



Overview of Traumatic Brain Injury (TBI) in the Military

Center for Deployment Psychology
Uniformed Services University of the Health Sciences



Disclaimer

The views expressed are those of the presenters and do not necessarily reflect the opinions of the Uniformed Services University of the Health Sciences, the Department of Defense, or the U.S. Government.



Acknowledgements

This talk is based on the joint collaborative efforts of DVBIC and CDP



Learning Objectives

1. Define and differentiate between different types of traumatic brain injuries.
2. Identify the mechanisms of brain injury common in a military population.
3. Discuss traumatic brain injury resources for military clients, families, and providers.



What is Traumatic Brain Injury (TBI)?



Definition of TBI

Any injury to the head that results in:

- Loss of consciousness for any period of time
- Loss of memory immediately before or after injury
- Alteration of mental state
- Focal neurological deficits transient or non-transient in nature



Neurocognitive Disorder: DSM-5

A: Decline in one or more cognitive domains:

- Complex attention
- Executive functioning
- Learning and memory
- Perceptual-motor
- Social cognition



Neurocognitive Disorder: DSM-5

- Major Neurocognitive Disorder, Criteria A
 - Concern of the individual, a knowledgeable informant, or the clinician that there has been a **significant** decline in cognitive functioning
 - A **substantial** impairment in cognitive performance, preferably documented by standardized neuropsychological testing



Neurocognitive Disorder: DSM-5

- Mild Neurocognitive Disorder, Criteria A
 - Concern of the individual, a knowledgeable informant, or the clinician that there has been a **mild** decline in cognitive functioning
 - A **moderate** impairment in cognitive performance, preferably documented by standardized neuropsychological testing



Neurocognitive Disorder: DSM-5

- B: Capacity for independence in everyday activities
- The degree to which the neurocognitive deficits affect the individual's capacity for independent activities differentiates between **Major** and **Mild** Neurocognitive Disorder



Neurocognitive Disorder: DSM-5

- Major Neurocognitive Disorder, Criteria B
 - **Interferes** with independence
 - Requiring **assistance** with complex instrumental activities (paying bills or managing medications)
- Mild Neurocognitive Disorder, Criteria B
 - **Does not interfere** with independence
 - **Greater effort**, compensatory strategies or accommodation may be required



Neurocognitive Disorder: DSM-5

C: Deficits do not occur exclusively in the context of delirium

D: Not better explained by another mental disorder



Neurocognitive Disorder due to TBI

A: Criteria met for Neurocognitive Disorder
B: Evidence of a TBI with **one or more** of the following:

