

# Practice Guidelines

## Mild TBI in Children: Guidance from the CDC for Diagnosis and Treatment

### Key Points for Practice

- Head CT should not be routinely performed to assess patients with mild TBI.
- Most symptoms resolve within one to three months after TBI, with significant difficulties rarely lasting longer.
- Full return to activity is appropriate only after the patient is without symptoms at rest and gradually increased activity.

From the *AFP* Editors

**Mild traumatic brain injury** (TBI) in children is a major problem in the United States, causing pathophysiologic injuries and associated symptoms that can result in poor physical, cognitive, or psychological function. Although guidelines exist for adults and specifically for sports-related concussions in children, there has been no guidance provided on diagnosing and treating mild TBI in children. Based on a systematic literature review, the Centers for Disease Control and Prevention (CDC) released recommendations specific to children with Glasgow Coma Scale scores of 13 to 15. It should be noted that because the terms concussion, minor head injury, and mild TBI are often used with the same intended meaning, but actually have different connotations that can result in misinterpretation, the CDC recommends using the term mild TBI.

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**This series** is coordinated by Sumi Sexton, MD, Editor-in-Chief.

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### Recommendations

#### DIAGNOSIS

Head computed tomography (CT) should not be routinely performed to assess patients with mild TBI. Clinical decision rules, such as the Pediatric Emergency Care Applied Research Network decision rule (<https://www.mdcalc.com/pecarn-pediatric-head-injury-trauma-algorithm>), should be used instead to differentiate patients with a low risk of intracranial injury from those at higher risk of clinically important intracranial injury to determine the necessity of CT. Such decision rules assess a combination of risk factors that include age younger than two years, amnesia, Glasgow Coma Scale score, loss of consciousness, nonfrontal scalp hematoma, severe headache, significant mechanism of injury, suspicion of scalp fracture, and vomiting. Symptom rating scales and computerized cognitive testing specific to the patient's age are additional options to aid in diagnostic assessment of mild TBI; however, it should be noted that the Standardized Assessment of Concussion is not appropriate as a stand-alone diagnostic tool in patients six to 18 years of age. A discussion of the risks associated with head CT (e.g., radiation, sedation) should occur to help provide families with greater insight into the care process and decision-making.

Although magnetic resonance imaging is more sensitive than CT and avoids radiation, it should not be routinely performed in the acute setting because of the lack of adequate study in magnetic resonance imaging trials, increased need for sedation, and expense. Single-photon emission CT (SPECT) also should not be performed in evaluations of suspected or confirmed mild TBI. Skull radiography should not be performed for diagnosis of mild TBI or to screen for intracranial injury. Outside of research, biomarkers also are not appropriate for confirming a diagnosis of mild TBI.

#### PROGNOSIS

Most symptoms resolve within one to three months after TBI, with significant difficulties rarely lasting longer. The recovery process is

individualized, and no specific element identifies when symptoms might resolve or aids in determining patient outcomes, which should be discussed with patients and their families. A variety of tools can help determine the possible recovery time in children with mild TBI, including evidence-based symptom scales, cognitive testing, and balance testing for adolescent athletes.

Before a TBI occurs, a history to assess premorbid risk factors should be obtained as part of the patient's preparticipation athletic examination. Otherwise, this information should be assessed as soon as possible after injury to aid in determining the patient's prognosis. Recovery may be slower in patients with a history of mild TBI, lower cognitive functioning combined with an intracranial lesion, a neurologic or psychiatric disorder, learning problems, presence of concussion-like symptoms before the current TBI, or family or social stressors, which should be discussed with the patient's family during preparticipation athletic examinations, as well as after an injury occurs. Patients with mild TBI should be screened for risk factors for continued symptoms, using prediction rules to guide conversations about prognosis in the emergency department. Any patient identified as having a high risk of continued symptoms should be closely monitored; appropriate referral for further evaluation or treatment is warranted for any patient whose symptoms do not resolve as expected with usual care within four to six weeks.

