

## Traumatic Brain Injury Pathways

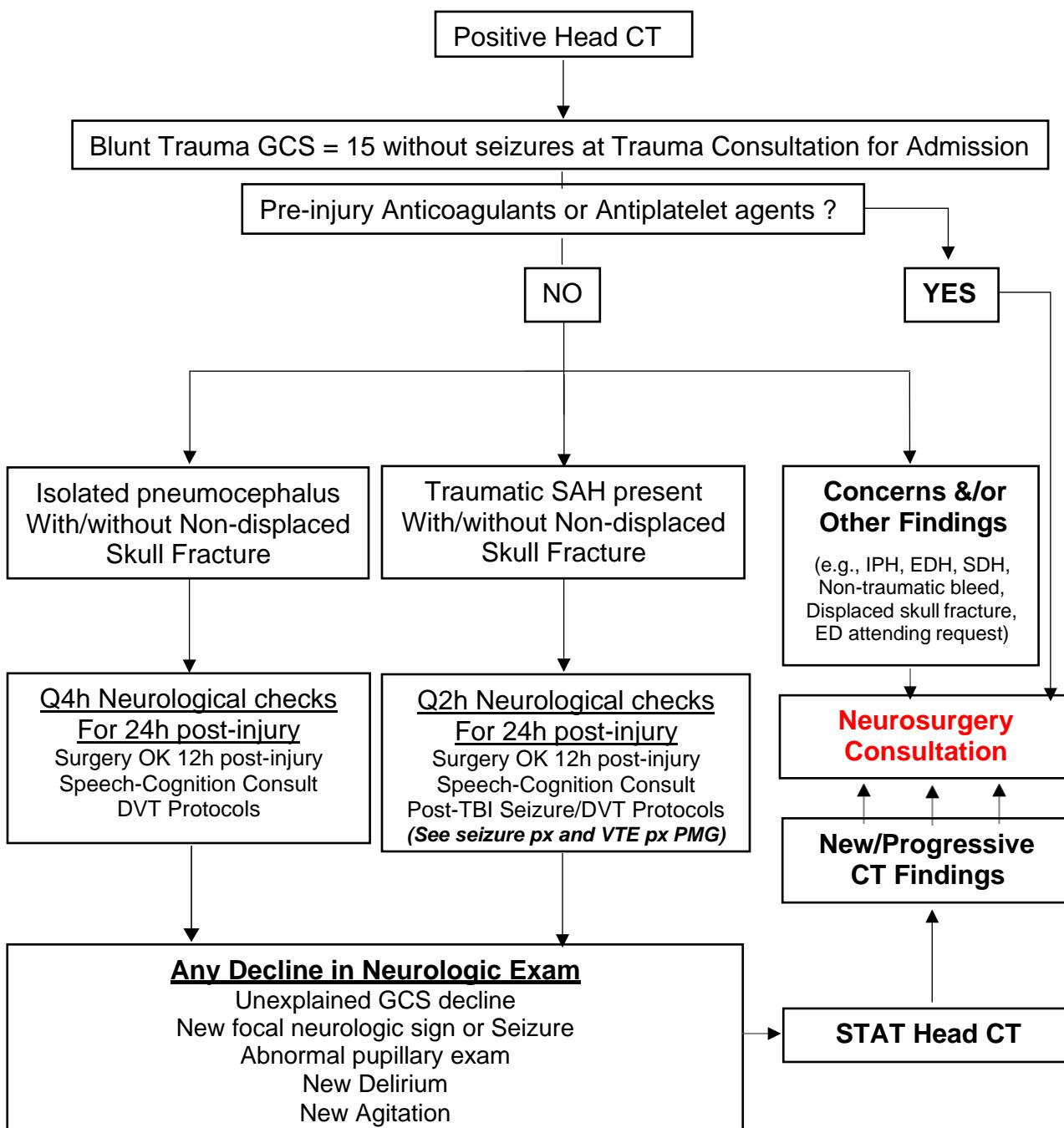
### for Adult ED Patients Being Admitted to Trauma Service

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ABBREVIATIONS	
CBC	Complete Blood Count
Cl	Chloride
CPP	Cerebral Perfusion Pressure
CSF	Cerebrospinal Fluid
CT	Computed Tomography
CVP	Central Venous Pressure
d	Day
DVT	Deep Venous Thrombosis
ED	Emergency Department
EEG	Electroencephalography
EDH	Epidural Hematoma
EVD	External Ventricular Drain
FFP	Fresh Frozen Plasma
GCS	Glasgow Coma Scale
h	Hour
HOB	Head of Bed
ICH	Intracerebral/Intraparenchymal Hematoma/Hemorrhage
ICP	Intracranial Pressure
INR	International Normalized Ratio
IPH	Intracerebral/Intraparenchymal Hematoma/Hemorrhage
MDTC	Multidisciplinary Trauma Conference
mL	Milliliter
Na	Sodium
NSU	Neurosurgery
PaCO <sub>2</sub>	Partial pressure of Carbon dioxide
PaO <sub>2</sub>	Partial pressure of Oxygen
PI	Process Improvement
PT	prothrombin time
PTT	partial thromboplastin time
Q	Every
SAH	Subarachnoid hemorrhage
SBP	Systolic Blood Pressure
SDH	Subdural Hemorrhage
TBI	Traumatic Brain Injury
TICU	Trauma Intensive Care Unit
TPOPPS	Trauma Program Operational Process Performance Committee