1. Loss of consciousness
2. Posttraumatic amnesia
3. Disorientation and confusion
4. Neurological signs

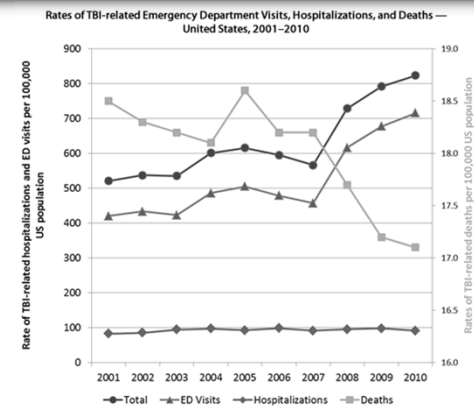


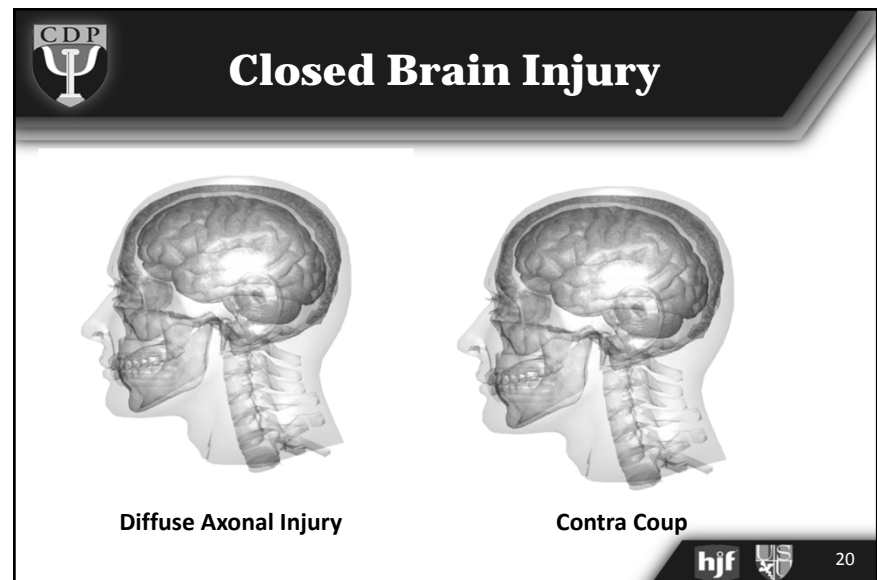
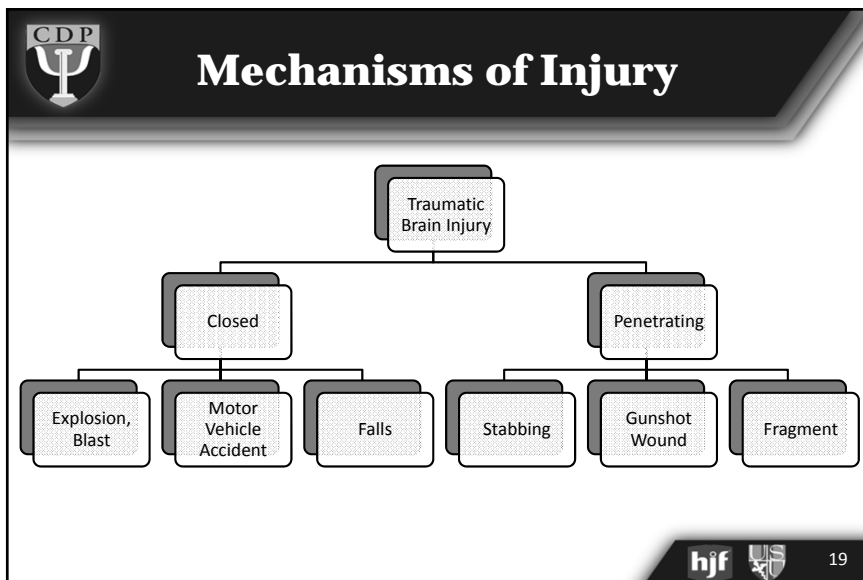
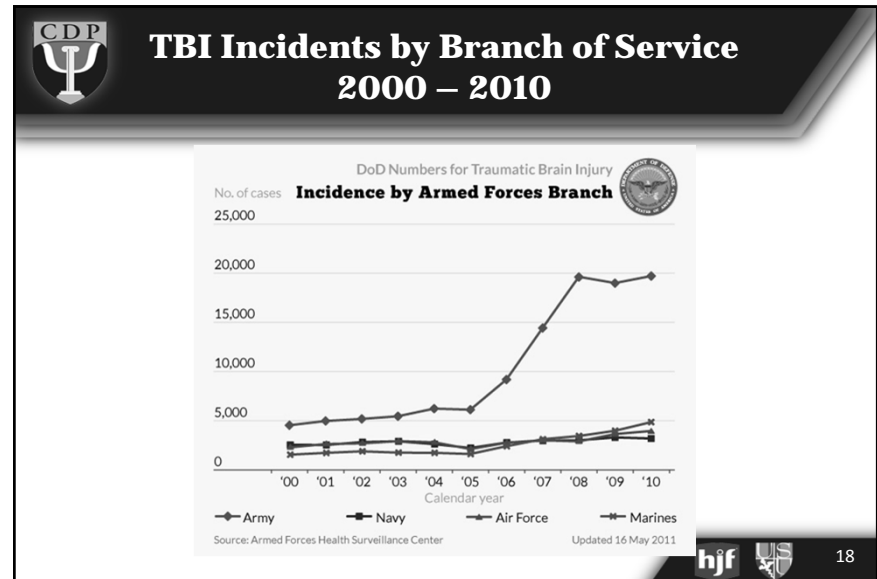
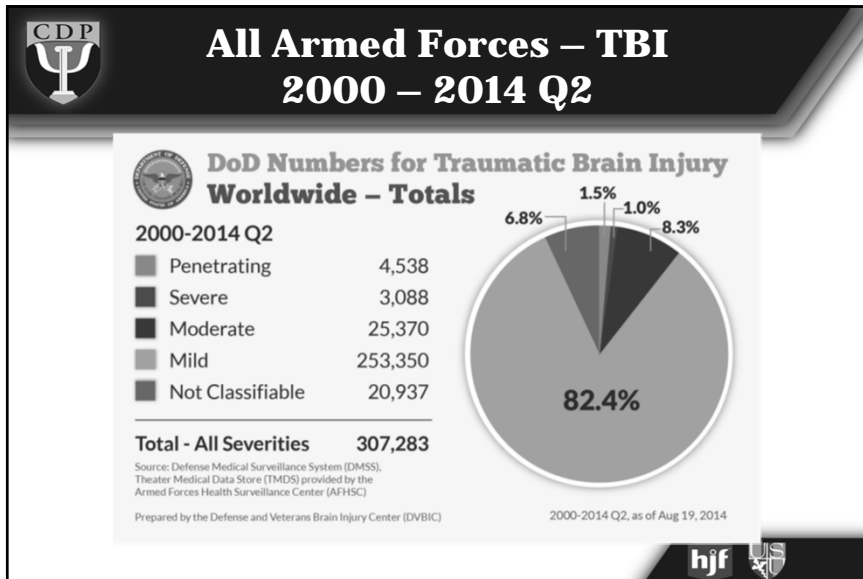
Neurocognitive Disorder due to TBI

