

Triage and Disposition of Neurotrauma Patients - TBI

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KEY POINTS:

- Severe TBI patients without significant polytrauma should be promptly admitted to the Neurosurgery service (within 1 hour)
- TBI patients GCS 9-13 with isolated head injuries (including minor facial fractures) should be admitted to Neurosurgery service (for either observation or inpatient status)
- Mild TBI patients with GCS 14, 15 can be considered for the TBI ED Observation Protocol
- Mild TBI patients with GCS 14, 15 ineligible for the ED Observation protocol should be admitted if discharge decision is expected to take longer than 6 hours
- TBI patients with neurosurgery consults cannot be discharged until seen (staffed) by an attending, fellow, or chief resident. Discharge without attending examination requires a documented discussion with the attending neurosurgeon.

Traumatic Brain Injury (TBI) patients are defined as those that received a blow, jolt, or penetrating injury to the head. These injuries can be associated with loss of consciousness, external signs of injury to the head, and/or imaging findings consistent with intracranial injury.

Severe TBI Patients (GCS \leq 8)

The following injuries must be seen immediately (within 30 minutes) and the neurosurgery attending on call must be notified for discussion of the treatment plan. Time of consultation, time consultation seen, and treatment plan discussed with neurosurgery attending must be documented in the note by a PGY-2 resident or above.

30 Minute Response Criteria

Neurosurgery	Neurotrauma care must be continuously available for all TBI and spinal cord injury patients and must be present and respond within 30 minutes based on institutional-specific criteria (CD 8-2).
	GCS \leq 8 with:
	Penetrating head injury
	Open skull fracture
	Intracranial hemorrhage with midline shift

In the absence of significant polytrauma, it is expected that these patients will receive prompt admission to the neurosurgery service in the NSICU. *Admission of neurotrauma patients to the NCC service is not permitted, except under special circumstances.* If appropriate, such patients can be transferred to the Neurotrauma service or the NCC service the following morning, after initial admission to Neurosurgery. Such transfers must be discussed and approved by the transferring and accepting attending.

In the event that a NSICU bed is not available, and the patient requires ICU level of care, the neurosurgery team may discuss boarding the patient in the SICU with the trauma and SICU team. This patient will be admitted under the Neurosurgery service/attending, however the SICU team (instead of the NCC team) will assist in managing the patient. In instances of complex neuro needs, the NCC team can be consulted for assistance in managing a patient boarding in the SICU.

All patients requiring intracranial multimodality monitoring should be prioritized for a NSICU bed.

For severe TBI patients without significant intracranial hemorrhage or edema (ie: DAI, anoxic injury), in the absence of significant polytrauma, these patients should be admitted to Neurosurgery. As above, if appropriate, such patients can be transferred to the Neurotrauma service or the NCC service the following morning, after initial admission to Neurosurgery.

Consults for severe TBI are considered emergent and the patient care plan, including decision to admit, orders, and discussion with the requesting physician, should occur within 60 minutes of consultation.

Moderate TBI (GCS 9-12)

Isolated head injuries with moderate TBI should be admitted to neurosurgery service for a minimum of a period of observation, unless expected improvement to discharge within 6 hours. All patients should receive PT, OT, and ST cognitive evaluations prior to discharge. The patient care plan, including decision to admit, orders, and discussion with the requesting physician, should occur within 4 hours of consultation.

Mild TBI (GCS 13-15)

Mild TBI patients with GCS 13 will be treated as Moderate TBI above.

Patients with GCS 14 or 15 will undergo ED triage protocols (see below). GCS 14-15 with negative head CT typically do not receive a neurosurgery consult and will be discharged or monitored in the ED Observation Unit, per protocol.

Those with head CT positive for intracranial blood will receive a neurosurgery consult. Those with intracranial hemorrhage in a low risk pattern can be considered for ED Observation Protocol. *Patterns of blood that are not defined as low risk, require neurosurgery admission if stability scan and improvement to discharge criteria not expected within 6 hours.* Admission can be observation status if need for inpatient admission (2 midnights) seems unlikely. The patient care plan, including decision to admit, orders, and discussion with the requesting physician, should occur within 4 hours of consultation.

