



ASSESSMENT OF

Minor Head Trauma in Pediatric Patients

2019
(Reaffirmed March 2023)

This care process model (CPM) was developed by the Intermountain Pediatrics and Childhood Health Minor Head Trauma Development Team. It serves as a guide to providers in assessing the risk of clinically important traumatic brain injury (ciTBI) — trauma resulting in an adverse outcome or requiring significant intervention — after minor head trauma (MHT). These recommendations apply to patients younger than 18 years with acute, isolated, uncomplicated, MHT that has occurred within 24 hours of patient presentation. Recommendations are based on available scientific evidence, particularly the landmark ‘PECARN’ study.^{KUP}

► Why Focus ON MINOR HEAD TRAUMA IN CHILDREN?

- **It’s common.** Head trauma is a common reason parents seek medical care for their children.
- **Presentation can be misleading.** While most instances of pediatric head trauma are minor, some children presenting with apparent MHT have ciTBI and require intervention.
- **Accurate assessment is complex.** Assessment requires consideration of many factors, as no single factor accurately identifies patients at very low risk of ciTBI.
- **CT use is variable and often overutilized.** Implementing a guideline is likely to reduce unnecessary CT scans and attendant risk of CT-induced malignancy.

► WHAT’S INSIDE?

ALGORITHMS:

Assessment of minor head trauma in pediatric patients <2 years of age **2**

Assessment of minor head trauma in pediatric patients ≥2 years of age **3**

RESOURCES..... **4**

BIBLIOGRAPHY..... **5**

Key Points

This CPM is evidence-based and functions as a practical guide to assessment of MHT. The information and algorithms:

- Are based on a robust, landmark trial which identified patients at very low risk of ciTBI.^{KUP} The model also incorporates findings from other important studies (see references).
- Stratify patients into risk groups and provide management recommendations.
- Contain a separate algorithm for assessing children <2 years of age to help manage the complexity of evaluating very young children.
- Give guidance for appropriate decisions regarding neuroimaging because:
 - CT is highly accurate in identifying intracranial injuries.
 - The use of CT is highly variable and generally increasing.
 - It is important to avoid unnecessary CT scans given the increased risk of malignancy associated with ionizing radiation. Malignancy rates associated with pediatric head CT are estimated at 1/1000 to 1/5000, with increasing risk associated with younger age.^{BRE1, BRE2}
- Help identify cases where observation is appropriate.
- Provide recommendations regarding duration of observation and discharge criteria.



MEASUREMENT & GOALS

The goal of this CPM is to decrease CT use in mild head trauma patients without increasing rates of missed ciTBI.

For continuous improvement, we will monitor and report:

- CT rate in children presenting to the ED with MHT
- 48-hour admission rate in children with MHT that were initially discharged from the ED



Indicates an Intermountain measure



(a) Severe mechanism of injury

- Motor vehicle crash with patient ejection, death of another passenger, or rollover
- Pedestrian/bicyclist without helmet, struck by motor vehicle
- Fall >3 feet
- Head struck by high-impact object

(b) High-risk hematoma

Risk of ciTBI increases for non-frontal hematomas as more of the following are present.

- Size >3 cm
- Boggy (soft) consistency
- Patient <9 months of age

(c) Risk table (< 2 years old)

Isolated risk factor	Risk of ciTBI
Loss of consciousness (> 5 sec) ^{LEE}	0.5 %
Hematoma ^{DAY2}	0.4 %
Severe mechanism of injury ^{NIG}	0.3 %

(d) Factors favoring CT use in intermediate risk category

- Multiple risk factors present
- Symptoms are severe or worsening
- Age <3 months
- High-risk hematoma (b)
- Provider inexperience
- Patient lives long distance from CT facility or facility is very far from trauma center

(e) Observation

If observation is determined for patients in intermediate risk category, consider:

- Observation for 3–4 hours after injury
- Neurochecks every 2 hours
- Administration of clear fluids
- Need for CT if symptoms worsen or are persistent and significant

(f) Discharge

Consider discharge if patient meets the following criteria:

