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CDC Guideline on Mild Traumatic Brain Injury in Children: Important Practice Takeaways for Sports Medicine Providers

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Abstract

Objectives: The Centers for Disease Control and Prevention (CDC) published an evidence-based guideline on the diagnosis and management of pediatric mild traumatic brain injury (mTBI) in 2018. This commentary provides key practice takeaways for sports medicine providers outlined in the Guideline recommendations.

Data Sources: The CDC Pediatric mTBI Guideline was developed through a rigorous scientific process using a modified Grading of Recommendations, Assessment, Development and Evaluations (GRADE) methodology. A systematic review of the scientific literature published over a 25-year period for all causes of pediatric mTBI formed the basis of the Guideline.

Main Results: The key practice takeaways for sports medicine providers focus on preseason evaluations, neuroimaging, symptom-based assessment, managing recovery, monitoring for persistent symptoms, and return to activity, including sport and school.

Conclusions: Sports medicine providers play an integral part in the implementation of evidence-based practices that promote appropriate diagnosis and management of mTBI in children. This commentary highlights key practice takeaways that sports medicine providers can implement.

Keywords

concussion; brain; injury; guideline; athlete

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INTRODUCTION

Whether on the sideline or in your office, as a sports medicine provider, you will no doubt encounter children with a mild traumatic brain injury (mTBI), also called concussion. Mild TBIs are at the forefront of the significant injuries sports medicine providers anticipate and manage. An mTBI results from an impact to the head or body that causes the brain to undergo translational, rotational, or angular acceleration and deceleration forces.[1,2] These forces may lead to a wave of energy that passes through the brain tissue, injuring it, and triggering neuronal dysfunction involving a cascade of ionic, metabolic, and physiologic events.[2–5] Children may be at particular risk of mTBI. Physiologic factors associated with a child's risk of brain injury include their developing nervous system, thinner cranial bones, lack of musculature to absorb transmitted forces, and an increased susceptibility to the chemical and metabolic changes that occur in the brain.[5–8]

From 2001 through 2012, more than 3 million emergency department visits occurred related to sports- and recreational-related traumatic brain injuries. Seventy percent involved patients 19 years of age and younger.[9] Although mTBI can happen in any sport, they are more common in collision sports such as football, ice hockey, lacrosse, and soccer.[4,10] According to Marar et al,[10] over two-thirds (70%) of concussions among high school athletes result from colliding with another athlete.

To help guide the care of athletes with mTBI, several reviews have been published,[11–13] most recently the updated International Concussion in Sports Census Statement in 2017.[14] These publications address concussions related only to sports participation, but few of them focus solely on children.[15] To address this information gap, CDC published an evidence-based guideline on the diagnosis and management of pediatric mTBI from all causes, including sports, in September 2018.[16] The CDC Pediatric mTBI Guideline was developed through a rigorous scientific process using a modified Grading of Recommendations, Assessment, Development and Evaluations (GRADE) methodology. A systematic review of the scientific literature published over a 25-year period for all causes of pediatric mTBI formed the basis of the Guideline.[17] The CDC Pediatric mTBI Guideline consists of 19 clinical recommendations that cover diagnosis, prognosis, and management and treatment. Recommendations included in the Guideline provide guidance to healthcare professionals who care for children in primary care, outpatient specialty, inpatient, and emergency care settings, including the sideline. Leading medical organizations and the public reviewed and provided feedback on the Guideline.

KEY PRACTICE TAKEAWAYS FOR SPORTS MEDICINE PROVIDERS

The CDC Pediatric mTBI Guideline highlights the need for consistent and evidence-based care of children with concussion. Below is a discussion of key practice takeaways for sports medicine providers outlined in the Guideline recommendations. These practice takeaways were chosen based on common topics covered in concussion in sports guidelines and protocols. The practice takeaways focus on: preseason evaluations, neuroimaging, symptom-based assessment, managing recovery, monitoring for persistent symptoms, and return to activity, including sport and school (Table 1).

