TBI Clinical Guidance Initiatives

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**DoD TBI Definition**

- **Traumatically induced structural injury or physiological disruption of brain function as a result of external force to the head**
- **New or worsening of at least one of the following clinical signs**
  - Loss of consciousness or decreased consciousness
  - Loss of memory immediately before or after injury
  - Alteration in mental status (confused, disoriented, slow thinking)
  - Neurological deficits
  - Intracranial lesion
- **DoD Definition parallels standard medical definition**
  - CDC, WHO, AAN, ACRM
# Severity Rating for TBI

## Traumatic Brain Injury Description

<table>
<thead>
<tr>
<th>Severity</th>
<th>GCS</th>
<th>AOC</th>
<th>LOC</th>
<th>PTA</th>
<th>Imaging</th>
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<tr>
<td>Mild</td>
<td>13-15</td>
<td>≤ 24 hrs</td>
<td>0-30 min</td>
<td>≤ 24 hrs</td>
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<tr>
<td>Moderate</td>
<td>9-12</td>
<td>&gt; 24 hrs</td>
<td>&gt; 30 min</td>
<td>&gt; 24 hrs</td>
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<td>Severe</td>
<td>3-8</td>
<td>&gt; 24 hrs</td>
<td>&gt; 24 hrs</td>
<td>&gt; 7 days</td>
<td>Normal or Abnormal</td>
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GCS- Glasgow Coma Score  
AOC- Alteration in consciousness  
LOC - Loss of consciousness  
PTA- Post-traumatic amnesia
**Types of TBI**
- Mild
- Moderate
- Severe
- Penetrating

**TBI Post-Injury Stages**
- Acute
- Sub-Acute
- Chronic

**Levels of TBI Care**
- In-theater
- CONUS
- In-patient
- Outpatient
- Community
Operational Implications

• Growing body of science shows the pathophysiologic effects of concussion
• Early detection leads to early treatment and improved outcome
• Undiagnosed concussion can result in:
  – Symptoms affecting operational readiness
  – Risk of recurrent concussion during the healing period
• Tracking recurrent concussion will allow for comprehensive medical evaluation of high risk Service members, ensuring a fit fighting force and care for the individual

Bergsneider et al., J Neurotrauma 17:2000
**Treatment**

**MILD TBI**
- Primary Care
- Referral to TBI specialist after initial management failure
- Core TBI interventions (if required) may include:
  - Cognitive rehabilitation
  - Vestibular/balance therapy
  - Medication management
  - Vision therapy
  - Driving rehabilitation
  - Assistive technology
  - Tinnitus management
  - Headache Management
  - Complementary and alternative medicine interventions

**MODERATE / SEVERE / PENETRATING**
- In-theater Acute Field Management
- First Responder actions (Combat Lifesaver)
- Neurosurgical theater presence
- Continuing evolution of air transport capabilities
- DoD TBI centers, VA Polytrauma Rehabilitation Centers, Civilian Rehabilitation Programs
- Family Caregiver Education Curricula
Treatment

• **Moderate/Severe/Penetrating CPGs**
    • Brain Trauma Foundation
  – Field Mgt of Combat Related Head Trauma (2006)
    • DVBIC and Brain Trauma Foundation
  – Surgical Management for TBI
    • AANS/CNS Section
  – Penetrating Brain Injury Guidelines
    • AANS/CNS Section
    • DVBIC
  – Nursing Management of Adults with Severe TBI (2008)
    • DVBIC/DCoE Supported
• **OSD/HA Clinical Guidance (May 2008):**
  - Acute: up to 7 days
  - Subacute
  - Class III (Consensus) Guidelines

• **VA/DoD Clinical Guidelines (April 2009):**
  - Subacute: beyond 7 days
  - Chronic
**Treatment: Headache**

**Episodic Headache**
- Characterize type
- Abortive therapy
  - Maximum 6 doses/week

**Chronic Daily Headache**
- > 15 HA days per month
- Analgesic rebound
- Prophylaxis is key

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**Abortive**

- Avoid Narcotics & Benzodiazepines

**Prophylaxis**
- Onset of action ~ 4 wks

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**NSAIDs**
- GI side effects
- Ibuprofen
- Naproxen
- Sodium Acetaminophen
- Aspirin

**Triptans**
- Contraindicated in patients with CAD
- Fioricet
- Fiorinal
- Midrin

**Combination Medications**
- Cognitive side effects
- Risk of W/D
- Promethazine
- Metoclopramide
- Prochlorperazine
- Tizanidine
- **Non-medication**
  - Trigger point injection
  - Occipital nerve block
  - Physical therapy