C: The neurocognitive disorder presents immediately after the occurrence of the TBI or immediately after recovery of consciousness, and persists past the acute post-injury period.



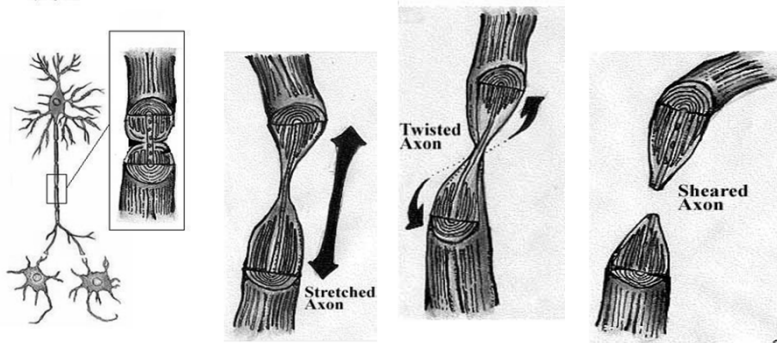
Emergency Department Visits, Hospitalizations and Deaths Related to TBI 2001 -2010 (per 100,000)



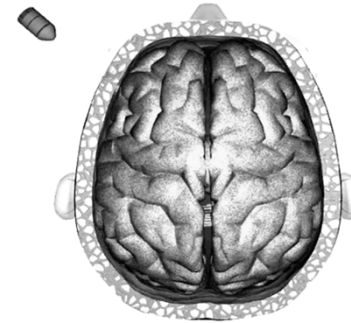




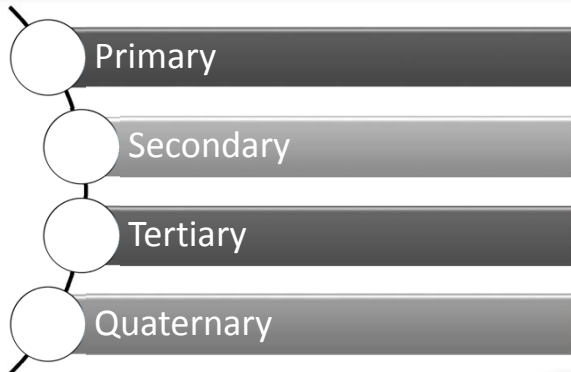
Diffuse Axonal Injury (DAI)



Penetrating Brain Injury



Mechanisms of Blast Injuries



Blast Mechanism Overview

Invisible Wounds Brain trauma from an explosion is typically caused by three major effects.

SHOCK WAVES from an explosive blast can cause injuries as the invisible pressure variations pass through brain tissue. Shock waves can also cause brain trauma by compressing the chest and abdomen, which transfer the waves' kinetic energy through large blood vessels into the brain.

SHRAPNEL and other objects propelled by the blast wave can penetrate the skull or hit the head with concussive force.

ACCELERATION of the body can also cause trauma. Rapid head movement can cause the brain to strike the inside of the skull, and hitting the ground or a wall can lead to bruising on the opposite side of the brain.

The illustration shows a person being thrown by a blast. To the right, two diagrams of a head illustrate the effects of acceleration and impact. The top diagram is labeled "Acceleration bruise" and shows the brain moving within the skull. The bottom diagram is labeled "Impact bruise" and shows the brain hitting the skull.



