffic accidents are also warranted. Collaboration with different sectors involved in collecting and reporting road traffic injury data should be encouraged.[144,154]

**STATEMENT 15. PROMOTION: Clinicians should play a positive role in the prevention of interpersonal and collective violence as well as the settings in which violence occurs in order to avoid injuries in general and mandibular fractures in particular.** *Recommendation.*

***Action Statement Profile for Statement 15***

- Aggregate evidence quality: Level III, Grade C

Level III. A cross sectional study of 512 patients admitted at the Philippine General Hospital for a 4-year period from 2004 to 2007 revealed that young adults aged 21 to 30 years old were the most affected age group. The most common cause of facial fractures was road traffic accidents at 63.7%. The study suggested that "a prevention protocol must be developed based on traffic–related injuries."[4]

Level III. A cross sectional review of records of 310 motorcycle crash victims admitted to the Trauma Division, Department of Surgery, of the Philippine General Hospital from 2004 to 2006 showed that the majority of victims were young adults with a mean age of 27.7 and 83.8% were males, with maxillofacial

involvement in 78%, and helmet use in only 11 of 84 (13%) injured motorcyclists. Alcohol consumption prior to the crash was documented in 88%.[140]

Level III. A cross sectional analysis of records of patients seen at the Oral and Maxillofacial Surgery Unit at Christchurch Hospital, New Zealand from 1996 to 2006 revealed that alcohol was the main contributing factor for facial fractures associated with interpersonal violence. The study emphasized the important role of medical professionals in the rehabilitation process of patients and prevention programs.[144]

Level III. A cross sectional study at Christchurch Hospital, New Zealand over an 11-year period from 1996 to 2006 examined data on demographics, fractures, mode of injuries, and treatment for maxillofacial trauma patients; 90% of the patients were males and 66% were in the 15 to 29-year age group. Assault was the most common cause of injury (73% in the first period and 83% in the second period). The study also concluded that "alcohol related injuries were the main problem in young male adults".[145]

Level IV. A narrative review article from the Royal Colleges of Surgeons of Edinburgh and Ireland studied the trends in violence and emphasized the important role of physicians in patient care and violence prevention through data collection and sharing. Physicians can also contribute through community safety partnerships with the local government and police.[154]

Level III. A cross sectional study involving 92 patients seen at the emergency department at the University Hospital, University of Medicine and Dentistry of New Jersey from 1999 to 2000 noted that 80% of the patients were males and that assault (75%) was the most common cause of facial trauma followed by motor vehicle accidents (18.5%). "In response to the health promotion portion of the interview schedule, 82.6% (n = 76) of all participants expressed willingness to change behavior patterns that may be contributing to facial trauma. Most respondents appeared to be in the contemplation or preparation stage of change." The study concluded that "patients experiencing recurrent trauma are responsive to violence reduction programs."[155]

Level III. A cross-sectional study of 200 trauma patients attended at the ENT department and trauma centre, Gajra Raja Medical College and associated J.A. Group Hospitals, Gwalior, India from 2014 to 2015 revealed that 64% of the patients were males and that road traffic accidents (37%) were the most common cause of injury followed by interpersonal violence (25%).[156]

Level III. A cross sectional review of records involving 285 patients seen at the University Hospital, Newark, New Jersey (a level 1 trauma center) from 2000 to 2012 revealed that 124 patients (43.5%) obtained fractures from interpersonal violence. Mandibular fractures were the most common site involved in fractures secondary to interpersonal violence.[157]

- Benefit: Preventing violence and the settings in which it occurs decreases injuries in general and maxillofacial injuries in particular.
- Risks, harms, costs: None
- Benefit - harm assessment: Preponderance of benefit over harm
- Value judgements: None
- Intentional vagueness: The manner by which clinicians play their role in the prevention of interpersonal and collective violence as well as the settings in which violence occurs is left to their discretion.
- Role of patient preference: None
- Exception: None
- Policy level: Recommendation
- Differences of opinion: None

***Supporting Text***

The 8 articles reviewed were composed of cross sectional studies and 1 narrative review article**.**

