MINNESOTA METROPOLITAN REGIONAL TRAUMA ADVISORY COMMITTEE MEETING AGENDA –

Metropolitan Emergency Services Board
2099 University Ave West, St Paul
November 4, 2022, 7:00 a.m.

1. **Call to Order** – Committee Chair, Dr. Jonathan Gipson

2. **Approval of Agenda** – Dr. Gipson

3. **Approval of August 12, 2022 MMRTAC Minutes –** Dr. Gipson

4. **Old Business**

   A. MMRTAC Trauma Level III Position Open
   B. STAC Update – Chris Ballard
   C. MMRTAC at 2022 Minnesota State Fair August 26th- REVIEW- Greg Hayes

5. **New Business**

   A. 2023 Meeting Dates and locations
   B. Approval: Pediatric Trauma Resources: Head and Neck
   C. Set 2023 Goals

6. **Updates**

   A. Local Updates – Hospitals, System, EMS

7. **Adjourn**

2023 MMRTAC Meetings:

2022 STAC Meetings:

December 6, 2022

MINNESOTA METROPOLITAN REGIONAL TRAUMA ADVISORY COMMITTEE MEETING AGENDA –

Metropolitan Emergency Services Board
2099 University Ave West, St Paul
November 4, 2022, 7:00 a.m.

Minnesota Metropolitan Regional Trauma Advisory Committee Members:

Trauma Surgeon – Level I
Jonathan C. Gipson, MD (2022 Chair)
Uroghupatei Iyegha, MD
Chad J. Richardson, MD

Trauma Program Manager – Level I
Sherrie Murphy, RN

Trauma Surgeon – Level II
Chris Tignanelli, MD

Trauma Program Manager – Level II
Tammy Gallagher, RN

Trauma Program Manager – Level III
Open

Trauma Program Manager – Level IV
Dawn Rolling, RN

Process Improvement Specialist
Cori Sybrant, RN

EMS Representative – MREMSS
Tom Edminson, NRP

EMS Medical Directors
East – Bjorn Peterson, MD
West – Charles Lick, MD

Pediatric Trauma Specialist
Nathan Kreykes, MD

Trauma Surgeon – MN ACS-COT
Brian Myer, MD

Emergency Physician – ACEP
David Larson, MD

MESB EMS Coordinator
Greg Hayes, NREMT

Minnesota Metropolitan Regional Trauma Advisory Committee MMRTAC

August 12, 2022
WebEX

Members Present

Chris Ballard
Tom Edminson
Jonathan Gipson
Greg Hayes
Nathan Kreykes
Charles Lick
Sherrie Murphy
Brian Myer
Bjorn Peterson
Cori Sybrant

Others Present

Beth Aller, Laura Anderson, Rachel Bienert, Maeve Dwyer, Lynette Erickson, Emily Fofana, Mary Kay Kaiser, Linda Meier, Julie Philbrook, Laura Plasencia, John McCormick, Nancy Nyberg, Melanie Smalley

1. Call to order

Dr. Gipson**,** Chair called meeting to order.

2. Approval of Agenda/Minutes

3. Old Business

A. MMRTAC Trauma Level III Program Manager Position Open

Laura Anderson volunteered to send in her application.

1. STAC Update

Chris Ballard said the STAC last met on June 7. Angie Grimm replaced Maria Flores as the new Level III and IV STAC member. The 2023 meeting dates are on the STAC website.

Ballard said there was not much legislative activity. There was a state trauma funding bill that was introduced last session that did not pass. It will be on the next year's agenda.

Ballard said the EMSRB data sharing agreements have finally been approved. The technical piece needs to be re-built.

Ballard said a part-time student worker has been hired to assist the epidemiologist with data analysis. There is a vacancy for an epidemiologist and a vacancy for an orthopedic surgeon. Marty Forseth has retired. Lynn Marie Harris replaced Forseth.

Ballard said there is a high-level overview of the EMSRB and the EMS industry published in the Legislators Auditors Report.

Ballard said Dr. McGonigal has been re-elected as chair of the state's Trauma Advisory Council. Tammy Vonn will serve as vice-chair. These are two-year appointments.

2. MMRTAC at 2022 Minnesota State Fair August 26th.
Greg Hayes outlined the specifics of the MMRTAC presence of Stop the Bleed for the 2022 MN State Fair.

D. TXA for Isolated Head Injury – Removed

E. EMS Diversions - Removed

F. Good Sam app - Removed

G. Resources for Optimal Care of Injured Patients
Dr. Gipson said the new gray resource book is available. There is an increased focus on geriatrics and senior trauma injuries. There are requirements for scoring the elderly for frailty as well as the three Ds Dementia, Deliria and Depression in the elderly. The American College of Surgeons is asking there are protocols set for these.

Dr. Gipson said the orange book will still be used next year for verification. Since the gray book is now out, he recommends the gray book is used as a template going forward.

5. New Business
Sherrie Murphy said the EMS diversions have worked well, but still have not fully addressed how stressed the EMS institutions are. A state-wide response is needed to support the trauma system.

Dr. Gipson said at North Memorial the biggest challenge is the loss of floor nurses and 25% of its ICU nurses. Baby Boomers are retiring and the next generation is much smaller.

Murphy said they are working on refining their MCI response.

6. Updates
A. Pediatric Workgroup Update
Laura Plasencia said a group of trauma managers got together a couple of months ago to discuss how to provide resources for pediatric trauma/abuse. Providers first need to identify if the injury was trauma, and then to transfer or not.

Plasencia said the report will be circulated to MMRTAC members for comments and suggestions. Members were asked to reply to Plasencia by September.15th.

