


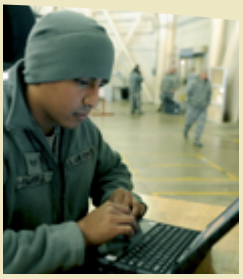


Traumatic Brain Injury

Background

The Defense Department maintains a traumatic brain injury (TBI) database, which shows that 202,281 service members sustained a TBI between 2000-2010, with the majority experiencing a mild TBI or concussion. Approximately 85 to 90 percent of combat exposed troops 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 respected national and international 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 factors 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, etc.)
- Neurological deficits (i.e., weakness, loss of balance, change in vision, numbness, etc.)
- 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:

- Blasts
- Fragments
- Bullets
- Motor vehicle accidents
- Falls

TBI Severity

There are four different grades of TBI, and they are as follows:

Mild TBI/concussion: A confused or disoriented state lasting 24 hours or less; loss of consciousness for up to 30 minutes; and 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; and 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 for more than 24 hours; and 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.

TBI Symptoms

TBI symptoms fall into three categories: physical, cognitive and behavorial/emotional

Physical symptoms: Headache, dizziness, balance disorder, nausea, fatigue, sleep disturbance, blurred vision, light sensitivity, hearing loss, noise sensitivity, seizures, transient neurological abnormalities, numbness and tingling

Cognitive: Difficulties with attention, concentration, memory, processing speed, judgment, executive control

Behavorial/emotional: Depression, anxiety, agitation, irritability, impulsivity, aggression

TBI Prevention

Prevention of TBI is the safest and most cost-efficient course of action. 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. As most TBIs occur in non-deployed settings, the Defense Department has launched an aggressive TBI prevention campaign emphasizing the use of seatbelts and protective eyewear and gear when service members are engaged in daily and recreational activities.

TBI Screening and Identification

While it is best that TBI screening occur close to the time of injury, this does not always happen. Thus, TBI screening occurs in two environments: deployed setting and non-deployed setting. The Defense and Veterans Brain Injury Center (DVBIC), a DCoE component center, is responsible for TBI surveillance across the Defense Department.

Treating TBI may not always involve providers in just one medical specialty. Rather, addressing TBI should be viewed as an interdisciplinary endeavor requiring an integrated approach that includes neurology, neurosurgery, psychiatry, neuropsychology, medicine and rehabilitation.

Medical evaluations are now mandatory following operational events such as exposure to blasts. The Defense Department issued a Directive-Type Memorandum in 2010 noting it was official policy to identify, 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 directs the management of concussion treatment with the use of approved clinical guidance.

A standardized TBI evaluation includes the Military Acute Concussion Evaluation tool (MACE), to identify service members at high risk for possible TBI. The MACE is a tool that can be used for any acute concussion and is ideally administered within 72 hours of injury.

During deployment this screening takes place anytime a service member is evacuated from theater to Landstuhl Regional Medical Center for battle or non-battle injuries and illnesses. Additionally, all service members returning from deployment must undergo the post-deployment health assessment, which identifies those who were exposed to an injury event, lost consciousness, had concussive symptoms or still have them. Three to six months later, service members complete a post-deployment health reassessment.

Any service member entering a Veterans Affairs medical center for clinical care undergoes TBI screening identical to the initial post-deployment health assessment. If a service member indicates through these self-reporting screening procedures they may have experienced a TBI, a primary care provider conducts a confirmation evaluation, documentation is made in the patient's electronic medical record and treatment is started for those with persistent symptoms.

Management of TBI

When service members are involved in an event in-theater that may have caused a TBI, they are required to follow mandatory rest periods to prevent a second TBI from occurring close in time to their initial concussion. Neurologists are also available in-theater to advise on difficult cases. An electronic consulting service has been established for providers in-theater to work directly with TBI subject matter experts. This service is open to all providers in all services and answers are normally provided within four hours of the original consult.

DVBIC has established 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 members once they reach the United States and again at three, six, 12 and 24 months following their injury. The care coordinator assesses what further resources the service member may need and determines if there are other issues which may indicate the need for additional follow-up care.

In response to the FY 2008 National Defense Authorization Act, the Assistant Secretary of Defense for

Health Affairs directed baseline pre-deployment neurocognitive testing to begin. The primary objective of this testing is to better inform return-to-duty determinations in-theater following a possible TBI by comparing baseline pre-injury scores to post-injury scores. Currently, the **Automated Neuropsychological Assessment Metrics** (ANAM) is the main testing tool the Defense Department uses.

When service members experience a TBI in the United States, they receive care in the primary care setting while remaining at their home duty stations. Referrals are made to TBI specialists when warranted. Service members also receive care focused heavily on rehabilitation and reintegration in settings such as Defense Department TBI centers, Veterans Affairs polytrauma rehabilitation centers and civilian rehabilitation programs.

The Future

The Defense Department TBI research portfolio has grown reflecting the department's understanding of these injuries, which will translate into improved clinical care and outcomes. TBI research continues to be fast tracked to assist our service members in improved care in collaboration with the line, medical and research communities. The Defense Department will continue to provide a continuum of TBI screening and care from in-theater to post-deployment, including transitions to Veterans Affairs, ensuring the military health system properly screens and cares for service members with TBI.

TBI Resources for Providers and Patients

- **Mild Traumatic Brain Injury 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. It is intended for patients over the age of 18, diagnosed with mild TBI and complaining of symptoms related to the injury.
- **The Center of Excellence for Medical Multimedia Traumatic Brain Injury Website** — 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.
- **Family Caregiver Curriculum** — Provides a comprehensive guide for families providing care to a family member living with TBI.
- **DCoE Outreach Center** — Provides 24/7 support to service members, veterans, family members, providers and unit leaders and can be reached by calling toll-free 866-966-1020.
- **DoD Driver Rehabilitation Services and VA Driver Rehabilitation Centers** — Provides lists of driving centers around the country offering rehabilitation training to assist service members in driving again.
- **Driving Following Traumatic Brain Injury: 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.
- **Driving Following TBI** — A one-page summary of the above report on clinical recommendations for driving following TBI.
- **Five Things You Need to Know About Concussion** (**powerpoint version** **or** **PDF**) — Provides advice to service members about the basics of mild TBI, including symptoms.
- **A Summary of Clinical Recommendations from a 2009 Consensus Conference** — 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 post-traumatic stress disorder.
- **VA/DoD Clinical Practice Guideline for Management of Concussion/mild TBI** — A 112- page report for health care providers.
- **Summary of VA/DoD Clinical Practice Guideline for Management of Concussion/mild TBI** — A 69-page summary of the above report.
- **Information Sheet Summarizing VA/DoD Clinical Practice Guideline for Management of Concussion/mild TBI** — A two-page summary of the above report.