Preparticipation Athletic Examinations

Preparticipation athletic examinations are a critical opportunity for sports medicine providers to identify athletes at increased risk of injury, based on identified risk factors discussed in the Guideline, and to discuss sports-specific injury-prevention strategies. The risk of delayed recovery or prolonged postconcussive symptoms is increased in the presence of certain premorbid conditions (eg, history of previous concussions, history of migraine, cognitive or learning difficulties, attention deficit hyperactivity disorder, or psychiatric history).[18–24] Thus, sports medicine providers should assess the premorbid history of children as part of preparticipation athletic examination to assist in determining risk and prognosis. In addition, sports medicine providers should counsel patients and families about risk factors and that recovery from pediatric mTBI is variable, with most symptoms resolving in a few weeks to months after injury.

Neuroimaging

Sports medicine providers should not routinely image (ie, magnetic resonance imaging, computed tomography, and skull x-ray) children with suspected mTBI for diagnostic purposes. Instead, providers should use validated clinical decision rules to identify children at risk of more serious intracranial injury, for whom imaging is warranted. One such example sports medicine providers can use is the PECARN decision rule.[25] Decision rules assess a variety of risk factors that are associated with increased risk of serious intracranial injuries. These factors include: age <2 years; recurrent vomiting; loss of consciousness; severe injury mechanism (such as motor vehicle crash with patient ejection and head struck by a high-impact object); severe or worsening headache; amnesia; nonfrontal scalp hematoma; Glasgow Coma Scale <15; and clinical suspicion for skull fracture.

Symptom-Based Assessment

Sports medicine providers should use an age-appropriate, validated symptom rating scale as a component of the diagnostic evaluation in children presenting with mTBI.[4,26-29] Several validated tools are freely available[16] (such as the Graded Symptom Scale Checklist,[27] Post-Concussion Symptom Inventory,[4] Post-Concussion Symptom Scale,[28,29] and the Health and Behavior Inventory[26]). The evidence is insufficient to determine whether baseline ratings in children better identify concussion as compared to postinjury scores alone.[30,31] The symptom scale in the Child-SCAT uses the HBI. Future studies are needed to validate the Child-SCAT 5.

Managing Recovery

Evidence suggests that education and clear communication from healthcare professionals can optimize outcomes. Sports medicine providers can more effectively counsel patients with mTBI when they have assessed risk factors for outcome and recovery. Risk factors for prolonged recovery include: severe symptom presentation immediately after the injury; history of concussion or other intracranial injury; and personal characteristics and family history (eg, older age, female sex, Hispanic ethnicity, lower socioeconomic status and cognitive ability, neurological or psychiatric disorder, learning difficulties, and family and social stressors).[18–24,32]

Sports medicine providers may assess the social supports available to the child,[33–36] including people who provide emotional support, problem-solving advice, constructive feedback, and positive affirmations. Providers can emphasize social support as a key element of recovery when educating families and school professionals who will be interacting with the patient during recovery.

Monitoring for Persistent Symptoms

Although sports medicine providers should inform patients and their families that most symptoms of mTBI resolve within a couple of weeks[14,37] and 70% to 80% in 1 to 3 months,[38-40] they should also monitor children at risk of persistent symptoms or delayed recovery who are likely to need further intervention. Because no single assessment tool is sufficient to monitor recovery, sports medicine providers should consider using a combination of tools including validated symptom scales, cognitive testing tools that measure reaction time, and balance testing.

Return to Activity

Return to organized sports, particularly contact sports, may be initiated after a child's successful completion of a customized return to activity plan (including return to school). Gradual return to physical and cognitive activity, as tolerated, without significantly exacerbating symptoms, can begin after several days of rest.[16] Sports medicine providers should closely monitor patients for symptom expression (number and severity) as they return to their regular activities. When the patient is ready to initiate a return to sport progression, providers should give written and verbal guidance and supervision with the goal of increasing adherence to the progression among athletes, coaches, and parents. Children should not return to contact sports, or activities that place them at high risk of repeat head injury, until they have had resolution of their concussion symptoms and are evaluated and cleared by their healthcare professional.