B. Local Updates – Hospitals, System, EMS – no updates

Adjournment at 8:30 AM

Pediatric Trauma Resources: Head and Neck

Disclaimer: This guide is intended to be used as a reference and is a guide only. This guide is not a substitute for a clinician's professional judgment. Reviewed October 2022.

Disclaimers

- MMRTAC makes no representations or warranties about the accuracy, reliability, or completeness of the content. Content is provided “as is” and is for informational use only. It is not a substitute for professional medical advice, diagnosis, or treatment. MMRTAC disclaims all warranties, express or implied, statutory or otherwise, including without limitation the implied warranties of merchantability, non-infringement of third parties’ rights, and fitness for a particular purpose.
- This content was developed to guide general patient care and may not be suitable for use in all patient care environments. MMRTAC does not endorse, certify, or assess third parties’ competency. You hold all responsibility for your use or nonuse of the content. MMRTAC shall not be liable for claims, losses, or damages arising from or related to any use or misuse of the content.

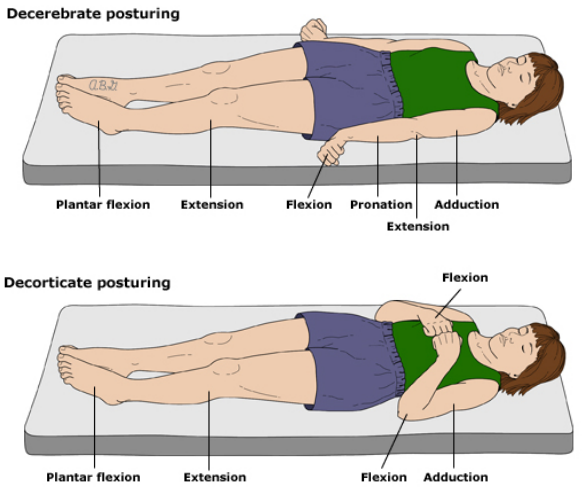
Pediatric Glasgow Coma Scale

Eye Opening Response		
Adults, Children over 2 years		**Under 2 years**
Spontaneous – opens with blinking at baseline	**4**	Eye opening spontaneously
Opens to verbal command, speech, or shout	**3**	Eye opening to speech
Opens to pain	**2**	Eye opening to pain
No eye opening	**1**	No eye opening
Verbal Response		
Adults, Children over 2 years		**Under 2 years**
Oriented and converses	5	Coos or babbles (developmentally appropriate)
Confused, but able to answer questions	4	Is irritable and continually cries
Inappropriate responses, words are discernable	3	Cries to pain
Incomprehensible speech/sounds	2	Moans to pain
No verbal response	1	No verbal response
Motor Response		
Adults, Children over 2 years		**Under 2 years**
Obeys commands for movement	6	Moves spontaneously or purposefully
Purposeful movement to painful stimulus	5	Withdraws from touch
Withdraws from pain	4	Withdraws from pain
Abnormal (spastic) flexion; decorticate posture	3	Abnormal flexion to pain for an infant; decorticate posture
Extensor (rigid) response; decerebrate posture	2	Extension to pain; decerebrate posture
No motor response	1	No motor response

The Glasgow Coma Scale (GCS) is scored between 3 and 15, with 3 being the worst and 15 the best. It is composed of 3 parameters: best eye response (E), best verbal response (V), and best motor response (M).

The components of the GCS should be recorded individually; for example, E2V3M4 results in a GCS of 9. A score of 13 or higher correlates with mild brain injury, a score of 9 to 12 correlates with moderate injury, and a score of 8 or less represents severe brain injury.

The Pediatric Glasgow Coma Scale (PGCS) was validated in children 2 years of age or younger.



Graphic 61697 Version 3.0

References:
1.Teasdale G, Jennett B. Assessment of coma and impaired consciousness. A practical scale. Lancet 1974; 2:81.
2.Holmes JF, Palchak MJ, MacFarlane T, Kuppermann N. Performance of the pediatric Glasgow coma scale in children with blunt head trauma. Acad Emerg Med 2005; 12:814.
3.UpToDate, Inc. 2022. https://www.uptodate.com/contents/image?imageKey=PEDS%2F59662

Disclaimer: This guide is intended to be used as a reference and is a guide only. This guide is not a substitute for a clinician's professional judgment. Reviewed October 2022.

Pediatric Blunt Head Injury Management: Imaging Recommendations

Age < 2 years

Assessment:	Recommendations:
• GCS ≤ 14 • Altered Mental Status • Palpable Skull Fracture	Obtain CT -risk for ciTBI* = 4.4%

• GCS 15 with one or more of the following:
  • Occipital, parietal, or temporal hematoma
  • Loss of consciousness > 5 seconds
  • Severe mechanism**
  • Not acting normally per parent
	Observation vs CT
	-risk of ciTBI* = 0.9%
	-consider CT based on your experience, multiple vs. isolated findings, worsening symptoms after period of observation, age < 3 months, concerns for non-accidental trauma, or parental preference.