**Alternatives**
- Nortriptyline
- Amitriptylline
- Paroxetine
- Fluoxetine

**Anti-depressants**
- May improve mood
- Improves sleep

**Anti-epileptics**
- Neuropathic pain
- Mood lability
- Propranolol

**Beta-blockers**
- Non-selective may have benefit on autonomic effects of PTSD

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OSD/HA Clinical Guidance (May 2008)
• Accelerating but still small body of scientific literature supporting cognitive rehabilitation in mTBI
• DoD Programs (inventory of current programs)
• Outsourced care vs MTF provided
• DCoE/DVBIC Consensus Conference – April 2009
  – 2-day; 50 members
  – DoD (Quad Service)
  – DVA representation
  – SOCOM representation
  – Reserve Affairs representation
  – Civilian Subject Matter Experts
Treatment: Cognitive Rehabilitation in mTBI

- **Cognitive domains affected after TBI**
  - **Attention**
    - Foundation for other cognitive functions/goal-directed behavior
    - Efficacy of attention training established
  - **Memory**
    - True memory impairment vs poor memory performance from inattention
    - Evidence to support development of memory strategies and training in use of assistive devices (‘memory prosthetics’)
  - **Social/Emotional**
    - Evidence to support group sessions in conjunction with individual goal setting
  - **Executive Function**
    - Evidence to support training use of multiple step strategies, strategic thinking and/or multitasking

- **Compensatory vs restorative therapy**
In-Theater Guidelines for Mild TBI/Concussion

• 2007: Developed by JTTS and DVBIC and deployed
• 2008: Revision: Includes Psychological Health Co-Morbidity
• 2009: Proposed Revisions
  – Symptom-Based → Incident-Based
  – Adding “Recurrent Concussion” Guidance

• Identification of red flags
  – Those that may need neurosurgical intervention

• Cornerstones of treatment
  – Protect from further injury to the brain
  – Medications for symptomatic relief
  – Education stressing positive expectations for full recovery
  – Follow recovery course and RTD
Tri-service Multi-agency Gray Team

- Optimize care as close to point of injury as possible
- Policy on repeat concussions
- CENTCOM coordination to assign in-theater TBI champion
- Integrate clinical, operational and technical initiatives
MACE: Military Acute Concussion Evaluation

- Developed by DVBIC and released in Aug 2006
- Performed by medical personnel
- 3-Part Screening Tool – “CNS”
  - Cognition
  - Neurological Exam
  - Symptoms
- Alternate versions available
- Upcoming revision will include recurrent concussion questions
- Can be used during exertional testing to ensure that cognitive function remains intact

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### Military Acute Concussion Evaluation (MACE)
Defense and Veterans Brain Injury Center

**Patient Name:**

**SS#:** __________ Unit: __________

**Date of Injury:** __________ **Time of Injury:** __________

**Examiner:**

**Date of Evaluation:** __________ **Time of Evaluation:** __________

**History:** (I – VIII)

I. **Description of Incident**
   - A: What happened?
   - b: Tell me what you remember.
   - c: Were you dazed, confused “saw stars”?  Yes ☐ No ☐
   - d: Did you hit your head?  Yes ☐ No ☐

II. **Cause of Injury** (Circle all that apply):
   1. Explosion/Blast
   2. Blunt object
   3. Motor Vehicle Crash
   4. Gunshot wound
   5. Fall
   6. Other ☐

III. **Was a helmet worn?**  Yes ☐ No ☐ Type __________

IV. **Amnesia Before:** Are there any events just BEFORE the injury that are not remembered? (Assess for continuous memory prior to injury)
   - Yes ☐ No ☐ If yes, how long __________

V. **Amnesia After:** Are there any events just AFTER the injury that are not remembered? (Assess time until continuous memory after the injury)
   - Yes ☐ No ☐ If yes, how long __________

VI. **Does the individual report loss of consciousness or “blackout”?**  Yes ☐ No ☐ If yes, how long __________

VII. **Did anyone observe a period of loss of consciousness or unresponsiveness?**  Yes ☐ No ☐ If yes, how long __________

VIII. **Symptoms** (Circle all that apply)
   - 1) Headache
   - 2) Dizziness
   - 3) Memory Problems
   - 4) Balance problems
   - 5) Nausea/Vomiting
   - 6) Difficulty Concentrating
   - 7) Irritability
   - 8) Visual Disturbances
   - 9) Ringing in the ears
   - 10) Other __________

08/2006  800-870-9244
DVBC.org

This form may be copied for clinical use.