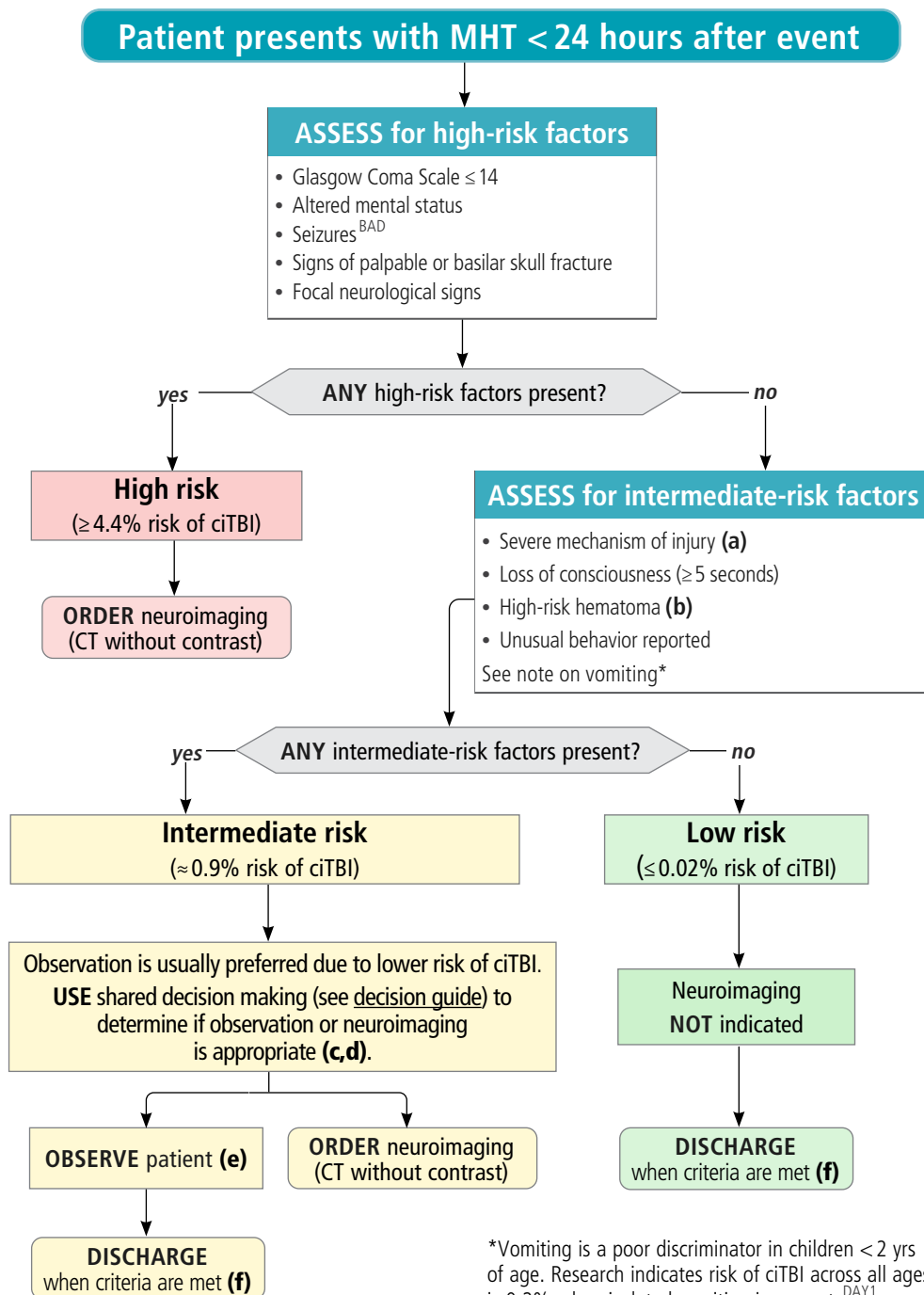
- Normal mental status
- Resolving or minor symptoms
- Tolerating oral intake
- Dependable social support

▶ **MINOR HEAD TRAUMA IN PATIENTS < 2 YEARS OLD**

The algorithm below and risk estimates of clinically important traumatic brain injury (ciTBI)* are based primarily on the PECARN study and should be used to approach acute, isolated, minor head trauma (MHT) without complicating factors. **Do not use algorithm if:** Moderate or severe head injury, multisystem trauma, penetrating injury, structural brain disease, VP shunts, or bleeding disorder is present; if abuse is suspected; or more than 24 hours have elapsed since time of injury.

