



Information for Radiologists

Recent literature has demonstrated the safety of managing patients with minor traumatic brain injury (mTBI) less intensely than traditional algorithms. Minor injuries with minimal change in the level of consciousness have been monitored without neurosurgical consultation or follow-up head CT scan with equivalent clinical outcomes. Advantages include reducing the need for transfer for neurosurgical evaluation and sparing the patient and family from dislocation from community-based support. Several institutions in North Carolina have instituted some form of systems-based practice change with excellent system and patient outcomes. A subgroup of the NCCOT/STAC research committee has been tasked with generating recommendations surrounding this issue for statewide guidelines.

Joseph et al (2014) defined guidelines based on patient history, physical examination, and initial CT scan to identify which patients required transfer to a tertiary trauma center for neurosurgical consultation versus a period of observation. They defined three categories of brain injury: BIG-1 through BIG-3 (Table 1). They proposed that patients with minor brain injuries (BIG-1) be observed for 6 hours without neurosurgical consult or repeat CT scan. BIG 2 injuries represented moderate brain injuries, requiring inpatient admission for observation, but without neurosurgical consult or repeat head CT scan. BIG-3 injuries are severe head injuries that require hospitalization, neurosurgical consult, and repeat head CT. See guidelines for categorizing brain injuries below.

Information on the interpretation of brain imaging by the radiologists is crucial to the determination of the extent of a patient's brain injuries. As part of the goal to provide consistent care across all NC institutions, we have worked with a UNC radiologist to develop a template for reporting brain CT results. The use of the radiology template on the next page allows ED physicians to make the decision about care for a brain-injured patient. It provides clear, consistent information based on the outcome of the CT scan.

Implementation of the template at your institution should include the table below to allow easy, consistent categorization of the brain injury based on radiologic findings. Highlight the boxes representing the finding, then report the highest BIG category based on imaging findings.

	Radiologic Brain Injury Guideline (BIG) Categorization			
	No traumatic findings	BIG-1	BIG-2	BIG-3
Skull fracture	No	No	Non-displaced	Displaced
Subdural hemorrhage	No	< 4 mm	5 - 7	> 8 mm
Epidural hemorrhage	No	No	No	Yes
Intraparenchymal hemorrhage/Location count	No	< 4 mm / 1	5 - 7 mm / < 2	> 8 mm / > 3
Subarachnoid hemorrhage	No	Trace (<1 mm in thickness and localized in 1-3 sulci)	Localized (1-3 mm in thickness and more than 3 sulci in 1 hemisphere)	Scattered (>3 mm in thickness or bi hemispheric)
Intraventricular hemorrhage	No	No	No	Yes

Highest BIG category based on imaging findings: _____

Overall BIG categorization

Patients with a brain injury (blood seen in the brain) will be categorized using the following guidelines. If no blood is seen on the patient's CT, then the patient has a concussion, and concussion guidelines should be followed. Patients meeting any criteria in a higher category should be categorized in the higher category.

BIG Categorizations and Therapeutic Plans for Patients with CT scan Positive for Blood			
	BIG 1	BIG 2	BIG 3
Mechanism	Blunt	Blunt	Blunt or Penetrating
GCS	15	15	<15
Anticoagulation	No	No	Yes
Skull fracture	No	Non-displaced (no more than thickness of skull)	Displaced more than thickness of skull
Subdural hemorrhage	< 4 mm	5-7 mm	> 8 mm
Epidural hemorrhage	No	No	Yes
Intraparenchymal hemorrhage location count	1	< 2	> 3
Subarachnoid Hemorrhage	Trace (<1 mm in thickness and localized in 1-3 sulci)	Localized (1-3 mm in thickness and more than 3 sulci in 1 hemisphere)	Scattered (>3 mm in thickness or bi-hemispheric)
Intraventricular Hemorrhage	No	No	Yes
Therapeutic Plan			
Admission	6 hr observation ED/OBS	24 hr observation /Admit to Non-trauma center/ Level 3 trauma center	Admit to trauma center Level 1/2
Repeat CT scan	No	No	Yes
Neurosurgeon	No	Yes or teleconsultation	Yes
Contingencies	Could be retained at initial treatment site	Have plan of care in consultation with Level 1 or 2 trauma center for deterioration	
	Provide standardized ED patient discharge instructions and link to post discharge follow up @ 2 weeks after injury with appropriate resources		

*Some institutions may decide to keep patients with GCS-total of 13-14. We are starting conservatively by using GCS-total=15.