



## Traumatic Brain Injury

### Background

From 2000 through the first quarter of 2012, 244,217 service members sustained a traumatic brain injury (TBI) according to the Defense Department. The majority of those reported TBIs were mild TBI, also known as concussion, and occurred in the non-deployed setting. Most individuals who sustain a mild TBI experience a complete resolution of symptoms within the first several days to weeks after the incident.

### Definition

In October 2007, the Defense Department established a formal definition of TBI consistent with other nationally and internationally respected organizations as a “traumatically induced structural injury and/or physiological disruption of brain function as a result of an external force.” The injury is indicated by the onset or worsening of at least one of the following immediately after the event:

- Any period of loss or a decreased level of consciousness
- Any loss of memory of events immediately before or after the injury
- Any alteration in mental state at the time of the injury (confusion, disorientation, slowed thinking)
- Neurological deficits (i.e., weakness, loss of balance, change in vision, numbness)
- Intracranial lesion

**External forces may include any of the following events:**

- Head being struck by an object or head striking an object
- Brain undergoing an acceleration/deceleration movement without direct external trauma to the head
- Foreign body penetrating the brain
- Forces generated from events such as blast or explosion, or other force yet to be defined

**The leading causes of TBI in the military are:**

- Motor vehicle crashes
- Blasts
- Falls
- Fragments
- Bullets

### TBI Severity

There are four different severities of TBI:

**Mild TBI/concussion:** A confused or disoriented state lasting 24 hours or less; loss of consciousness from a moment up to 30 minutes; or memory loss lasting less than 24 hours.

**Moderate TBI:** A confused or disoriented state that lasts more than 24 hours; loss of consciousness for more than 30 minutes but less than 24 hours; or memory loss lasting for more than 24 hours, but less than seven days.

**Severe TBI:** A confused or disoriented state that lasts more than 24 hours; loss of consciousness lasting 24 hours or more; or memory loss for seven days or more.

**Penetrating TBI or open head injury:** The outer layer of the brain is penetrated by a foreign object.

### Mild TBI Symptoms

Symptoms that an individual may experience following a mild TBI can be classified into three categories: physical, cognitive and behavioral/emotional.

**Physical symptoms associated with mild TBI** — Headache, dizziness, balance disorder, nausea, fatigue, sleep disturbance, blurred vision, light sensitivity, hearing loss, noise sensitivity, seizures, transient neurological abnormalities, numbness and tingling

**Cognitive symptoms associated with mild TBI** — Difficulties with attention, concentration, memory, processing speed, judgment, executive control

**Behavioral/emotional symptoms associated with mild TBI** — Depression, anxiety, agitation, irritability, impulsivity, aggression

## TBI Prevention

Prevention is key to reducing the incidence of TBI. The Defense Department and the services are working diligently to improve today's helmet designs, reduce the risks of blunt impact, provide greater ballistic protection and guard against blast injury. In addition, ongoing safety campaigns promote particular behaviors that would prevent TBIs, to include using seatbelts, protective eyewear and gear when service members are engaged in daily and recreational activities.

## TBI Screening and Mild TBI Identification

While it is best that screening for mild TBI occur close to the time of injury, this does not always happen especially for injuries that occur in the deployed setting. Thus, screening for mild TBI occurs in two environments: deployed and non-deployed settings.

Medical evaluations are now mandatory following events which may cause a concussion in the deployed setting. In 2010, the Defense Department issued official policy to identify, treat, track and ensure, to the fullest extent possible, the protection of service members exposed to potential concussive events, including blasts. This policy includes a medical evaluation for any service member exposed to such an event and guides the management of concussion treatment.

In the non-deployed setting, service members evacuated from theater to Landstuhl Regional Medical Center, Germany, for battle or non-battle injuries and illnesses are screened for concussion. Additionally, all service members returning from deployment must undergo the Post-Deployment Health Assessment and the Post-Deployment Health Reassessment, which, among other things, helps to identify those service members who sustained a concussion and may continue to have symptoms.

Any service member or veteran entering a Department of Veterans Affairs (VA) medical center for clinical care undergoes TBI screening. For those individuals who screen positive for a TBI, a confirmation evaluation is conducted, documented in the medical record, and treatment initiated if necessary.

## Management of TBI

When service members are involved in an event in theater that may have caused a concussion, primary care management is initiated which includes rest, treatment of symptoms including headache and sleep hygiene. They may also require additional care at one of many available concussion care centers. These centers provide specialty care with varying levels

of capabilities and assets to include neurologists and neuropsychologists. An electronic consultation service is also available for providers in theater to work directly with Defense Department TBI subject matter experts. This consultation service is open to all deployed providers in all services and answers are normally provided within four hours of the original consult request. Additionally, there are numerous TBI clinics at military treatment facilities in the United States that provide a standardized approach to TBI care.