Primary Blast

- Enormous Over-Pressurization Wave:
 - Axonal Damage
 - Changes in Cell Metabolism
- Primary Blast Injuries Examples:
 - Ear/Auditory/Vestibular
 - Lung
 - Abdomen



Primary Blast

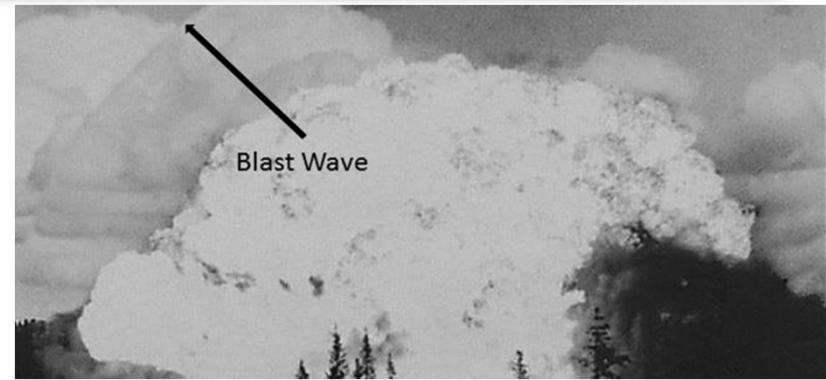


Photo Credit: D.R. Richmond, US Army



Secondary Blast Injury: Flying Debris

Objects propelled by blast wind

- Small missiles accelerated to 50 ft/sec cause skin laceration
- Speeds of 400 ft/sec associated with body cavity penetration



Secondary Blast Injury: Fragment and Shrapnel Wounds

Figure 11. Multiple fragment wounds from blast injury.



Photo courtesy of Professor Zvi Gimmon, MD.

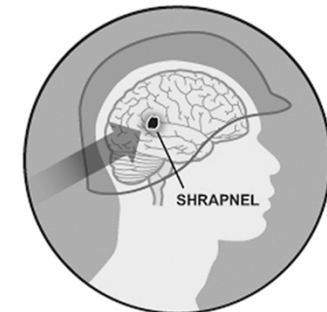


Image: Al Granberg/ProPublica



Tertiary Blast Injuries



- Body Displacement by:
 - Overpressure
 - Shockwave
- Close to explosion
- Multiple Fractures
- Head Injuries
- Amputations

Photo Credit: Sgt. Anthony L. Ortiz, USMC



29



Quaternary or Miscellaneous Blast Injuries



- Collapsed Structures
- Displaced Heavy Objects
- Smoke Inhalation
- Burn Injuries
- Complications from Existing Conditions

Photo Credit: US Department of Defense



30



Concussion/mTBI Assessment: Principle Goals

- **Identify** patients who have experienced risk for mTBI
- **Minimize** impact of secondary effects
- **Improve** treatment outcome
- **Optimize** mTBI care
- **Reduce** disability



31



Predisposing TBI Risk Factors

- Psychiatric Conditions
- Personality Traits
- Medical Conditions
- Intelligence Level
- Demographic Characteristics
- Coping Abilities



32



Concussion Screening

- Military Acute Concussion Evaluation (MACE)
- Screening Protocols in Theater, Landstuhl, MTFs
- PDHA, PDHRA
- VA 4 Questions

MACE
Military Acute Concussion Evaluation

Patient Name: _____
 Service Member ID#: _____ Unit: _____
 Date of Injury: _____ Time of Injury: _____
 Examiner: _____
 Date of Evaluation: _____ Time of Evaluation: _____

CONCUSSION SCREENING
 Complete this section to determine if there was both an injury event AND an alteration of consciousness.

1. Fg 1. Other
 If yes, to how long? _____



Pre-Deployment Testing: ANAM



- Automated Neuropsychological Assessment Metrics (ANAM)
- Establishes an accurate baseline of cognitive performance

Photo Credit: US Department of Defense



Accurate Diagnostic Factors

- Screening Checklists
- Records Review
- COC Input
- Family/Patient Interview
- Concussion History
- Potential Missed & Misdiagnoses Issues

TBI Assessment Domains

Severity	Glasgow Coma Score (GCS)	Alteration in consciousness (AOC)	Loss of consciousness (LOC)	Post traumatic amnesia (PTA)
Mild	13 – 15	≤ 24 hrs	0 – 30 min	≤ 24 hrs
Moderate	9 – 12	> 24 hrs	> 30 min < 24 hrs	> 24 hrs < 7 days
Severe	3 – 8	> 24 hrs	≥ 24 hrs	≤ 7 days