Another main cause of maxillofacial fractures is interpersonal violence.[155-156] "The World Health Organization has defined interpersonal violence (IPV) as violence committed by an individual or a small group of individuals and includes physical and sexual assault, emotional and psychological abuse, and neglect."[144] Young male adults were the most affected demographic group, with alcohol as a main contributing factor.[4, 140, 145]

"Mandible fractures are common following interpersonal violence, often cited as one of the most common fractures following assault."[157] "The health professionals have an important role in community violence prevention to increase public safety."[144,154] "Oral and maxillofacial

surgeons who typically treat the patients with facial injuries in the acute and convalescent phase are in a good position to institute the necessary rehabilitation process, as well as preventive programs."[144] The majority of people consulting at the emergency department for facial trauma due to interpersonal violence are in the contemplation or the preparation stage of behavior change. Given these results, it may be beneficial to develop violence reduction programs within emergency departments.[155]

Injuries are preventable by changing the environment, individual behavior, product, social norms, legislation and governmental and institutional policies to reduce or eliminate risks and increase protective factors. Violence-related facial fractures are a health hazard that deserves more public awareness and implementation of preventive programs. Health professionals need to be aware of their important role in prevention, and preventive measures have to be disseminated effectively.[144,154,155,157]

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## APPENDIX A: GUIDELINE DEVELOPMENT GROUP (GDG)

| | |
|---|---|
| Chair: | Dr. Joselito F. David |
| Co-Chair/Methodologist: | Dr. Jose Florencio F. Lapeña Jr. |
| Liaison Officers: | Dr. Elmo R. Lago Jr. (PSO-HNS)<br>Dr. Enrico Micael G. Donato (PACMFS) |
| Staff Lead: | Dr. Ann Nuelli Acluba-Pauig |
| Resident Representative: | Dr. Joy Celyn G. Ignacio |
| Maxillofacial Surgeons: | Dr. Jose Rico A. Antonio<br>Dr. Arsenio L. Pascual III |
| Orthopedic Surgeon: | Dr. Antonio Mario L. de Castro |
| Family Physicians/GPs: | Dr. Policarpio B. Joves Jr.<br>Dr. Alejandro V. Pineda Jr. |
| Anesthesiologist: | Dr. Edgardo Jose B. Tan |
| Nurse Practitioner: | Dean Tita Y. Cruz |
| Dentists: | Dr. Eliezer B. Blanes<br>Dr. Mario E. Esquillo |
| Radiologist: | Dr Emily Rose M. Dizon |
| Motorcyclists: | Dr. Joman Q. Laxamana<br>Dr. Fernando T. Aninang |
| Bicyclist/Commuter/Pedestrian: | Ms. Carmela Cecilia G. Lapeña |

## APPENDIX B: GUIDELINE WORKING GROUP (GWG)

### Consultants

* Dr. Joselito F. David[1,2]
* Dr. Jose Florencio F. Lapeña Jr.[1,3]
* Dr. Francis V. Roasa[2]
* Dr. Arsenio L. Pascual III[4]
* Dr. Enrico Micael G. Donato[1,5]
* Dr. Jose Rico A. Antonio[6]
* Dr. Jehan Grace B. Maglaya[1,7]
* Dr. Rene Louie C. Gutierrez[1]
* Dr. Jennifer M. de Silva Leonardo[5]
* Dr. Ryan Neil C. Adan[1]
* Dr. Philip B. Fullante[3]
* Dr. Ann Nuelli B. Acluba-Pauig[1]

  Dr. Jay Pee M. Amable[7]