**Minimal Traumatic Brain Injury Pathway**  
**for Adult ED Patients Being Admitted to Trauma Service**



# Traumatic Brain Injury Pathway, GCS 9-15

**Positive CT Head**

**in Adult ED Patient Being Admitted to Trauma Service**

Failed Minimal TBI Pathway  
or GCS 9-15 (any mechanism) on initial evaluation

## **TRAUMA SERVICE ADMISSION**

Consult Neurosurgery  
Consult Speech-Pathology  
7d Seizure prophylaxis protocol  
CBC, PT/INR, PTT  
Consider Reversal of  
Anticoagulant/Antiplatelet Use

## **Consider Repeat Imaging within 6-24h, if any of following:**

- High Risk CT Features:
  1. Subdural
  2. Epidural
  3. Intracerebral hemorrhage
- Clinical Deterioration
- Anticoagulant/Antiplatelet Use
- Consultant request

# Traumatic Brain Injury Pathway, GCS < 9

## **ADULT ED PATIENT ADMITTED TO TRAUMA WITH POSITIVE HEAD CT**

Consult Neurosurgery (*Trauma Attending & Neurosurgery Attending to have Direct Conversation for Major Diverging MultiTeam Plans*)

Consult Speech-Pathology

7d Seizure prophylaxis protocol; Arterial Blood Gas, CBC, PT/INR, PTT



Intubation

Keep  $\text{PaCO}_2$  35-40,  $\text{PaO}_2 > 60$

HOB > 60 degrees (or reverse Trendelenberg until Spine cleared)

SBP > 90 mm Hg

Consider FFP (and/or K-Centra) and Platelet transfusion  
for target INR < 2.0 / Platelet > 100K

Establish central access, arterial line; Maintain Euvolemia

Optimize Sedation and Analgesia, Consider Paralysis

Low threshold for Hyperosmolar Therapy



CPP < 60

If ICP Monitor Placed

1<sup>st</sup> line: Phenylephrine  
2<sup>nd</sup> line: Norepinephrine

ICP > 20

If EVD, then  
drain CSF

ICP > 20

ICP > 20

CPP < 60

Hyperosmolar Therapy

3% NaCl @ 30-50 mL/hr

CVP High: Mannitol bolus q6h

CVP low: 3% NaCl bolus q6h

Q6h BMP, Osm

Max: Na 160, Osm 320

- Contact TICU attending and/or fellow
- Contact Neurosurgery (decompressive craniectomy vs. pentobarbital coma)
- Monitor Intra-abdominal pressures
- Consider pentobarbital coma with Neurology consult (Continuous EEG)
- Consider Palliative care consult

Persistent ICP > 20  
and/or CPP < 60

# REFERENCES

## **Mild-Moderate TBI**

- Haydel. Clinical decision instruments for CT scanning in minor head injury. *JAMA* (2005) vol. 294 (12) pp. 1551-3
- Haydel. The Canadian CT Head Rule. *Lancet* (2001) vol. 358 (9286) pp. 1013-4
- Haydel et al. Indications for computed tomography in patients with minor head injury. *N Engl J Med* (2000) vol. 343 (2) pp. 100-5
- Jagoda. Mild traumatic brain injury: key decisions in acute management. *Psychiatr Clin North Am* (2010) vol. 33 (4) pp. 797-806
- Joseph B, Pandit V, Haider AA, et al. Improving Hospital Quality and Costs in Nonoperative Traumatic Brain Injury: The Role of Acute Care Surgeons. *JAMA Surg* (2015) vol 150(9) pp. 866-72
- Menon et al. Position Statement: Definition of Traumatic Brain Injury. *Arch Phys Med Rehabil* (2010) vol. 91 (11) pp. 1637-1640
- Thurman and Guerrero. Trends in hospitalization associated with traumatic brain injury. *JAMA* (1999) vol. 282 (10) pp. 954-7

## **Severe TBI**

- Carney N, Totten AM, O'Reilly C, et al. Guidelines for the Management of Severe Traumatic Brain Injury, Fourth Edition. *Neurosurgery* 2016;80(1):6–15.
- Feinstein et al. Resuscitation with pressors after traumatic brain injury. *J Am Coll Surg* (2005) vol. 201 (4) pp. 536-45
- Marshall et al. Pentobarbital coma for refractory intra-cranial hypertension after severe traumatic brain injury: mortality predictions and one-year outcomes in 55 patients. *J Trauma* (2010) vol. 69 (2) pp. 275-83
- Patel MB, Guillamondegui OD. Severe Traumatic Brain Injury: Medical and Surgical Management. Section: Head Injury. In: Papadakos P, Gestring M, editors. *Encyclopedia of Trauma Care*. Heidelberg, Berlin: Springer-Verlag; 2015. p. 1711–6.
- Vella M, Crandall MA, Patel MB. Acute Management of Traumatic Brain Injury. *Surgical Clinics of North America*. 2017; 97(5):1015-1030. PMCID: PMC5747306.
- Wakai et al. Mannitol for acute traumatic brain injury. *Cochrane Database Syst Rev* (2007) (1) pp. CD001049