*ciTBI is injury resulting in: Death, neurosurgery, intubation >24 hours, or admission to hospital ≥2 nights.

▶ **ALGORITHM: ASSESSMENT OF MHT IN PATIENTS < 2 YEARS OF AGE**



*Vomiting is a poor discriminator in children < 2 yrs of age. Research indicates risk of ciTBI across all ages is 0.2% when isolated vomiting is present.^{DAY1}

(a) Severe mechanism of injury

- Motor vehicle crash with patient ejection, death of another passenger, or rollover
- Pedestrian / bicyclist without helmet, struck by motor vehicle
- Fall > 5 feet
- Head struck by high-impact object

(b) Risk table (≥ 2 years old)

Isolated risk factor	Risk of ciTBI
Loss of consciousness (>5 sec) ^{LEE}	0.5 %
Vomiting ^{DAY1}	0.7%
Severe mechanism of injury ^{NIG}	0.5%

(c) Factors favoring CT use in intermediate risk category

- Multiple risk factors
- Symptoms are severe or worsening
- Provider inexperience
- Patient lives long distance from CT facility or facility is very far from trauma center

(d) Observation

If observation is determined for patients in intermediate risk category, consider:

- Observation for 3–4 hours after injury
- Neurochecks every 2 hours
- Administration of clear fluids
- Need for CT if symptoms worsen or are persistent and significant

(e) Discharge

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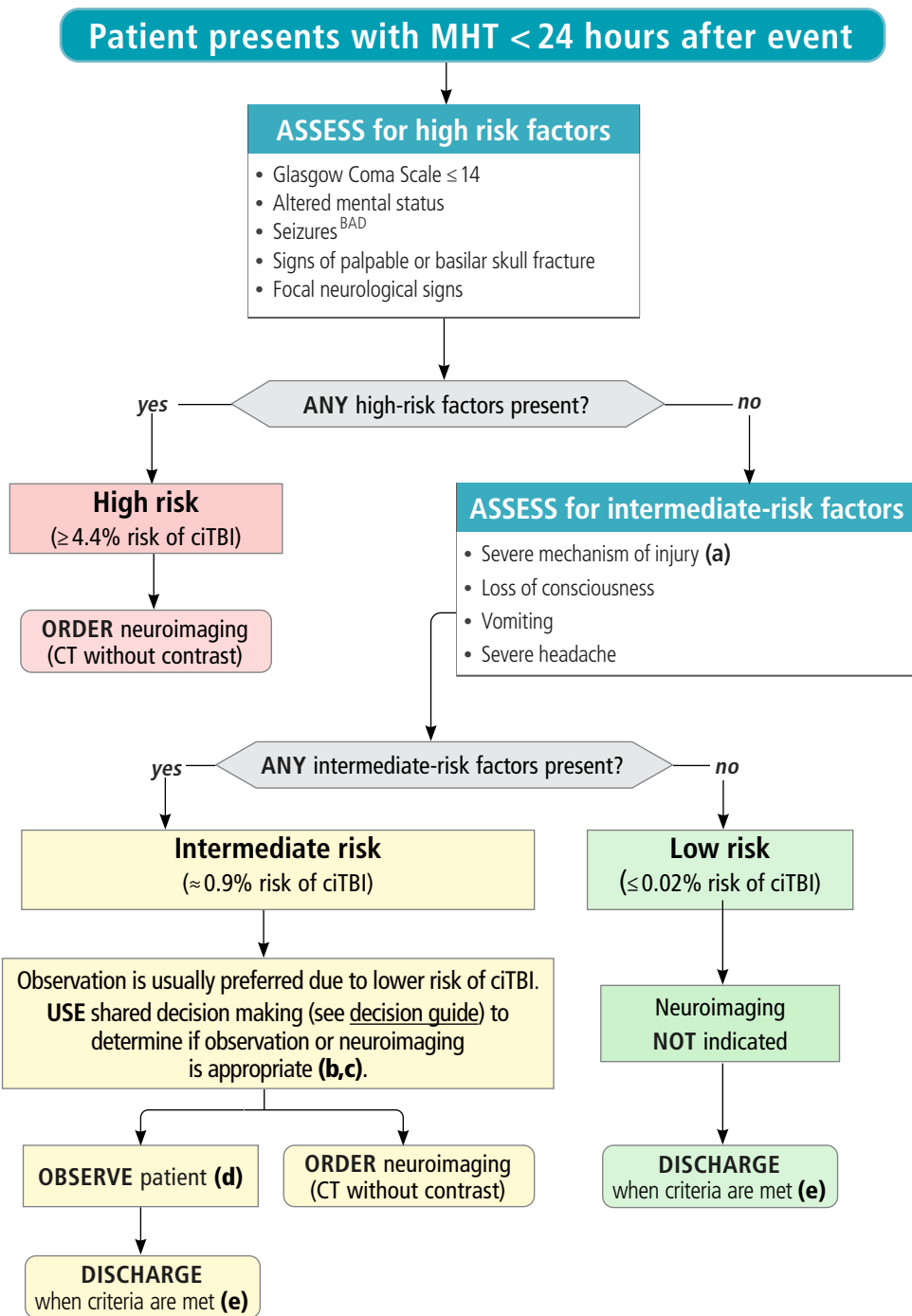
- Normal mental status
- Resolving or minor symptoms
- Tolerating oral intake
- Dependable social support