- Consider imaging results when determining level of severity
- Positive Imaging = at least a moderate TBI rating
- GCS not as useful given complications of theater setting
- Use of AOC in DoD severity rating

Fallen Heroes Fund



TBI “Red Flags”

- a) Altered consciousness
- b) Progressively declining neurological exam
- c) Pupillary asymmetry
- d) Seizures
- e) Repeated vomiting
- f) Double vision
- g) Worsening headache
- h) Cannot recognize people or is disoriented to place
- i) Behaves unusually or seems confused and irritable
- j) Slurred speech
- k) Unsteady on feet
- l) Weakness or numbness in arms/legs



Identified as Positive for Concussion

- Evaluate and treat symptoms
- Assess for non-TBI factors contributing to presentation
- Assess cognitive complaints through formal testing, if appropriate
- Educate about recovery appropriately depending on severity of injury and time since injury



Concussion Education

- Early intervention with TBI education and positive expectations have a direct effect on recovery
 - Patients, families, providers, military command, employers
 - Reduces patient and family anxiety
- Prevent re-injury while recovering
- Address specific symptoms (e.g., headaches, sleep problems) with strategies or referrals



Concussion Brain Injury Clinical Course

Expected Outcomes

- Full recovery (vast majority)
 - Rapid recovery (days to weeks) with minimal intervention
 - Longer recovery (3 months – 12 months)
- Persisting symptoms (minority; years)
 - Sometimes referred to as post-concussive syndrome (PCS) but controversial and not in DSM-5



Concussion Brain Injury Clinical Course

- Second impact syndrome (repeated mild concussion before full recovery) ->possible [rare] fatality (synergistic effects)
- Multiple concussions (>2) over time – more morbidity/slower recovery
- “Invisible Injury”
 - Can adversely impact interpersonal relationships
 - Symptoms can be missed due to more apparent physical injuries
 - Co-morbid emotional distress



44



What are common changes following a concussion?



45



Thinking Changes in “Executive Functioning”

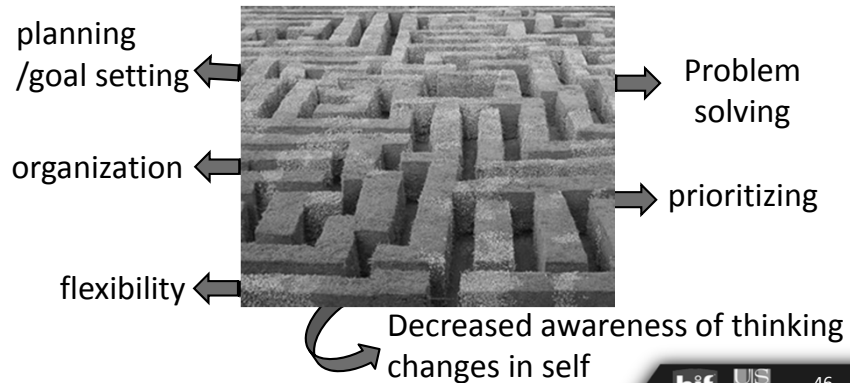


Photo Credit: marsroverdriver



46



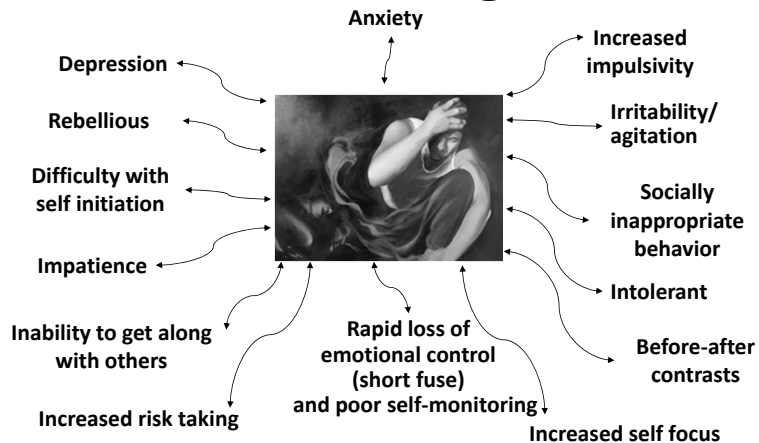
Thinking Changes

- Learning & Memory
- Attention
- Processing Speed
- Communication



47

Emotional, Behavioral, and Social Changes



Psychosis, courtesy of artist, Amber Osterhout.