DISCUSSION

Sports medicine providers play an integral part in the implementation of evidence-based practices that promote appropriate diagnosis and management of mTBI in children. To help support sports medicine providers integrate the Guideline recommendations into practice, CDC created free and publicly available educational tools. These tools include an online training with continuing education credits, as well as a checklist for providers, diagnostic tools, discharge instructions, and handouts for patients and families with symptom-based recovery tips. To access the CDC Pediatric mTBI Guideline and educational tools, visit: www.cdc.gov/HEADSUP.

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TABLE 1.

Overview of Clinical Recommendations Most Applicable to Sports Medicine Contained in the CDC Pediatric mTBI Guideline

Preparticipation athletic examination
Sports medicine providers should assess the premorbid history of children as part of preseason evaluation to assist in determining risk and prognosis
Athletes at increased risk of injury can be identified based on risk factors:
History of mTBI
Preinjury symptom burden associated with prior concussions
Preinjury neurological or psychiatric disorder
Learning difficulties
Lower cognitive ability
Family and social stressors
Sports medicine providers should counsel patients and families about risk factors and that each child's recovery from mTBI is unique
Neuroimaging
Validated clinical decision rules assessing a combination of risk factors should be used to assess the likelihood of mTBI before obtaining neuroimaging (magnetic resonance imaging, computed tomography, or skull x-ray). Examples of risk factors include:
Age <2 yrs;
Recurrent vomiting
Loss of consciousness
Severe injury mechanism
Severe or worsening headaches
Amnesia
Nonfrontal scalp hematoma
Glasgow Coma Scale < 15
Clinical suspicion for skull fracture
Mild TBI is a clinical diagnosis and is generally not dependent on neuroimaging
In cases of acutely worsening symptoms of headache, especially in the setting of other risk factors, consider emergent neuroimaging to assess for more severe intracranial injuries
There is currently not enough evidence to support the routine use of advanced imaging or serum biomarkers.
Symptom-based assessment
Age-appropriate, validated symptom-rating scales should be used as a component of diagnostic evaluation
Managing recovery

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To optimize outcomes, sports medicine providers should communicate clearly and provide patient/family education about mTBI
Although no single factor is strongly predictive of outcome, sports medicine providers can provide counseling to patients and family when they assess known risk factors of prolonged recovery (possibly using validated prediction rules). Prolonged recovery is more common among:
Older children/adolescents
Hispanic ethnicity
Lower socioeconomic status
More severe presentation of mTBI (eg, those associated with intracranial abnormalities), including intracranial hemorrhage
Higher levels of postconcussive symptoms
Sports medicine providers can emphasize social support (ie, emotional, informational, instrumental, and appraisal) as a key element of recovery when educating families and school professionals who will be interacting with the patient during recovery
Monitoring for persistent symptoms
Sports medicine providers should inform patients and their families that most symptoms of mTBI resolve within a couple of weeks or 1–3 mo
Sports medicine providers should also monitor children at risk of persistent symptoms who might need further intervention
Because no single assessment is sufficient to monitor recovery, sports medicine providers should use a combination of tools (eg, validated symptom scales, cognitive testing tools that measure reaction time, and balance testing) to assess recovery in children with mTBI
Return to activity
Sports medicine providers should provide guidance on the management of cognitive and physical activity/rest that will affect return to play and school, including:
More restrictive physical and cognitive activity during the first few days followed by a gradual return to activity/play that does not significantly exacerbate symptoms
Close monitoring of symptom number and severity
Follow-up instructions as activity integration cannot be preapproved at the time of initial symptomatic review and joint medical and school-based teams should address these specifics including “clearance” for full activity

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