### Residents

* Dr. Rene Rose A. Arciga[8]
* Dr. Anna Carlissa P. Arriola[8]
* Dr. Mark Jansen D. G. Austria[6]
* Dr. Vergil Leo Claude C. Esquivel[4]
* Dr. Elaine Rose C. Ferrandiz[4]
* Dr. Soraya N. Joson[1]
* Dr. Jaysonnel O. Notario[3]
* Dr. Almia A. Pazon[4]
* Dr. Shella May M. Promentilla[1]
* Dr. Amihan Singson-Morales[3]
* Dr. Karen Adiel D. Rances[4]
* Dr. Melanie Grace Y. Cruz[1]
* Dr. Jan Caezar B. Cordero[1]
* Dr. Jemilyn C. Gammad[8]
* Dr. Stephen Y. Lee[8]
* Dr. Marion S. Bassig[8]
* Dr. Jose Carlo R. Villanueva[7]
* Dr. Dennis Andrew C. Remigio[1]
* Dr. Paula Sigma L. Javier[1]
* Dr. Joy Celyn G. Ignacio[1]
* Dr. Karina Vel E. Dizon[1]

  Dr. Louie Aldwin D. Roque[8]

  Dr. Bianca Denise E. Edora[8]

  Dr. Jesusa Santos-Perez[8]

* Dr. Fatima Angela C. Umali[8]
* Dr. Ma. Concepcion F. Vitamog[8]
* Dr. Helena Michelle N. Casipit[2]
* Dr. Marichu Florence Ciceron-Gloria[2]
* Dr. Harvey Hendrix G. Chu[2]
* Dr. Giselle L. Gotamco[2]
* Dr. Mark Aldrin A. Alcid[2]
* Dr. Veronica Marie M. Mendoza[2]
* Dr. Anli Kael C. Tan[2]
* Dr. Dann Joel C. Caro[2]
* Dr. Jenina Rachel DJ Escalderon[2]
* Dr. Christen-Zen I. Sison[2]
* Dr. Therese Monique DG Gutierrez[2]
* Dr. Alfred Peter Justine E. Dizon[1]
* Dr. Patrick Jan T. Lim[1]
* Dr. Fatima M. Gansatao[1]

  Dr. Nicole Sacayan-Quitay[3]

  Dr. Tracy Joyce M. Zamora[8]

  Dr. Chantel Jacqueline R. Tirol[3]

  Dr. Louie Francis T. Akiat[1]

  Dr. Mark Gil A. Magboo[1]

  Dr. Fery Mai J. Rafanan[1]

  Dr. Laurice Ann C. Canta[1]

*Original GWG; the rest contributed after 2017

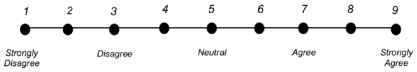
[1]East Avenue Medical Center, [2]University of Santo Tomas Hospital, [3]University of the Philippines – Philippine General Hospital, [4]Quezon City General Hospital, [5]Manila Central University – Filemon D. Tanchuco Medical Foundation Hospital, [6]Rizal Medical Center, [7]Univsersity of the East Ramon Magsaysay Memorial Medical Center Inc. [8]Jose R. Reyes Memorial Medical Center

## APPENDIX C: DELPHI PROCESS INSTRUMENT

For each item, please encircle the whole number (between 1-9) that is closest to your opinion.

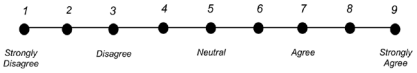
### 1. HISTORY, CLINICAL PRESENTATION AND DIAGNOSIS

Clinicians should consider a presumptive diagnosis of mandibular fracture in adults presenting with a history of traumatic injury to the jaw plus a positive tongue blade test, and any of the following physical findings: malocclusion, trismus, tenderness on jaw closure, broken tooth and step deformity.

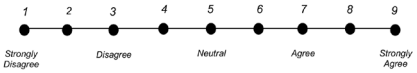



### 2. IMAGING

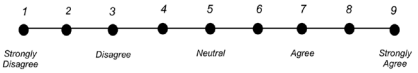
A. Clinicians may request for panoramic x-ray as the initial imaging tool in evaluating patients with a presumptive clinical diagnosis of mandibular fractures.




A. In a setting where panoramic radiography is not available, clinicians may recommend plain mandibular radiography among patients with presumptive clinical diagnosis of mandibular fracture.