Long Term Challenges Post TBI

- Vocational and/or school failure
- Family life/social relationships collapse
- Increased financial burden on families and social service systems
- Alcohol and drug abuse
- Chronic depression/anxiety

hjf



49



TBI and DoD

Some controversies include:

- Diagnosis of mTBI
- Effectiveness of cognitive rehabilitation
- Utility of ANAM

Hoge et al (2009), Coldren et al (2012), Roebuck-Spencer et al (2012)

hjf



50



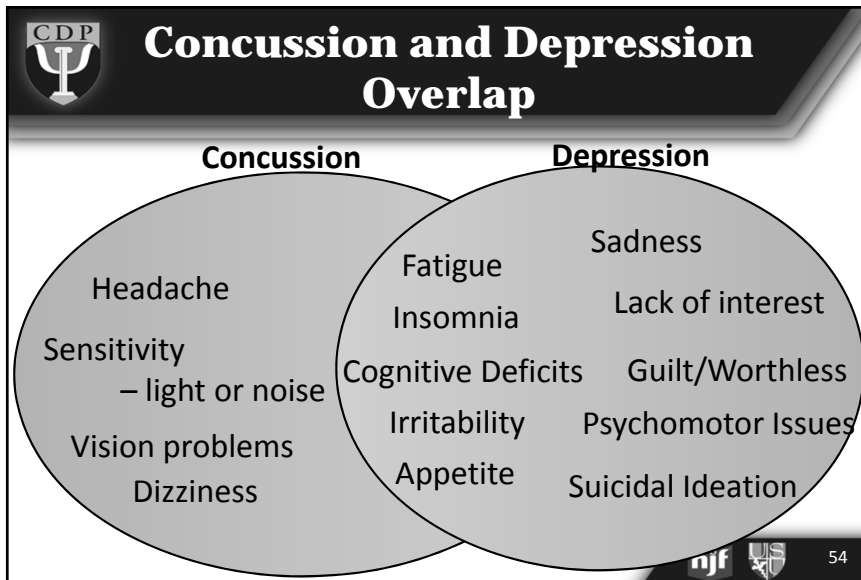
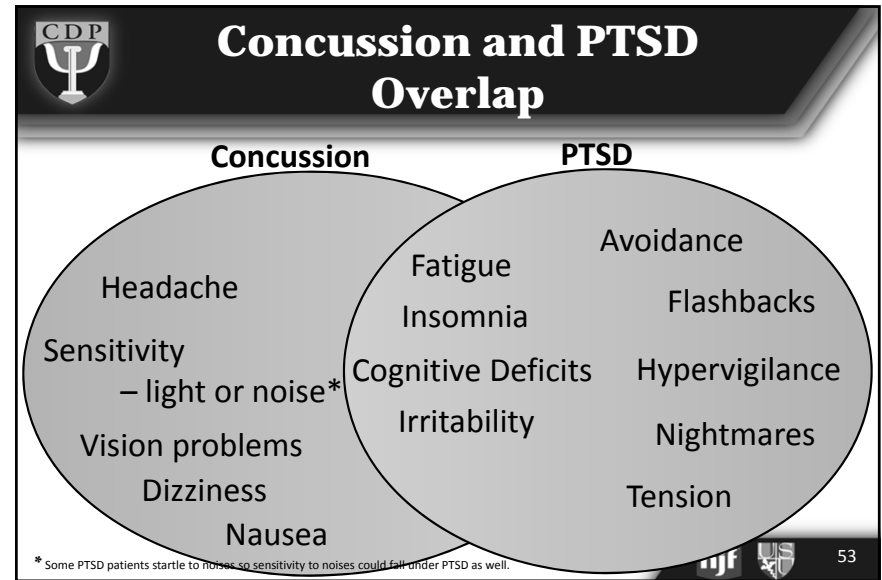
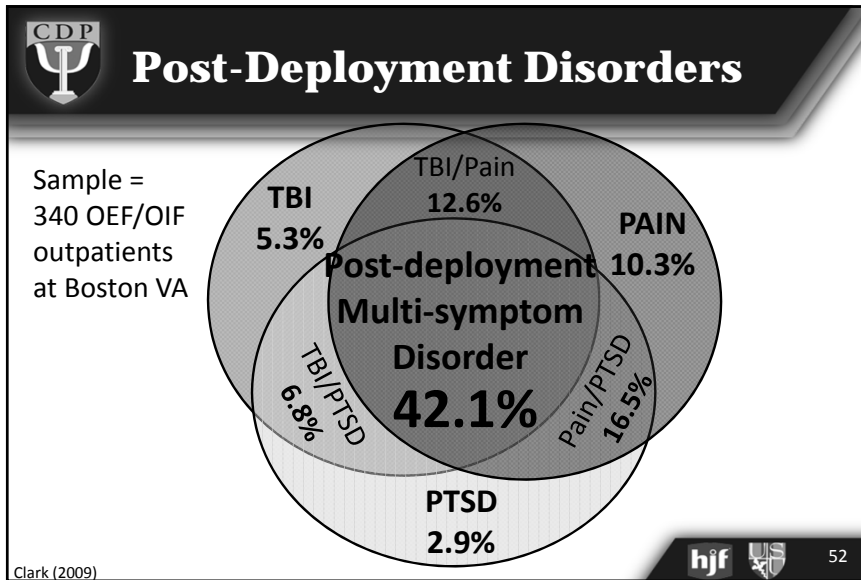
Comorbid Conditions & TBI Overview