▶ MINOR HEAD TRAUMA IN PATIENTS ≥ 2 YEARS OLD

The algorithm below and risk estimates of clinically important traumatic brain injury (ciTBI)* are based primarily on the PECARN study and should be used to approach acute, isolated, minor head trauma (MHT) without complicating factors. **Do not use algorithm if:** Moderate or severe head injury, multisystem trauma, penetrating injury, structural brain disease, VP shunts, or bleeding disorder is present; if abuse is suspected; or more than 24 hours have elapsed since time of injury.

*ciTBI is injury resulting in: Death, neurosurgery, intubation > 24 hours, or admission to hospital ≥ 2 nights.

▶ ALGORITHM: ASSESSMENT OF MHT IN PATIENTS ≥ 2 YEARS OF AGE



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► RESOURCES

To support shared decision-making and education on this topic, access the patient and provider resources listed below.

Patient resources

You can find a searchable list of all patient handouts at [Intermountainhealthcare.org](https://www.intermountainhealthcare.org)

Clinicians can order Intermountain patient education booklets, fact sheets, and trackers for their patients from **Print It**, Intermountain's Design and Print Center for one-stop access and ordering of Intermountain-approved education.

Patient Information:

An array of booklets, trackers, and fact sheets to help, including:

- [Head Injury decision guide: is a CT scan right for my child?](#) (English) / (Spanish)
- [Mild Traumatic Brain Injury](#) (English) / (Spanish)
- [Brain Injury: creating a healing environment](#) (English) / (Spanish)
- [Brain injury: Keeping your child safe after head injury](#) (English) / (Spanish)
- [Sleep after a brain injury](#) (English) / (Spanish)
- [Brain Injury Severity and Measurements](#) (English) / (Spanish)
- [Brain Injuries: a guide for teachers](#) (English) / (Spanish)



Provider resources

To find this CPM, clinicians can go to [intermountainphysician.org](https://www.intermountainphysician.org).

This CPM also has abbreviated algorithms for point-of-care use. These can be accessed at <https://www.intermountainhealthcare.org/ckr-ext/Dcmnt?ncid=528135897>

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This CPM presents a model of best care based on the best available scientific evidence at the time of publication. It is not a prescription for every physician or every patient, nor does it replace clinical judgment. All statements, protocols, and recommendations herein are viewed as transitory and iterative. Although physicians are encouraged to follow the CPM to help focus on and measure quality, deviations are a means for discovering improvements in patient care and expanding the knowledge base. Send feedback to Jeff Schunk MD, Intermountain Healthcare, Jeff.Schunk@hsc.utah.edu.