Low Risk Hemorrhage Patterns
Punctate contusions (1mm focus of hyperdensity, < 5)
Convexity Subarachnoid Hemorrhage
Skim Subdural (≤ 2 mm without shift)*

* not considered low risk in patient on Coumadin

Patients that receive a neurosurgery consult, cannot be discharged until there is a documented stable head CT and discharge is approved by the neurosurgery attending on call. Consults should be seen by an attending, fellow, or chief resident prior to discharge. *Discharge without attending examination requires a documented discussion with the attending neurosurgeon.*

For TBI patients admitted to Neurosurgery, after initial staffing by the neurosurgery attending on call, floor status TBI patients may be transferred to the Neurotrauma Service in the morning. Stepdown and ICU level of care patients may also be transferred to the Neurotrauma Service in the morning, however such transfers must be discussed and approved by the transferring and accepting attending.

Patients that are “bounce-back” visits to the ED with continued and/or increased TBI symptoms should be admitted to Neurosurgery for a period of observation.

EmergencyKT: Isolated Mild Traumatic Brain Injury

Table 1: Types of Hemorrhages

Subarachnoid hemorrhage, subdural hematoma, epidural hematoma, intraparenchymal hemorrhage, cerebral contusion

Examples of Head CT findings suitable for Observation Protocol:

1. Convexity Subarachnoid Hemorrhage
2. Punctate Contusions (no more than 5)
3. Rim Subdural along Convexity

Table 2: Inclusions and Exclusions from Protocol

Inclusion Criteria:

Adult patients who sustain an isolated head injury with a GCS 14 or 15 may be included in the ED mild TBI observation protocol. Patients may have a normal or abnormal head CT.

Patients will be excluded from protocol if found to have any of the following features:

1. Any patient with INR >3.0 is excluded. Patients with an INR \geq 1.5 may only have a hemorrhage listed in Table 4. Please see Table 4 for eligibility of patients on Coumadin.
2. Patient is on a factor Xa inhibitor or a direct thrombin inhibitor.
3. Objective new neurologic exam findings/deficits (e.g. aphasia, hemiparesis, weakness, etc.)
4. Intoxicated patients with negative head CT who need only to achieve sobriety prior to discharge
5. Patients who require intense nursing attention, direct line of sight and/or are restrained
6. Hemorrhages that require neurosurgical intervention or bleeds determined to be unsuitable for observation (please see Table 1)
7. Patients who are greater than 24 hours after their injury with new neurologic symptoms
8. Multiple traumatic injuries or any other severe traumatic injury
9. Patients with actively declining mental status
10. Vital sign abnormalities: BP>190/110 or <85/50; HR>120 or <45; O₂<91% on RA
11. Other active acute comorbid conditions (e.g. DKA, CHF, etc.)
12. Patients who require additional inpatient syncope workup as the cause of their fall
13. Greater than one seizure, or any seizure greater than 30 minutes after initial injury
14. INR greater than or equal to 1.5; unless patient has hemorrhage listed in Table 4.
15. Thrombocytopenia (Platelet count <100,000)
16. Patient is on Heparin or Low Molecular Weight Heparin

Table 3: Observation Protocol Discharge Goals

1. Education regarding concussions and mild TBI
2. Medication reconciliation, specifically, regarding use of Aspirin and Plavix
3. Return to sports requirements if necessary
4. Follow up established with a PCP
5. Patient is in care of family or friends
6. Patient is sober
7. Serial head CT's demonstrate no significant progression of ICH
8. Patient has been seen by the attending neurosurgeon
9. Neurotrauma nurse has been notified of patient in the emergency department, or the patient has been given the neurotrauma nurse hotline to call if needed. Phone # is 584-2804
10. Consider Internal Medicine Consultation for Medication Reconciliation / impact of mild TBI on medical co-morbidities (i.e., in relationship to continuation of home medications such as anti-platelet or anti-coagulation)
11. Evaluate for Return to Sports Requirement if indicated:
<http://www.healthy.ohio.gov/concussion>