• None of these signs/symptoms and GCS 15	No CT -risk of ciTBI* <0.02% in children < 2 years

Age > 2 years

Assessment:	Recommendations:
• GCS ≤ 14 • Altered mental status • Signs of basilar skull fracture	Obtain CT -risk for ciTBI* = 4.3%

• GCS 15 with one or more of following:
  • History of vomiting
  • Any loss of consciousness
  • Severe mechanism**
  • Severe headache
	Observation vs CT
	-risk for ciTBI* = 0.9%
	-consider CT based on your experience, multiple vs. isolated findings, worsening symptoms after period of observation, age <3 months, or parental preference

• None of these signs/symptoms and GCS 15	No CT -risk of ciTBI* <0.05% in children >2 years

*Clinically important traumatic brain injury, defined as 1) death from TBI, 2) neurosurgical intervention, 3) intubation, 4) intubation >24 hours, 5) Hospital admission > 2 nights

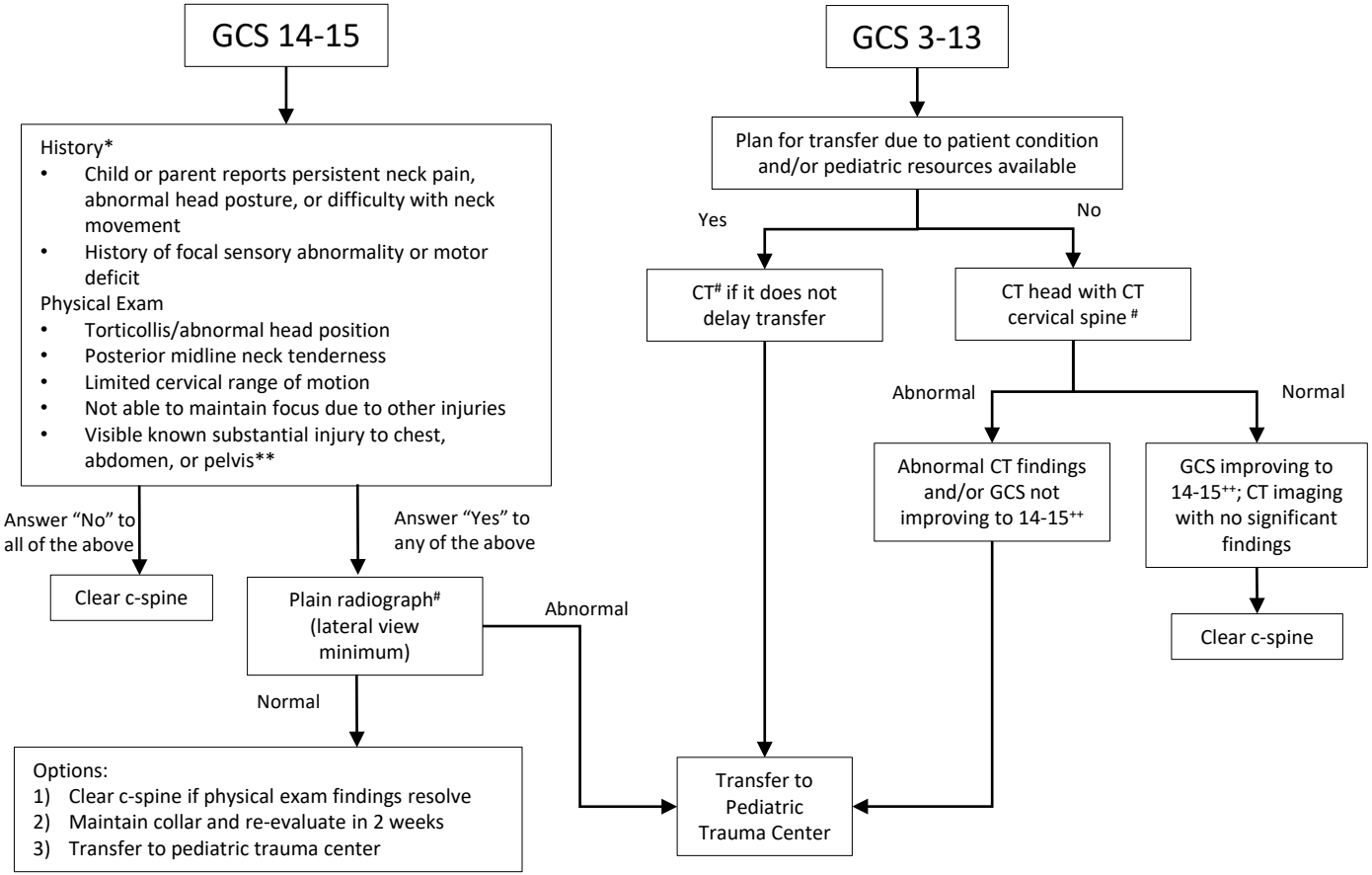
**Severe mechanism, defined as MVC with patient ejection, death of another passenger, rollover; pedestrian or bicyclist without helmet struck by motorized vehicle, fall > 3 feet, for ages <2 years, > 5 feet ages >2 years, head struck by high-impact object. Note: These recommendations do not necessarily apply in cases of suspected physical child abuse.

References: Kuppermann N, et al. Identification of children at very low risk of clinically important brain injuries after head trauma: a prospective cohort study. Lancet. 2009 Oct 3; 374 (9696):1160-70

Abid Z, Kuppermann N, Tancredi DJ, Dayan PS. Risk of Traumatic Brain Injuries in Infants Younger than 3 Months With Minor Blunt Head Trauma. Ann Emerg Med. 2021 Sep;78(3):321-330.e1. doi: 10.1016/j.annemergmed.2021.04.015. Epub 2021 Jun 17. PMID: 34148662.

Disclaimer: This guide is intended to be used as a reference and is a guide only. This guide is not a substitute for a clinician's professional judgment. Reviewed October 2022.

Pediatric Cervical Spine Clearance



*Stronger consideration for imaging should be given towards patients with the following mechanisms of injury (MOI): diving, axial load, clothes-lining, and high-risk MVC (HR-MVC), however the literature findings are controversial. HR-MVC is defined as a head-on collision, rollover, ejected from the vehicle, death in the same crash, or speed >55mph.
**Substantial injury is defined as an observable injury that is life-threatening, warrants surgical intervention, or warrants inpatient observation.
#All imaging should be read by an attending physician.
++Patient has achieved GCS 14-15 and no longer presents with abnormal head posture, persistent neck pain, or difficulty in neck movement.