- Risk of psychiatric conditions increase with TBI
- Assessment difficulties due to similar symptoms
- Psychiatric conditions and cognitive compromise

hjf



51



- ### CDP Factors Affecting Outcome after Concussion
- Physical injury in theater
 - Pre-injury and demographic variables
 - Family/social/unit/command support
 - Compensation/secondary gain
 - Additional behavioral health conditions
 - Course of medical care



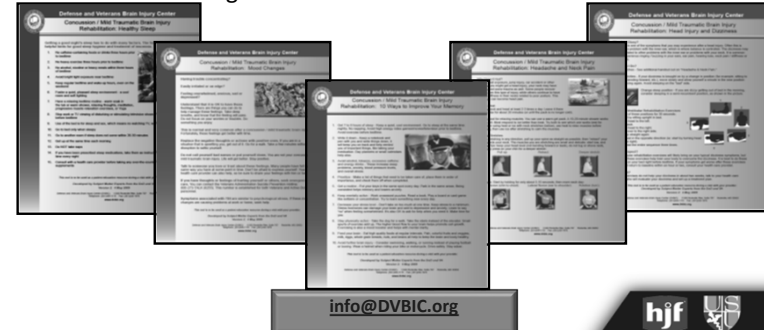
TBI Resources for Patients, Families & Providers



Resources

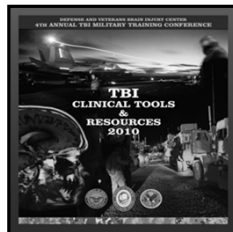
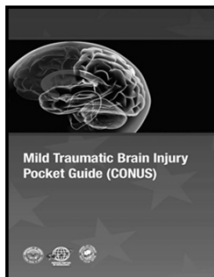
Concussion Symptom Management Patient Handouts

- Improving Memory
- Healthy Sleep
- Mood Changes
- Headache Management
- Head Injury and Dizziness



Products & Tools Available From DVBIC

- mTBI Pocket Guide
- Clinician Resources & Tools Binder
- DoD ICD-9 Coding Guidance



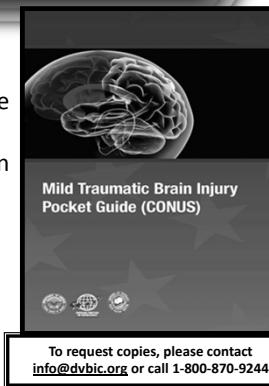
info@DVBIC.org



Mild TBI Pocket Guide

Contents Include

- Summary of VA/DoD Clinical Practice Guideline (2009) and DoD mTBI Updated Clinical Guidance (2008)
- Assessment, referral and treatment for common symptoms associated with mTBI
- ICD-9 coding guidance
- Summary of cognitive rehabilitation clinical recommendations
- Clinical recommendations on driving after mTBI
- Patient education materials
- Clinical tools and resources



Purpose: Quick reference, all encompassing resource on the treatment and management of patients with mTBI and related symptoms



Web Based TBI Education & Resources



www.dvbic.org



www.dcoe.health.mil



www.traumaticbraininjuryatoz.org



www.brainline.org



60



TBI Clinical Practice Guidelines

- Acute/Subacute
 - Evaluation & Management of Concussion in Deployed Setting (DVBIC, 2008)
 - Evaluation & Management of Concussion in CONUS (DVBIC, 2008)
- Chronic
 - VA/DoD Evidence Based Guideline for Management of Concussion / mTBI (DVA/DoD, 2009)