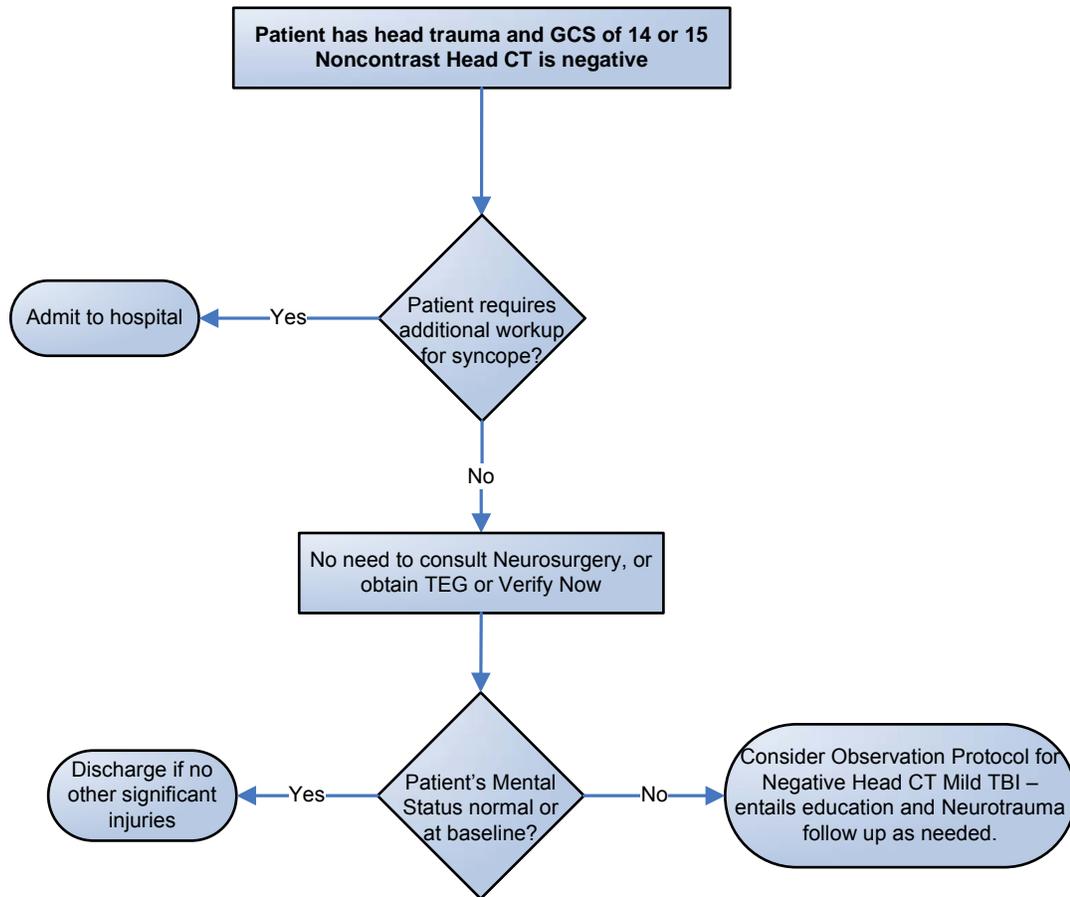
Table 4: Low Risk Hemorrhages in Patients Therapeutic (1.6-3.0) on Coumadin

1. Punctate Contusions
2. Convexity Subarachnoid Hemorrhage

Table 5: Low Risk Hemorrhage in Patients on Anti Platelet Therapy (Aspirin or Plavix):

1. Punctate Contusions
2. Convexity Subarachnoid Hemorrhage
3. Rim Subdural Hematoma along Convexity

ED Protocol for patients with mild TBI and a normal Head CT



ED Protocol for patients with mild TBI, but not on Anti-Platelet Medications or any Anti-coagulation (including Heparin or LMWH)