REFERENCE:
Herman, et al. (2019) Pediatric cervical spine clearance: A consensus statement and algorithm from the Pediatric Cervical Spine Clearance Working Group. *Journal of Bone and Joint Surgery,* 101:e1 (1-9), http://dx.doi.org/10.2106/JBJS.18.00217

Disclaimer: This guide is intended to be used as a reference and is a guide only. This guide is not a substitute for a clinician's professional judgment. Reviewed October 2022.

General Guidelines

1. Patients with blunt traumatic injuries should be placed in a rigid padded collar as soon as possible.

2. For patients who do not fit a cervical collar, alternative methods of cervical spine immobilization such as sandbags or manual stabilization should be used.

3. Information about the type of disability, the child's baseline intellectual function, and preinjury behaviors should be considered when clearing cervical spine in a patient with pre-existing musculoskeletal conditions or developmental disabilities.

4. Documentation of the cleared cervical spine by the provider should include clearance methodology, date, and time.

5. If a patient remains in a cervical collar for extended periods of time, regular assessments of the skin should be done per nursing practice standards to prevent skin breakdown.

6. Clinical clearance after blunt trauma that could potentially involve the neck CANNOT be performed if the child exhibits a visible or known substantial injury to the chest, the abdomen, or the pelvis, regardless of GCS.

7. Clinical clearance CANNOT be performed if the child or parent reports persistent neck pain, abnormal head posture, or difficulty in neck movement.

8. When clinical clearance is not possible for children <3 years old with GCS 14-15, the primary imaging modality for children is radiographs. A one-view (lateral) radiograph is sufficient initially.

Non-Accidental Trauma:
Patterned Skin Injuries and Unusual Locations of Injuries

Sentinel Injuries

Providers should be aware of potential sentinel injuries that, if missed, may result in more serious injury to the child. This includes:

- Frenulum tears, oral injuries in non-ambulatory children
- Rib fractures, especially posterior
- Metaphyseal (corner) fractures in children <12 months
- Ear pinna bruising
- Unexplained or unwitnessed head injury
- Cigarette or other patterned burns
- Abdominal injuries in children <5 years with non-motor vehicle collision mechanism reported
- Bruising in non-mobile infant

Note:

- Simple household falls rarely result in serious injury.
- An unexplained injury is an injury that is not consistent with the child's age, developmental abilities, or injury type; history that is vague or changes with time, repetition or caregiver; and/or an injury that presents after a delay in seeking care.
- Prompt evaluation and treatment of traumatic injuries should be emphasized over initial investigation of suspected child abuse.

TEN-4-FACES-P

Torso
Ear
Neck

4
Bruises in the **TEN** distribution in a child under **4 years of age**
or
ANY bruise in an infant less than **4-6 months of age**

Frenulum (mouth)
Angle of the jaw
Cheek
Eyelids (bruising)
Subconjunctivae
Patterned bruising

Note:
This is not a diagnostic tool. TEN-4-FACES-P is a screening tool to improve the recognition of potentially abused children with bruising who require further evaluation. The child's developmental abilities must be considered when assessing the likelihood of abuse, as well as the history provided by caregivers. Early consultation by a child abuse pediatrician is recommended if physical abuse is suspected to guide the evaluation, testing, and treatment plan.

Reference: Pierce MC, et al. Validation of a Clinical Decision Rule to Predict Abuse in Young Children Based on Bruising Characteristics. JAMA Netw Open. 2021 Sep 1;4(9):e2130136. PMID: 33852003.

Disclaimer: This guide is intended to be used as a reference and is a guide only. This guide is not a substitute for a clinician's professional judgment. Reviewed October 2022.

Contact a Child Abuse Physician for Consultation or Recommendations for Disposition:

- Univ. of Minnesota Masonic Children's Hospital, Minneapolis -- Center for Safe & Healthy Children (612) 273-SAFE (7233) or (672) 365-1000
- Children's Minnesota, Minneapolis and St. Paul -- Midwest Children's Resource Center (MCRC) (651) 220-6750 or (866) 755-2121
- Hennepin Health HCMC, Minneapolis -- Center for Safe & Healthy Children (800) 424-4262 (Hennepin Connect)
- Mayo Clinic, Rochester -- Mayo Child and Family Advocacy Program (507) 266-0443 daytime or (507) 284-2517
- Essentia Health St. Mary's, Duluth – (218) 786-8364
- Gundersen Health System, La Crosse—Child Protection Team (608) 782-7300
- Sanford Health Sioux Falls, Sioux Falls -- Child's Voice Child Advocacy Center (605) 333-2226
- Sanford Health Fargo, Fargo -- Child & Adolescent Maltreatment Service(CAMS) (70I) 234-2000 or (877) 647 -1225

Concussion Assessment and Management

Children and teens who show or report one or more of the signs and symptoms listed below, or simply say they just "don't feel right" after a bump, blow, or jolt to the head or body, may have a concussion or more serious brain injury.

Observed Concussion Signs

•Can't recall events *prior to* or *after* a hit or fall.
•Appears dazed or stunned.
•Forgets an instruction, is confused about an assignment or position, or is unsure of the game, score, or opponent.
•Moves clumsily.
•Answers questions slowly.
•Loses consciousness *(even briefly)*.
•Shows mood, behavior, or personality changes.

Reported Concussion Signs

•Headache or "pressure" in head.
•Nausea or vomiting.
•Balance problems or dizziness, or double or blurry vision.
•Bothered by light or noise.
•Feeling sluggish, hazy, foggy, or groggy.
•Confusion, or concentration or memory problems.
•Just not "feeling right," or "feeling down".