## TREATMENT

If a patient presents to the emergency department with severe headache, monitoring and consideration of a head CT are appropriate to evaluate for intracranial injury that might necessitate further treatment. Emergent neuroimaging should be performed in any child who is being monitored for headaches if symptoms get worse. Hypertonic saline 3% should not be given to children with acute headache outside of research settings, but nonopioid pain medications can be provided with education about the risks of overuse. For patients who develop long-term headache after TBI, the cause is likely multifactorial, and they may benefit from a multidisciplinary evaluation with consideration of analgesic overuse as a possible contributor.

When talking with patients' families, the following should be addressed: indications of a worse injury, anticipated prognosis, monitoring for postconcussive symptoms, preventing additional

injury, managing cognitive and physical activity and rest, advice on returning to recreation and school, and follow-up protocols. Providing such consistent information at discharge is one factor shown to be significantly beneficial for patient outcomes. Social support, which also has been shown to be beneficial for a patient's recovery, may need to be emphasized to patients' families after assessing the types of support the patient is receiving.

It is important to counsel about more restrictive physical and cognitive activity in the first few days after TBI, including gradually increasing activity in a way that does not worsen symptoms. After the patient's activities have been gradually resumed, a rehabilitation program should be recommended to reintroduce noncontact aerobic activity. The patient should be closely monitored during both of these periods. Consideration of a full return to activity is appropriate only after the patient is without symptoms at rest and gradually increased activity, understanding that an optimal time frame for a full return to activity has not been established.

Medical and school professionals should provide education to the patient and his or her family about gradually increasing academic activities, with the goal of achieving increased activity without worsening symptoms. Rates of symptom resolution vary in this population; therefore, methods for a full return to school should be individualized to each patient based on their symptoms. If a child is unable to return to school because of continued symptoms (e.g., headaches or fatigue that interfere with academic performance), school professionals should identify whether additional academic support would be beneficial. Symptoms and progress in school should be monitored by all persons involved in the child's care, including the family and medical and school professionals, who also can determine the necessary accommodations to sustain academic work without worsening symptoms. If educational accommodations are made, they should be monitored and adjusted as needed until a full return to preinjury levels is achieved. If symptoms and difficulty with educational activities continue, the patient should be referred to a pediatric TBI subspecialist.

Because sufficient sleep is associated with health benefits, and insufficient sleep has been shown to adversely affect health problems, recommendations for proper sleep hygiene should be provided. If sleep problems occur or persist despite using sleep hygiene measures, the child may be referred

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to a sleep disorder subspecialist. If persistent vestibulooculomotor dysfunction is suspected, the child should receive referral for vestibular rehabilitation. For any patient who has cognitive dysfunction (e.g., deficits in attention or memory), efforts should be made to determine the etiology while taking the patient's other TBI symptoms into consideration, with identified treatments aimed at the suspected etiology. Patients with continued symptoms or issues associated with the cognitive dysfunction should be appropriately referred for formal evaluation to confirm the etiology and to identify treatment strategies.

**Editor's Note:** This CDC guideline on the diagnosis and management of mild TBI is the first mild head trauma guideline focusing only on children since the 1999 AAP/AAPF guideline (*Pediatrics*. 1999;104(6):1407-1415). The current guideline was created for all clinicians who care for children to help standardize the prevention, diagnosis, prognosis assessment, and management of mild TBI in this group. Understanding its principles will minimize the need for imaging and referral. Preparticipation evaluation can identify those at highest risk of mild TBI. Because mild TBI is a clinical diagnosis based on history and symptoms, neuroimaging, including CT and magnetic resonance imaging, should not be used to diagnose mild TBI. Imaging can be used in select patients to assist with management, and an approach to risk assessment is provided to determine who might benefit from such imaging. Guidance on prognosis and monitoring for persistent symptoms is also provided. Cognitive and physical rest are important. The guideline also offers suggestions for the gradual return to activity.—Theodore G. Ganiats, MD, Member of the Pediatric Mild Traumatic Brain Injury Guideline Workgroup

**Guideline source:** Centers for Disease Control and Prevention

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**Systematic literature search described?** Yes

**Guideline developed by participants without relevant financial ties to industry?** No

**Recommendations based on patient-oriented outcomes?** Yes

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