Defense and Veterans Brain Injury Center (DVBIC), a primary operational TBI component of DCoE, provides a care coordination network to identify all service members diagnosed with a TBI who are medically evacuated from theater. A care coordinator contacts the service member once they reach the United States and again at three, six, 12 and 24 months following their injury to determine if the service member needs additional follow-up care.

## The Future

The Defense Department TBI research portfolio has grown, reflecting the department's understanding of these injuries, which will ultimately improve clinical care and patient outcomes. The Defense Department will continue to provide a continuum of TBI screening and care during all stages of deployment, including transitions to the VA.

## TBI Resources for Providers

- **Mild TBI Pocket Guide** (for use within the United States): Gives primary care providers an all-encompassing, quick reference that includes clinical guidance in assessing and treating service members and veterans who have sustained a mild TBI.
- **Co-occurring Conditions Toolkit: Mild TBI and Psychological Health**: Provides guidance to primary care providers on the assessment and management of patients with the co-occurring conditions of concussion, posttraumatic stress disorder, pain, depression and substance use disorder.
- **Driving Following TBI: Clinical Recommendations**: A 16-page document providing clinical recommendations to health care professionals within the Military Health System to assess the ability to drive following a TBI, regardless of severity of the injury.
- **Defense Department Driver Rehabilitation Services and VA Driver Rehabilitation Centers**: Provides lists of driving centers around the country offering driving rehabilitation services.
- **Cognitive Rehabilitation Following Mild TBI**: Provides guidance regarding cognitive rehabilitation of chronic post-concussive symptoms in service members

and veterans receiving treatment within military medical settings.

- **Tips for Civilian Health Care Providers:** Provides checklists and resources for civilian health care providers treating service members with mild TBI and posttraumatic stress disorder.
- **VA/DoD Clinical Practice Guideline for Management of Concussion/mild TBI:** This evidence-based guideline applies to adult patients 18 years or older diagnosed with concussion/mild TBI who complain of symptoms related to the injury and are treated in VA/DoD clinical settings for these symptoms at least seven days after the initial head injury.
- **Information Sheet Summarizing VA/DoD Clinical Practice Guideline for Management of Concussion/mild TBI:** A two-page summary of the above report.
- **Mild TBI Pocket Guide Mobile Application:** A mobile application for health care providers that gives instant access to a comprehensive quick-reference guide on improving care for mild TBI patients. Designed to reflect current clinical standards of care, the mobile application can help improve quality of care and clinical outcomes for patients. Available for iPhone and Android.
- **Co-occurring Conditions Toolkit Mobile Application:** A mobile application for health care providers that contains the full contents of the DCoE Co-occurring Conditions Toolkit, helping providers assess and treat patients. Available for iPhone and Android.
- **Mild TBI Web-based Case Studies:** Health care professionals can learn more about mild TBI through a series of Web-based mild TBI case studies using real patient scenarios. The case studies are available to military and civilian health care providers, enabling providers to learn at their own pace. The cases include screening, diagnosis

and management of symptoms in the non-deployed setting. Defense Department providers can access the modules through the MHS Learn website. VA providers can access the case studies using the Talent Management System. Civilian providers can visit [www.health.mil](http://www.health.mil) and visit the Civilian Provider Education section to access the cases.

## TBI Resources for Patients

- **Five Things You Need to Know About Concussion (powerpoint version or PDF):** Provides facts to service members about the basics of concussion, including symptoms.
- **Family Caregiver Curriculum:** A comprehensive guide for families providing care to a family member living with a severe or penetrating TBI.
- **DCoE Outreach Center:** Provides 24/7 support to service members, veterans, family members, providers, unit leaders and the community and can be reached by calling toll-free 866-966-1020, **online** to live chat or email [resources@dcoeoutreach.org](mailto:resources@dcoeoutreach.org).
- **The Center of Excellence for Medical Multimedia Traumatic Brain Injury Website [www.traumaticbraininjuryatoz.org](http://www.traumaticbraininjuryatoz.org):** Provides an informative and sensitive exploration of TBI, including information for patients, family members and caregivers. Topics include types and symptoms of brain injury, TBI treatment and recovery and helpful insights about the potential long-term effects of brain injury. Survivors and their caregivers share courageous stories about their own experiences, providing down-to-earth facts along with inspiration and hope.