Dangerous Signs and Symptoms of a Concussion

- One pupil larger than the other.
- Drowsiness or inability to wake up.
- A headache that gets worse and does not go away.
- Slurred speech, weakness, numbness, or decreased coordination.
- Repeated vomiting or nausea, convulsions or seizures (shaking or twitching).
- Unusual behavior, increased confusion, restlessness, or agitation.
- Loss of consciousness (passed out/knocked out). Even a brief loss of consciousness should be taken seriously.
- For infants and toddlers: will not stop crying and cannot be consoled; will not nurse or eat

Signs and symptoms generally show up soon after the injury. However, some symptoms may not show up for hours or days. Ongoing assessment is important to identify any changes.

Reference: CDC HEADS UP Brain Injury Basics: https://www.cdc.gov/headsup/basics/concussion_symptoms.html

Disclaimer: This guide is intended to be used as a reference and is a guide only. This guide is not a substitute for a clinician's professional judgment. Reviewed October 2022.

Patient Education for Concussion Care

No two brain injuries are alike.

Most brain injuries heal with rest and time. Symptoms of traumatic brain injuries, such as headache and feeling tired, can be treated.

The symptoms below can be expected in a child with a mild traumatic brain injury:

Physical: Dizziness or balance issues Bothered by light or noise Feeling tired, no energy Nausea or vomiting (early on) Headaches Vision problems	**Thinking:** Attention or concentration problems Feeling slowed down Foggy or groggy Short- or long-term memory problems Trouble thinking clearly
Emotions: Anxiety or nervousness Irritability or easily angered Feeling more emotional Sadness	**Sleep:** Sleeping less than usual Sleeping more than usual Trouble falling asleep

Signs of a More Serious Brain Injury that Caregivers Should Recognize:

- A headache that gets worse and does not go away
- Significant nausea or repeated vomiting
- Unusual behavior, increased confusion, restlessness, or agitation
- Drowsiness or inability to wake up
- Slurred speech, weakness, numbness, or decreased coordination
- Convulsions or seizures (shaking or twitching)
- Loss of consciousness (passing out)

Brain Rest:

- Limited reading and screen time (e.g., computers, phones, video games, TV)
- Practice good sleep habits, including getting extra rest as needed
- Gentle motion like walking and stretching are encouraged; slow down or stop if symptoms change

Return to School:

Children who return to school after a concussion may need to:

- Shorten the school day, gradually returning to a full-time schedule
- Request additional time to move between activities or classes
- Request additional time to complete assignments or delay tests
- Initially reduce time spent on the computer, writing, or reading

Return to Athletics:

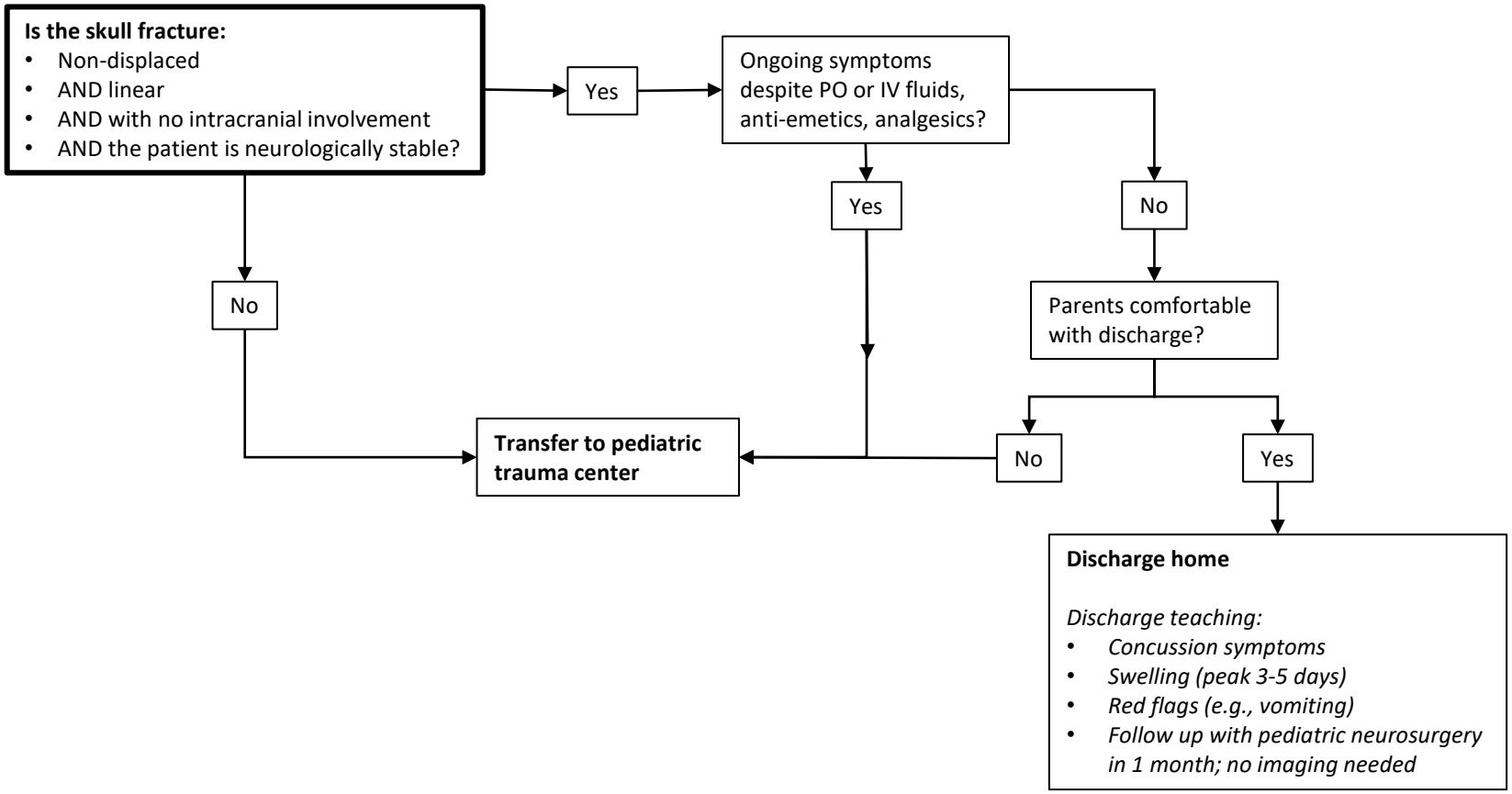
Before returning to contact sports, children should:

- Be back to doing their regular school activities
- Not have any symptoms from the injury when doing normal activities
- Have been evaluated by their health care provider

Reference: CDC HEADS UP, 2022. https://www.cdc.gov/headsup/index.html

Reviewed October 2022.

Pediatric Skull Fracture Management



References:

Hentzen, A. S, Helmer, S.D, et al. Necessity of repeat head computed tomography after isolated skull fracture in the pediatric population. The American Journal of Surgery. 2015; 201, 322-325.

Powell, E.C, Atabaki, S.M, et al. Isolated Linear Skull Fractures in Children With Blunt Head Trauma. Pediatrics. 2015; 135, e851.

Lyons, T.W., Stack, A. M., et al. A QI Initiative to Reduce Hospitalization for Children With Isolated Skull Fractures. Pediatrics. 2016; 137;6;e20153370.

Bressan, S., Marchetto, L., et al. A Systematic Review and Meta-Analysis of the Management and Outcomes of Isolated Skull Fractures in Children. Annals of Emergency Medicine. 2018; 71(6) 714-724.

Blunt Cerebrovascular Injury in Children

McGovern Screening Score

High risk of BCVI = ≥ 3 points

Criteria	Points
GCS Score ≤ 8	1
Focal neurological deficit	2
Carotid canal fracture	2
High impact mechanism of injury	2
Petrous temporal bone fracture	3
Cerebral infarction on CT	3

Focal neurological symptoms in both adult and pediatric trauma patients often do not occur until 10-72 hours after injury. The incidence of cerebrovascular injury in children is not well understood. Risk factors seen in the adult trauma population do not apply to the pediatric population; additionally, treatment varies in the adult and pediatric populations. Motor vehicle collisions are reported as the most prevalent mechanism of injury, including both children who are passengers in a vehicle involved in a collision as well as those who are pedestrians struck by a vehicle. Other screening tools that have been evaluated include the Memphis, Denver, and Utah screening tools.

Liberal use of CT angiogram to detect BCVI in children is not recommended in order to reduce the carcinogenic effects of ionizing radiation. Dose reduction techniques should always be used for imaging studies in children. CT angiogram should be obtained only in consultation with a neurosurgery attending. If an injured child screens positive for BCVI, transfer to a pediatric trauma center is warranted.

References:
Herbert JP, Venkataraman SS, Turkmani AH, Zhu L, Kerr ML, Patel RP, Ugalde IT, Fletcher SA, Sandberg DI, Cox CS, Kitagawa RS, Day AL, Shah MN. Pediatric blunt cerebrovascular injury: the McGovern screening score. J Neurosurg Pediatr. 2018 Jun;21(6):639-649. doi: 10.3171/2017.12.PEDS17498. Epub 2018 Mar 16. PMID: 29547069.

Ravindra VM, Riva-Cambrin J, Sivakumar W, Metzger RR, Bollo RJ. Risk factors for traumatic blunt cerebrovascular injury diagnosed by computed tomography angiography in the pediatric population: a retrospective cohort study. J Neurosurg Pediatr. 2015 Jun;15(6):599-606. doi: 10.3171/2014.11.PEDS14397. Epub 2015 Mar 6. PMID: 25745952.

Galardi MM, Strahle JM, Skidmore A, Kansagra AP, Guilliams KP. Cerebrovascular Complications of Pediatric Blunt Trauma. Pediatr Neurol. 2020 Jul;108:5-12. doi: 10.1016/j.pediatrneurol.2019.12.009. Epub 2020 Jan 11. PMID: 32111560; PMCID: PMC7306436.

Pediatric Facial Trauma:
An ATLS-Based Approach Primary Survey

Anatomical Considerations in Children

- Children have more prominent foreheads and smaller flatter faces than adults.
- Facial growth occurs in a downward and forward direction as the child ages.
- Pneumatization of paranasal sinuses does not occur until puberty, resulting in fewer frontal sinus fractures.
- Bones are more elastic and resistant to fractures.
- Non-erupted permanent dentition provide additional strength and support to the mandible and maxilla.
- Facial fat pads also provide cushioning and deflect force in the event of trauma.

Airway	**Breathing**	**Circulation**
Indications for tracheal intubation in brain-injured patients • GCS ≤ 8 • Significantly deteriorating conscious level (e.g. a fall in GCS of two points or more, or a fall in motor score of one point or more) • Loss of protective laryngeal reflexes • Significantly altered venous or arterial blood gases • Bilateral fractured mandible • Copious bleeding into the mouth (e.g. from skull base fracture) • Seizures	• Stridor, hoarseness, subcutaneous emphysema are all suggestive of laryngeal or tracheal injury. • Symptoms of respiratory collapse include agitation, cyanosis, and obtundation.	• Nasal packing: Begin with posterior nasal pressure to tamponade blood from posterior ethmoid artery. Inflated balloon of an indwelling foley catheter can be used. Petroleum gauze can be used to pack the anterior nare to tamponade bleeding from the anterior ethmoid artery.

