Overall Recommendation:

Standards:

1. Any person who a provider of first aid believes has sustained trauma [forceful bump, blow, or jolt to the head or body that results in rapid movement of the head and brain], along with any of the signals listed in table 6 [may be delayed] must be presumed to have sustained a mild traumatic brain injury or concussion.

2. Any person having sustained a mild traumatic brain injury or concussion must be removed from activity (ie., sport or other recreational activities) and must be referred to a qualified health care professional, experienced in evaluating and managing concussion.

Guidelines:

Options:

Questions to be addressed:

How can a first aid provider identify a person with a mild traumatic brain injury (ie., concussion) after sustaining trauma to the head and what are recommendations for managing this situation?

Introduction/Overview:

According to the Centers for Disease Control and Prevention a traumatic brain injury (TBI) is “caused by a bump, blow or jolt to the head or a penetrating head injury that disrupts the normal function of the brain.” The common mechanism of injury (MOI) include a: 1) coup, 2) contra-coup, 3) rotational acceleration-deceleration and 4) repetitive impact. A forceful blow (eg., projectile [ball, fist, unrestricted objects in a vehicle]) to the resting, movable head produces a coup injury, producing maximal brain injury beneath the point of impact. When the head strikes an unyielding object (ie., falling to the ground and striking the head on surface) a contra-
coup injury occurs producing localized trauma opposite the site of cranial impact. Rotational acceleration-deceleration occurs when the brain is “torqued” or twisted, while repetitive impact occur when the brain sustain low-impact trauma over the course of a period of time (eg., boxing, soccer heading). Depending on the type of trauma sustained, age of the person and other factors, a variety of signs and symptoms may be recognized in adults and pediatric patients.2-11

In the military, a TBI is often the result of blast related injuries. Common mechanism of injury include but are not limited to:11-14 1) direct exposure to over the pressurization wave produced by a blast, 2) being stuck with flying debris (coup) from a blast injury, 3) being thrown across the environment from a blast injury or 4) jumping15 from a plane (paratroopers). And while not all blows sustained by the head result in a TBI16, the severity1,7,8,17 of injury can range from “mild,” diffuse injury (ie., a brief change in mental status or consciousness) to “moderate” or “severe,” (ie., an extended period of unconsciousness or amnesia sustained after the trauma) depending on variety of factors at the time of injury. Important factors in determining the severity of injury include: 1) the velocity of the head before impact, 2) time over which the force is applied, 3) magnitude of the force applied to the head9,18 or body9,18 4) amount of linear and/or rotational acceleration-deceleration19, 5) criteria and tools used to determine the presence or absence of mTBI20-23 and level of familiarity with the signs and symptoms of a concussion.24

The majority of TBIs occurring each year are concussions or other forms of mild TBI (mTBI).25,26 A cerebral concussion is best classified as a mild diffuse injury with the term mTBI typically used interchangeably with the term concussion (as will be in the case of this document).7,8,25,27 However it should be noted that according to a review of literature by Mosenthal28, concussions can and do occur even when a person sustains other types of traumatic brain injuries. Currently, there is universally accepted agreement on a standard definition for both adults and children2 and diagnosis or nature of concussion. This is likely due to the variations in the mechanism of injury and presentations of TBI, as well as the more severe, but less common head injuries that can cause damage to the brain stem and other vital centers of the brain.8,29-31 Agreement does exist however on several features that incorporate clinical, pathologic, and biomechanical injury constructs associated with head injury.8,9
**Summary of Scientific Foundation:**

Providers of first aid must first recognize that no two mTBI (ie., concussions) are identical in both the cause and presentation. The degree of the resulting signs and symptoms from the physical trauma can be very different and difficult to visualize by a first aid provider depending upon a variety of factors. The diagnosis of a mTBI should involve the assessment of a range of domains including, but not limited to the person’s: 1) symptoms, 2) signs, 3) behavior, 4) balance and coordination, 5) sleeping patterns 6) cognition and analytical abilities and 7) response to physical exertion with each assessment tool adding additional information regarding the status of the injured person by independently evaluating differing aspects of cerebral functioning. However, while assessment tools such as neuropsychological and neurocognitive and balance and coordination testing are commonly used and provide the greatest amount of objective measures regarding a person’s of cognitive function and recovery after a concussive injury; individual variations in test scores and the necessity of baseline assessment makes it difficult for providers of first aid to administer these tools and interpret the results.

To help recognize a concussion, providers of first aid should observe for two items. First, the person sustaining a mTBI should experience a forceful bump, blow, or jolt to the head or body that results in rapid movement of the head and brain. Second, providers of first aid should observe for any change in the person’s physical, cognitive, emotional or sleeping patterns. These signs and symptoms can be located in Table 6. Note that these signals may or may not appear immediately and that some people do not recognize or admit (athletes) that they are having problems.

Any person who a provider of first aid believes is experiencing any of the signs and symptoms listed in table 1 and who has sustained trauma to the head should be removed from activity [ie., sport] and referred to a qualified health care professional, experienced in evaluating and managing concussion.

**Table 1. Signs and Symptoms of a Concussion.**
<table>
<thead>
<tr>
<th>Physical</th>
<th>Cognitive</th>
<th>Affective</th>
<th>Sleep</th>
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</thead>
<tbody>
<tr>
<td>Headache</td>
<td>Difficulty thinking clearly</td>
<td>Irritability</td>
<td>Drowsiness</td>
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<tr>
<td>Nausea or vomiting</td>
<td>Feeling mentally “foggy”</td>
<td>Sadness/depression</td>
<td>Sleeping more or less than usual</td>
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<tr>
<td>Balance or coordination problems</td>
<td>Difficulty concentrating</td>
<td>Anxiety</td>
<td>Difficulty falling asleep</td>
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<tr>
<td>Dizziness</td>
<td>Decreased processing speed</td>
<td>Heighted emotions</td>
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<tr>
<td>Double or blurry vision</td>
<td>Difficulty remembering new information</td>
<td>Nervousness</td>
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<tr>
<td>Sensitivity to light</td>
<td>Difficulty remembering events <em>prior</em> to the trauma</td>
<td></td>
<td></td>
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<tr>
<td>Sensitivity to noise</td>
<td>Difficulty recalling events <em>after</em> to the trauma</td>
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<tr>
<td>Tinnitus</td>
<td>Feeling “sluggish” or slowed down</td>
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<td></td>
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<tr>
<td>Fatigue</td>
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<td>Does not “feel right” or is “feeling down”</td>
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<td>Feeling “sluggish”, having no energy</td>
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<td>Numbness/tingling</td>
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<td>Loss of consciousness</td>
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**References**


