

Created: March 2026
Reviewed: March 2026
Revised: NA



Traumatic Brain Injury Management

Background:

The diagnosis of TBI is based on identifying a traumatic mechanism and/or physical signs of trauma to the brain in a patient with neurological signs or symptoms. The Glasgow Coma Scale (GCS) score ideally should be determined in the prehospital setting and repeated upon arrival to the ED and every 1-2 hours thereafter. The severity of the injury is classified by the *post-resuscitation* GCS score and graded as mild, moderate, or severe

Purpose:

To provide practice management guidelines for optimal care of traumatic brain injury based on the Brain Injury Guidelines (BIG) and the best practice guideline "The Management of Traumatic Brain Injury" by the American College of Surgeons.

Goals:

- Prevent further brain damage from secondary brain injury during resuscitation (hypoxia, hypovolemia, hypocarbia, anemia, hyperthermia, hypo/hyperglycemia)
- Rapidly identify and treat mass lesions of the brain
- Identify need for Intracranial Pressure (ICP)/ Cerebral Perfusion Pressure (CPP) monitoring and management of intracranial hypertension (ICH)
- Determine the need for transfer to a higher level of care

Definitions:

Traumatic brain injury (TBI) is defined as an alteration in brain function or other evidence of brain pathology caused by an external force. The severity of injury is classified by the post-resuscitation GCS score:

- Mild head Injury: Glasgow Coma Scale (GCS) score 14-15 (GCS score after adequate cardiopulmonary resuscitation)

- Moderate head Injury: Glasgow Coma Scale (GCS) score 9-13
- Severe head injury: GCS 3-8

Guidelines:

A. Primary Trauma Survey for TBI

- Complete primary and secondary trauma surveys
- Establish level of consciousness and any focal neurological deficits
The GCS score will be affected by hypotension, hypoxemia, sedation, and paralysis. Therefore, ideally it should be recorded in the ED following resuscitation and prior to administration of sedation or pharmacological paralysis
- Airway
 - Intubate all unconscious patient ($GCS \leq 8$) to secure airway
 - Maintain cervical spine immobilization in all unconscious or symptomatic patients (neck pain or signs of neurological deficits)
- Breathing: oxygenation and ventilation
 - Administer high flow oxygen to all patients with suspected head injury
 - Monitor O₂ saturation – avoid hypoxia ($SaO_2 < 90\%$ or $PaO_2 < 60$ mmHg)
 - Avoid Hyperventilation unless signs of herniation are present; Maintain PaCO₂ 35-40 mmHg
- Circulation
 - Goal SBP ≥ 110 mmHg
 - Resuscitate to goal mean arterial pressure (MAP) > 85 mmHg to maintain a presumptive cerebral perfusion pressure (CPP) > 60 mmHg
 - Fluids – Infuse 0.9% NaCl and/or blood as needed
- Disability (Head Injury) Recognize and treat herniation syndromes
 - Signs
 - Pupils – anisocoria (asymmetric), irregular, or sluggish reaction progressing to fixed dilated, nonreactive
 - Motor – Hemiparesis, decerebrate posturing, Babinski reflex
 - Progressive Neurologic deterioration, not attributable to extracranial causes
 - Emergency Treatment of herniation
 - Hyperventilation

2. Mannitol, if not hypotensive
3. Hypertonic saline
4. Do not treat intracranial hypertension in the absence of herniation syndrome until CT scan is completed

B. Additional Interventions

a. Indications for head CT scan (without contrast)

- i. Unconscious or history of loss of consciousness
- ii. Focal neurological deficits
- iii. Post-traumatic seizure
- iv. Decreasing level of consciousness
- v. Penetrating Injury
- vi. Skull Fracture

b. Manage all wounds in a sterile manner

c. Indications for ICU Observation with admission to the trauma surgeon – See attached "*DMMC mBIG Table & Algorithm*" guidelines for patients that may be managed by the Trauma Surgeon and admitted to ICU for serial neuro examinations followed by repeat head CT:

- i. Neuro Checks every 1 hour for 6 hours, then every 2 hours for 18 hours, then per ICU standard of care
- ii. Repeat head CT 24 hours from initial CT or sooner if indicated
- iii. If the patient has a change in neuro status, the Trauma Surgeon should repeat the head CT and consult Neurosurgeon at a higher-level trauma center as needed
- iv. Upon discharge, patients should follow up 2 weeks post discharge for residual symptoms (i.e. headache, nausea, inability to perform ADL, etc.)

d. Indications for transferring to a higher-level trauma center- See attached "*DMMC mBIG Table & Algorithm*"

- i. Moderate or Severe Head injury (GCS <13)
- ii. Post-traumatic seizure
- iii. Unequal pupils
- iv. Neurologic deficit
- v. Repeat CT head showing increasing intracranial hemorrhage
- vi. Need for Intracranial Pressure (ICP) monitoring

References:

- Committee on Trauma, American College of Surgeons. ACS TQIP Best Practice Guidelines: The Management of Traumatic Brain Injury. 2024. best-practices-guidelines-traumatic-brain-injury.pdf. Accessed March 24, 2026
- Joseph B, Friese RS, Sadoun M, Aziz H, Kulvatunyou N, Pandit V, Wynne J, Tang A, O'Keeffe T, Rhee P. The BIG (brain injury guidelines) project: defining the management of traumatic brain injury by acute care surgeons. *J Trauma Acute Care Surg.* 2014 Apr;76(4):965-9. doi: 10.1097/TA.000000000000161. PMID: 24662858.
- Martin GE, Carroll CP, Plummer ZJ, Millar DA, Pritts TA, Makley AT, Joseph BA, Ngwenya LB, Goodman MD. Safety and efficacy of brain injury guidelines at a Level III trauma center. *J Trauma Acute Care Surg.* 2018 Mar;84(3):483-489. doi: 10.1097/TA.0000000000001767. PMID: 29251702.
- Shen A, Mizraki N, Maya M, Torbati S, Lahiri S, Chu R, Margulies DR, Barmparas G. Reducing low value interhospital transfers for mild traumatic brain injury. *J Trauma Acute Care Surg.* 2024 Jun 1;96(6):944-948. doi: 10.1097/TA.0000000000004291. Epub 2024 Mar 25. PMID: 38523124.

DMMC MODIFIED BRAIN INJURY GUIDELINES - m(BIG)

QUALIFIERS TO UTILIZE mBIG GUIDELINES FOR ADMISSION VS TRANSFER	
CT Positive for Intracranial Hemorrhage?	Yes – Use mBIG
GCS 13-15?	Yes – Use mBIG
≥ 18 years of age	Yes – Use mBIG
Neuro Exam: any focal neurologic or pupillary findings?	No –Do not Use mBIG
On Anticoagulants/Antiplatelets (excluding ASA & NSAIDs)	No –Do not Use mBIG

	ADMIT	TXF
Skull Fracture		X
SDH ≤ 4mm	X	
SDH > 4mm		X
EDH		X
IPH		X
SAH “Trace”: ≤3 sulci “Localized”: Single Hemisphere	X	
SAH ≥ 4 sulci or bi-hemispheric		X
IVH		X
Midline Shift		X

	ADMIT
Hospitalization	<ul style="list-style-type: none"> ICU OBS to Trauma Services minimum 24 hrs Neuro Checks: Q1 hr for 6 hrs then Q2 hrs for 18 hrs; Then per ICU standard of care
Repeat Head CT – 24 hrs from initial CT or sooner if indicated	YES
Trauma Surgeon (Attending)	Assessment to be completed < 8 hrs
Consulting Physician/Service Assessment	Assessment at 6-12 hours
* If there is no clinical neurologic deterioration after 24 hours of observation and no CT changes, consider discharging home. If there is any worsening in neurological conditions, consider transfer.	

DMMC HEMORRHAGIC BRAIN INJURY GUIDELINE m(BIG)

ED ADMIT VS TRANSFER

PATIENT QUALIFIERS TO USE mBIG