Disability

- There is a positive association between the complexity of the fracture and the likelihood of additional injuries. Midface and mandible fractures have the highest risk of associated injuries due to amount of energy required to cause these fractures. There is an association of traumatic brain injuries with cranial vault and basal skull fractures; neurosurgical consultation is needed for patients with significant maxillofacial trauma.
- Beta transferrin is highly sensitive and specific for identifying cerebral spinal fluid (CSF). CSF rhinorrhea is not a contraindication to nasal packing because the cribiform plate is superior to the pressure packs. Antibiotic prophylaxis with IV ceftriaxone, or in the case of allergies a combination of vancomycin and ampicillin/sulbactam, should be used for CSF leaks.

Pediatric Facial Trauma: An ATLS-Based Approach
Secondary Survey

Frontal bone fractures:

- Non-displaced: observation only; no need for OMFS evaluation unless otherwise symptomatic
- Displaced: require evaluation by OMFS and/or ENT/Facial Plastics due to possible nasofrontal duct involvement

Orbital fractures and Eye Injuries:

- Initial evaluation should observe for extraocular muscle involvement, entrapment, periorbital fat herniation, and location and integrity of the globe
- Physical signs of diplopia, enophtalmos require early evaluation to rule out injury to the retina and/or globe
- Early ophthalmological evaluation is needed for eye injuries, altered vision of color perception, lacerations to the eyelid or medial canthus, vitreous injury, hyphema, relative afferent pupillary defect (RAPD), abnormal globe tension
- Traumatic optic neuropathy is evident by loss of vision and RAPD. ED management includes covering the eye, administration of steroids, and administration of cycloplegic and antihypertensive medications. Surgical repair should occur within 24 hours.

Mid-facial Fractures:

- Relatively rare in younger children due to the prominence of the forehead; incidence increases with age
- Fractures typically involve one or more bones of the nasal complex, orbitozygomatic complex, zygomatic arch, and maxillary bones. ED care is focused on anti-inflammatory and analgesic treatment. Immediate surgical repair is not needed. These fractures are not life-threatening.
- Nasal septal hematomas do, however, require immediate drainage to prevent complications such as cartilage necrosis, saddle-nose deformity, or potential mid-face growth impairment.

Mandibular Fractures:

- The tongue blade test is an accurate clinical predictor of mandibular injury. This involves having the patient bite down on a tongue depressor while the provider attempts to pull it out; this should be tested on both sides of the mouth. If the provider can pull out the tongue depressor, it is considered a positive test and indicative of a possible mandibular injury.

Dentoalveolar Injuries:

- Avulsed teeth should be accounted for by the provider. They can be irrigated with saline and re-implanted without removal of any blood clots, ideally within 2 hours. If reimplantation is not possible, the tooth should be stored in saliva or in milk.

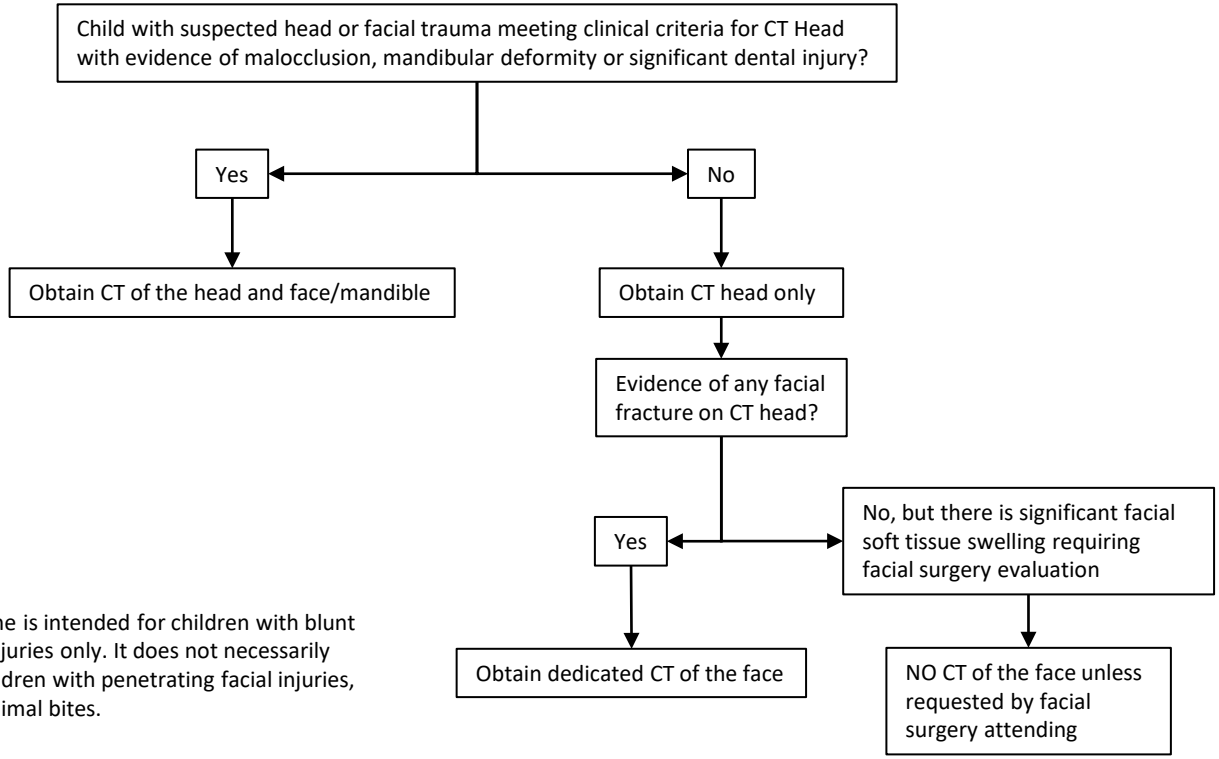
Cervical Spine Fractures:

- Mandibular fractures are associated with C1-4 disruption.
- Midface fractures are associated with C5-7 disruption.