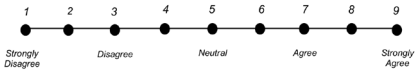



B. If available, non-contrast Facial CT Scan may be obtained for the assessment of mandibular fractures.



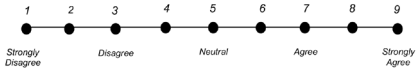

### 3. TREATMENT (MEDICAL)

A. Isolated mandibular body fractures should be temporarily immobilized/ splinted with a figure-of-eight bandage until definitive surgical management can be performed or while initiating transport during emergency situations.




A. Clinicians should routinely evaluate pain in patients with isolated mandibular body fractures using a numerical rating pain scale or visual pain analog scale; analgesics should be routinely offered to patients with a numerical rating pain scale score or VAS of at least 4/10.

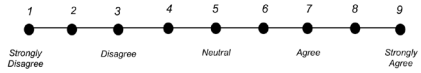
Patients may be initially managed with Paracetamol and a mild opioid with or without an adjuvant analgesic. Reassessment should be done and adequate analgesia should be given until the numerical rating pain scale score or VAS is 3/10 at most.




B. Prophylactic antibiotics should be given to adult patients with isolated mandibular body fractures with concomitant mucosal or skin opening with or without direct visualization of bone fragments.

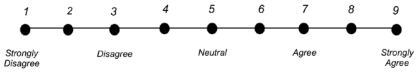
In patients without mucosal or skin lacerations, prophylactic antibiotics can be given 1 hour prior to surgery and up to 24 hours post op.

Penicillin is the drug of choice while Clindamycin may be used as an alternative for patients in whom Penicillin is contraindicated.



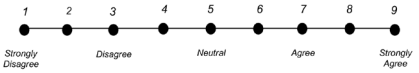

C. Nasotracheal intubation is the preferred route of anesthesia in patients diagnosed with isolated mandibular body fracture.

In the presence of contraindications to nasotracheal intubation, submental intubation or tracheostomy may be performed.

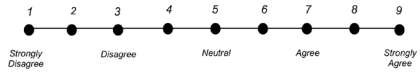



### 4. TREATMENT (SURGICAL)

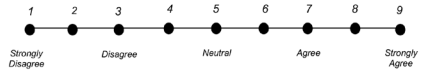
A. Observation with a soft diet may serve as management for patients diagnosed with favorable isolated nondisplaced and nonmobile mandibular body fracture with unchanged pre - traumatic occlusion.



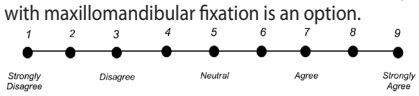

A. Closed reduction with immobilization by maxillomandibular fixation for 4-6 weeks may be considered in patients with minimally displaced favorable isolated mandibular body fracture with stable dentition, good nutrition and who are willing to comply with post-procedure care that may affect oral hygiene, diet modifications, appearance, oral health and functional concerns (eating, swallowing and speech).



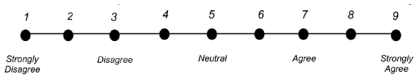

B. a. Open reduction and internal fixation using Titanium plates and screws should be performed in isolated displaced unfavorable and unstable mandibular body fracture.




b. In patients with isolated displaced unfavorable and unstable mandibular body fracture who cannot afford or avail of titanium plates, transosseous wiring with maxillomandibular fixation is an option.

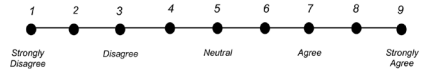



c. Intraoperative MMF may not be routinely needed prior to reduction and internal fixation of isolated displaced unfavorable and unstable mandibular body fracture.

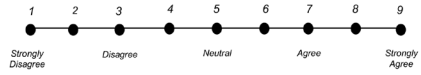



### 5. PREVENTION AND PROMOTION

A. Clinicians should advocate for compliance with road traffic safety laws (speed limit, anti-drunk driving, seatbelt and helmet use) for the prevention of motor vehicle, cycling and pedestrian accidents and maxillofacial injuries.




A. Clinicians should play a positive role in the prevention of interpersonal and collective violence as well as the settings in which violence occurs in order to avoid injuries in general and mandibular fractures in particular.



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