61



Rapid TBI Consultation

Providers, SMs & Families

- **DVBIC**
 - Info@DVBIC.org
 - 1-800-870-9244
- **DCoE 24/7 Outreach Center**
 - 1-866-966-1020
 - resources@dcoeoutreach.org
 - Live Chat
- **Military One Source**
 - 1-800-342-9647
 - wwrc@militaryonesource.com

Providers Only

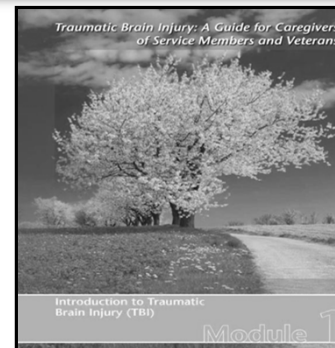
- **TBI.consult**
 - For Deployed Providers
 - Feedback Within 12 Hours
 - 38 TBI Specialists
 - 14 Clinical Disciplines
- **ANAM Baselines**
 - anam.baselines@amedd.army.mil



62



Traumatic Brain Injury:



*A Guide for
Caregivers of
Service Members
and Veterans*
DVBIC

<http://www.dvbic.org/Families---Friends/Family-Caregiver-Curriculum.aspx>
<http://www.traumaticbraininjuryatoz.org/Caregivers-Journey/Caregiver-Guides.aspx>



63



CDP Website: Deploymentpsych.org

Features include:

- Descriptions and schedules of upcoming training events
- Blog updated daily with a range of relevant content
- Articles by subject matter experts related to deployment psychology, including PTSD, mTBI, depression, and insomnia
- Other resources and information for behavioral health providers
- Links to CDP's Facebook page and Twitter feed



Online Learning

The following online courses are located on the CDP's website at:
Deploymentpsych.org/training/online-courses
NOTE: All of these courses can be take for free or for CE Credits for a fee

- Cognitive Processing Therapy (CPT) for PTSD in Veterans and Military Personnel (1.25 CE Credits)
- Prolonged Exposure Therapy for PTSD in Veterans and Military Personnel (1.25 CE Credits)
- Epidemiology of PTSD in Veterans: Working with Service Members and Veterans with PTSD (1.5 CE Credits)
- Provider Resiliency and Self-Care: An Ethical Issue (1 CE Credit)
- Military Cultural Competence (1.25 CE Credits)
- The Impact of Deployment and Combat Stress on Families and Children, Part 1 (2.25 CE Credits)
- The Impact of Deployment and Combat Stress on Families and Children, Part 2 (1.75 CE Credits)
- The Fundamentals of Traumatic Brain Injury (TBI) (1.5 CE Credits)
- Identification, Prevention, & Treatment of Suicidal Behavior in Service Members & Veterans (2.25 CE Credits)
- Depression in Service Members and Veterans (1.25 CE Credits)

All of these courses and several others are contained in the Serving Our Veterans Behavioral Health Certificate program, which also includes 20+ hours of Continuing Education Credits for \$350.



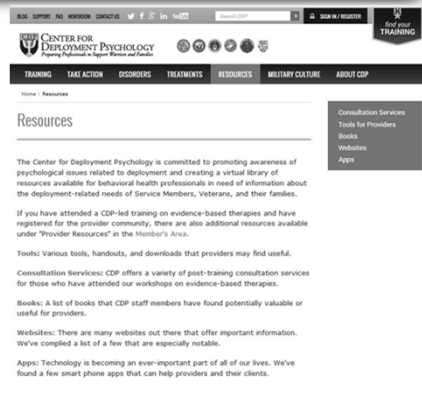
Provider Support

CDP's "Provider Portal" is exclusively for individuals trained by the CDP in evidence-based psychotherapies (e.g. CPT, PE, and CBT-I)

Features cover topics including:

- Consultation message boards
- Hosted consultation calls
- Printable fact-sheets, manuals, handouts, and other materials
- FAQs and one-on-one interaction with answers from SMEs
- Videos, webinars, and other multimedia training aids

Participants in CDP's evidence-based training will automatically receive an email instructing them how to activate their user name and access the "Provider Portal" section at Deploymentpsych.org.



How to Contact Us

Center for Deployment Psychology
Department of Medical & Clinical Psychology
Uniformed Services University of the Health Sciences
4301 Jones Bridge Road, Executive Office: Bldg. 11300-602
Bethesda, MD 20813-4768

Email: General@DeploymentPsych.org

Website: DeploymentPsych.org

Facebook: <http://www.facebook.com/DeploymentPsych>

Twitter: @DeploymentPsych