References:
Ryan ML, Thorson CM, Otero CA, Ogilvie MP, Cheung MC, Saigal GM, Thaller SR. Pediatric facial trauma: a review of guidelines for assessment, evaluation, and management in the emergency department. J Craniofac Surg. 2011 Jul;22(4):1183-9. doi: 10.1097/SCS.0b013e31821c0d52. PMID: 21772215.

Nathanson MH, Andrzejowski J, Dinsmore J, Eynon CA, Ferguson K, Hooper T, Kashyap A, Kendall J, McCormack V, Shinde S, Smith A, Thomas E. Guidelines for safe transfer of the brain-injured patient: trauma and stroke, 2019: Guidelines from the Association of Anaesthetists and the Neuro Anaesthesia and Critical Care Society. Anaesthesia. 2020 Feb;75(2):234-246. doi: 10.1111/anae.14866. Epub 2019 Dec 1. PMID: 31788789.

Imaging Guidelines for Blunt Oral-Maxillofacial Traumatic Injuries

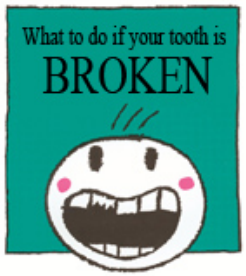


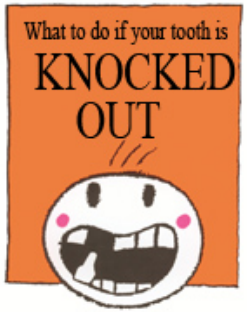
Note:
This guideline is intended for children with blunt traumatic injuries only. It does not necessarily apply to children with penetrating facial injuries, including animal bites.

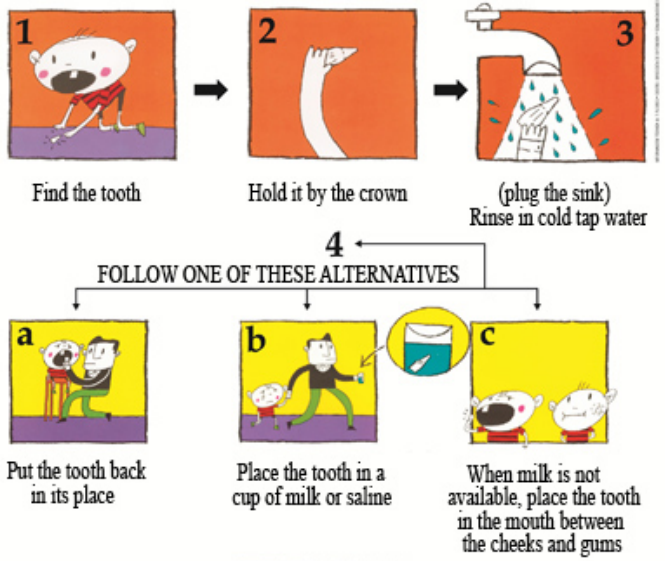
Reference: Clinical and radiographic predictors of the need for facial CT in pediatric blunt trauma: a multi-institutional study. Trauma Surg Acute Care Open 2022;7:e000899.

Save your tooth

Most of your permanent teeth may be saved if you know what to do after a blow to the mouth



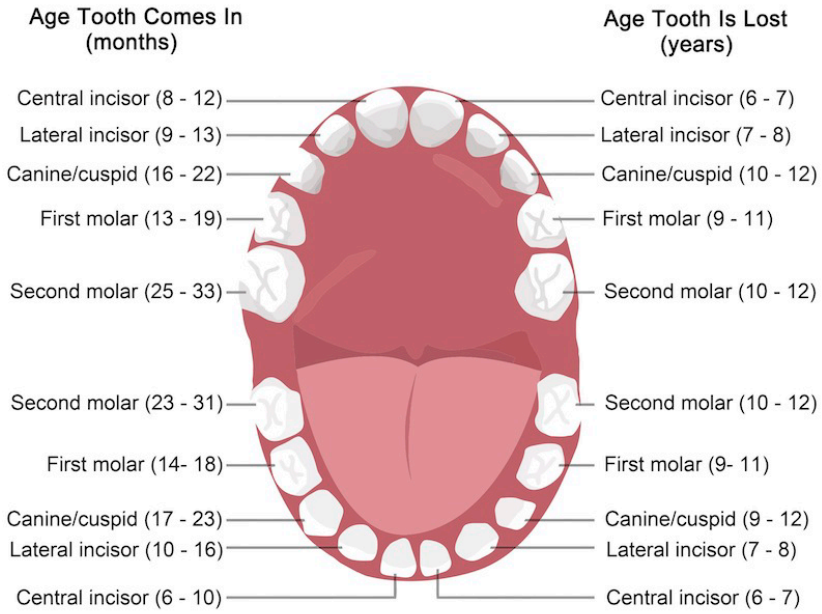




Universidad de Valparaíso
CHILE
Children's Dental Traumatology Service
Faculty of Dentistry.
mail: clinffo@uv.cl

IADT
IADT Administration
4425 Cass Street, Suite A
San Diego, CA 92109
www.iadt-dentaltrauma.org

Tooth Eruption and Shedding in Children



Sources:
https://friscokidsdds.com/why-are-primary-teeth-so-important/ Accessed 7/30/2022.

International Association of Dental 2020 Guidelines and Trauma ToothSOS app - https://www.iadt-dentaltrauma.org/for-professionals.html

Disclaimer: This guide is intended to be used as a reference and is a guide only. This guide is not a substitute for a clinician's professional judgment. Reviewed October 2022.