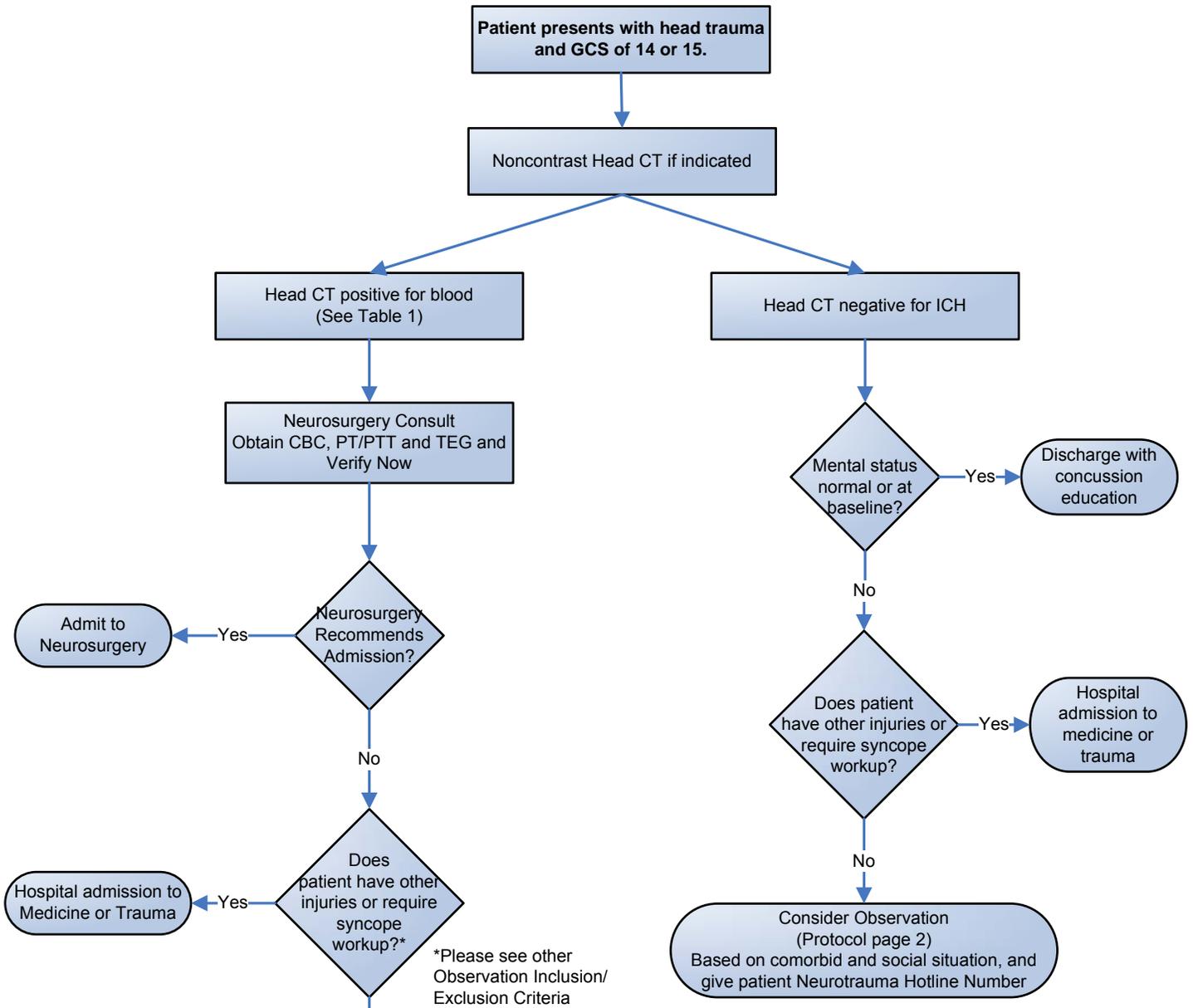


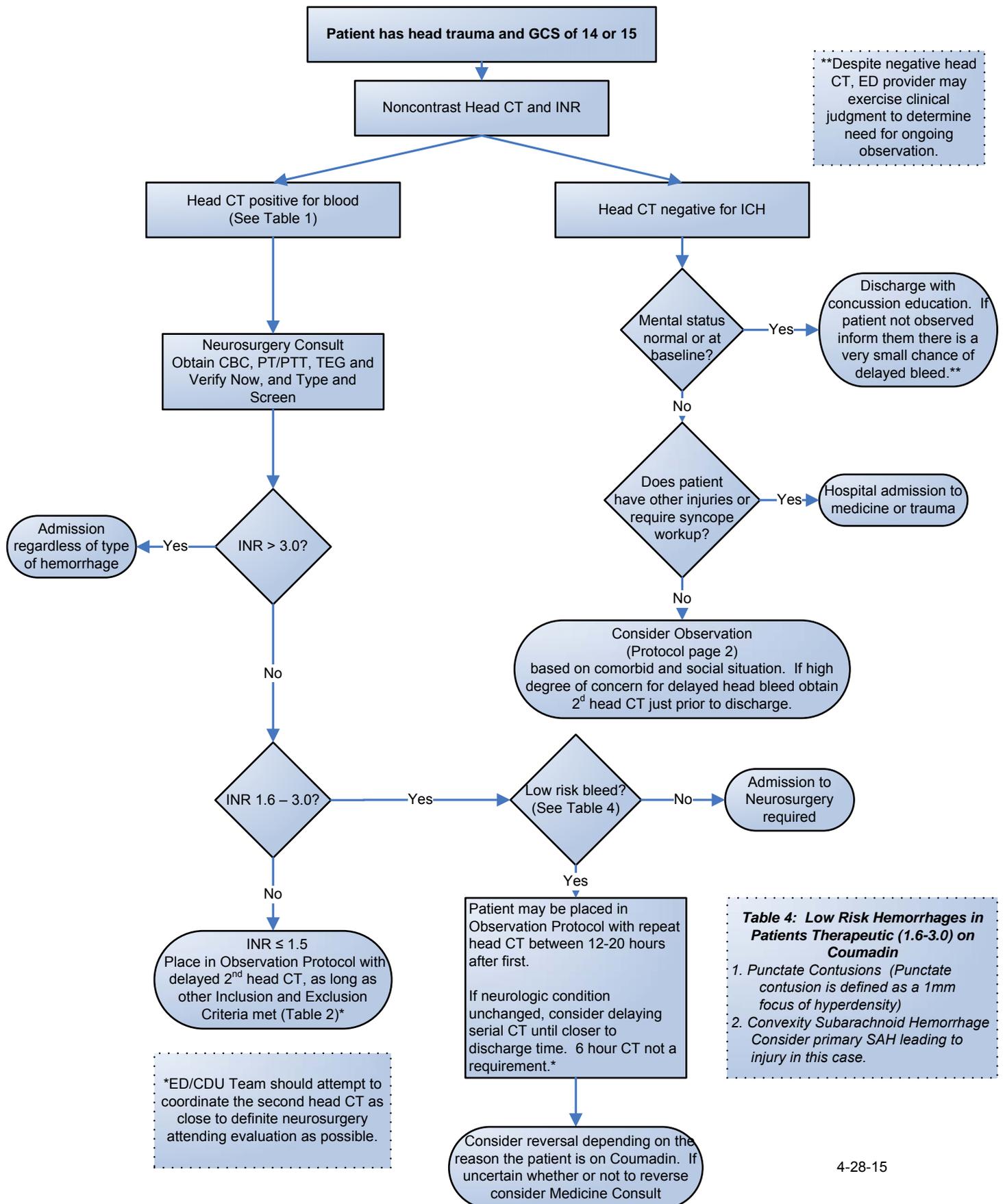
Table 1: Types of Hemorrhages

Subarachnoid hemorrhage, subdural hematoma, epidural hematoma, intra-parenchymal hemorrhage, cerebral contusion

Examples of Head CT findings suitable for Observation Protocol:

1. Convexity Subarachnoid Hemorrhage
2. Punctate Contusions (no more than 5) (*Punctate hemorrhage is defined as a 1mm focus of hyperdensity*)
3. Rim Subdural along Convexity (*A rim subdural is defined as ≤2mm with no mass effect.*)

ED Protocol for patients with mild TBI, and on Coumadin

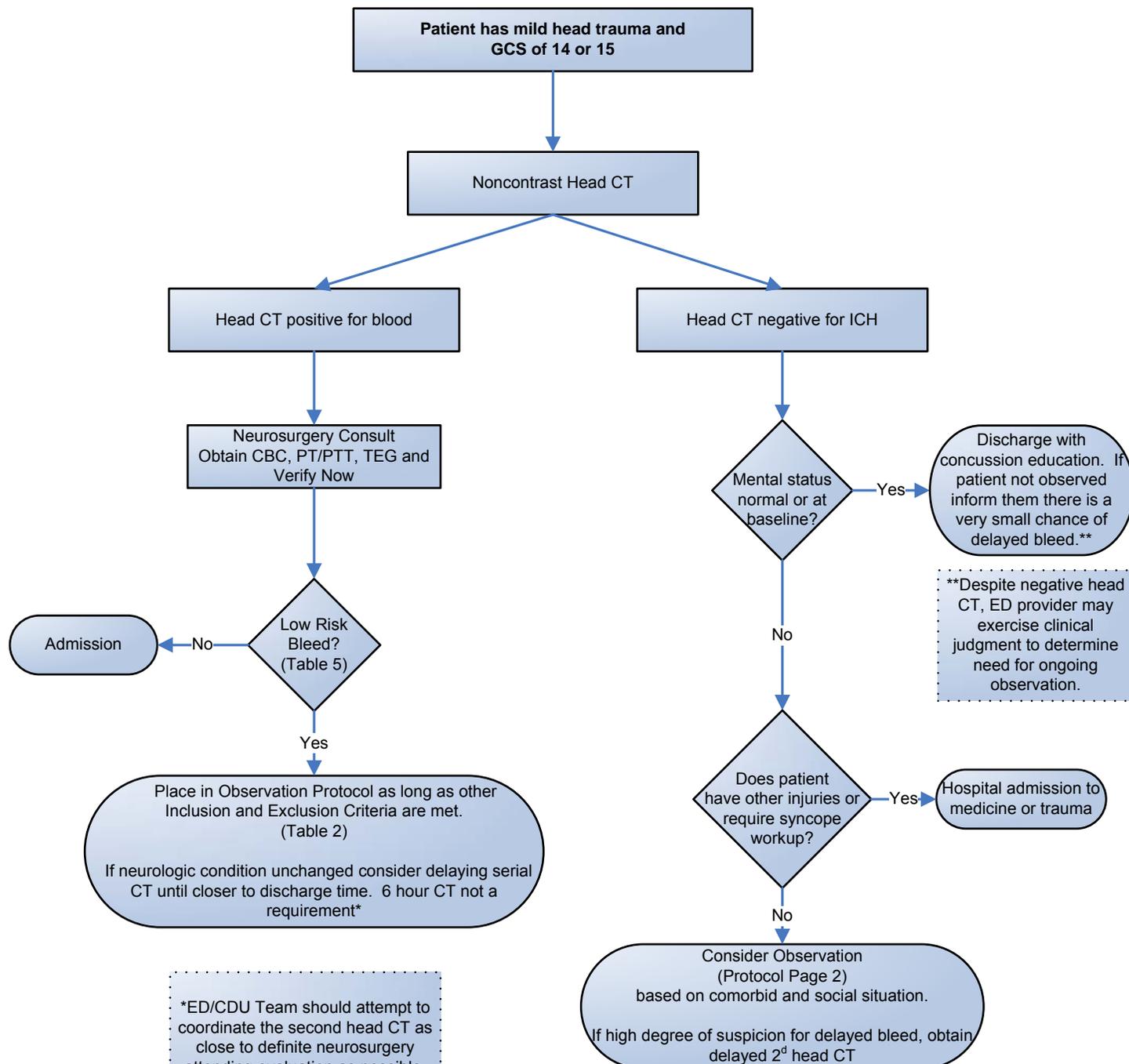


**Despite negative head CT, ED provider may exercise clinical judgment to determine need for ongoing observation.

Table 4: Low Risk Hemorrhages in Patients Therapeutic (1.6-3.0) on Coumadin

1. Punctate Contusions (Punctate contusion is defined as a 1mm focus of hyperdensity)
2. Convexity Subarachnoid Hemorrhage Consider primary SAH leading to injury in this case.

ED Protocol for patients with mild TBI, and on Aspirin, Plavix, Aggrenox, or Prasugrel



*ED/CDU Team should attempt to coordinate the second head CT as close to definite neurosurgery attending evaluation as possible.

Table 5: Low Risk Hemorrhages in Patients on Anti Platelet Therapy (Aspirin or Plavix):

1. Punctate Contusions (Defined as a 1mm focus of hyperdensity)
2. Convexity Subarachnoid hemorrhage Consider primary SAH leading to injury in this case
3. Rim Subdural Hematoma along Convexity (Defined as ≤2mm with no mass effect)

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