Page 1 of 6
Combat Medic/Corpsman Algorithm

- Updated to empower medics/corpsmen to provide greater care under medical officer supervision
  - Red flags and evacuation criteria
  - Perform MACE
  - Mandatory 24 hour rest for all
    - Protect from further injury
    - Re-calibrate
    - Sleep/hydration
  - Keep in unit with consultation with providers
  - Document
  - Exertional testing prior to full RTD
Initial Provider Management Algorithm

- Updated to incorporate recurrent concussion guidance and mandatory rest
- Review Red Flags
- Perform MACE
- Primary Care Management
  - Medications
  - Headache management
  - Address sleep
  - Rest for 24 hours
- Refer to Role III for:
  - Specialty services, neuroimaging, laboratory capability
- If still symptomatic at 7 days, then consider screening for Acute Stress Reaction
- TBI.consult@us.army.mil
Comprehensive Concussion Algorithm

- Updated to incorporate recurrent concussion evaluation and mandatory rest period
- CT scan as appropriate
- Neurocognitive evaluation
- Specialty services
  - Neurological assessment
  - Vestibular assessment
  - Visual assessment
- Aggressive treatment trials for 14 days
  - Address sleep
- Role III programs: reconditioning

Figure 3. Comprehensive Concussion Algorithm
Referral from Level I or II or Poly-trauma

Intent: Additional resources available at Level 3 facilities allow further evaluation and more comprehensive management for those patients who present early with concussion and/or have persistent symptoms.
Recurrent Concussion

Neurometabolic Changes and Concussion
(Hovda et al. 2001)

PERIOD OF VULNERABILITY
Another concussion during this period can lead to irreparable damage or death.

150%

-1 0 days 1 2 3 4 5 6 7 8 9 10 11 12 13

100
(Normal)

50

DEMAND FOR GLUCOSE

MISMATCH

BLOOD FLOW

METABOLIC RATE FOR OXYGEN
Recurrent Concussion: Cumulative Effects

- History of 3 previous concussions increases the risk of repeat concussions 3-fold (Guskiewicz, 2003)
- Athletes with a history of 3+ concussions report significantly more symptoms, lower memory scores at baseline
- Symptoms following repeat concussion may be more serious and resolve at a slower rate

- USMC Policy RC South: Restrict to FOB
  - 3 Concussions or 2 Grade III Concussions
  - USMC and Army data projects 1-2%

- New Tasking: Theater neurologist to assist in evaluations and new protocols to address recurrent concussion
Documented recurrent concussions within 12 months:

**1\textsuperscript{st} concussion**
- Follow clinical guidance

**2\textsuperscript{nd} concussion**
- Mandatory 7 day rest period following resolution of symptoms

**3\textsuperscript{rd} concussion**
- Comprehensive neurological exam
- Neuroimaging
- Neuropsychological assessment (attention, memory, processing speed, executive function, social pragmatics)
- Functional assessment
SCENARIOS REQUIRING MANDATORY MEDICAL SCREENING

- Mounted: All personnel in any damaged vehicle (e.g. blast, accident, rollover, etc)
- Dismounted: All within 50m of a blast; All within a structure hit by an explosive device
- Anyone who sustains a direct blow to the head or loss of consciousness
- Command directed
  - NOT limited to repeated exposures

MEDICAL SCREENING REQUIREMENTS

- ALL RECEIVE:
  - Medic/corpsman evaluation (MACE)
  - Minimum 24 hrs downtime
  - Medical re-evaluation pre-RTD
  - Event capture/tracking

- mTBI/Concussive Event
  - Medical evaluation above with physician, PA or NP oversight

- Witnessed Loss of Consciousness
  - Neurological evaluation by physician, PA or NP
  - Loss of consciousness greater than 5 minutes requires evacuation to Level III facility
I.E.D. Assessment

- Performed by UNIT LEADERSHIP once SM out of danger zone
  - Injury (Yes/No)
  - Evaluation – “HEADS” (Yes/No)
    - Headaches
    - Ears Ringing
    - Amnesia or Altered/Loss of Consciousness
    - Double Vision/Dizziness
    - Something Not Right
  - Distance (Proximity to Blast) or Damage (Yes/No)

- Document distance from blast & action taken

M.A.C.E.
(Military Acute Concussion Evaluation)

- Performed by MEDICAL Personnel
- 3-Part Screening Tool – “CNS”
  - Cognition
  - Neurological Exam
  - Symptoms

- Alternate versions available
- Upcoming revision will include “Recurrent Concussion” questions
NATO Collaborations

• Several NATO Allies have adapted DVBIC/DCoE Deployed Guidelines
  – Active U.S. Delegation to NATO Exploratory Team on mild TBI
GOAL: ID and treat as close to point of injury as possible.

• PIES Principle: *Proximity* – *Immediacy* – *Expectancy* – *Simplicity*

• **Role II Local Treatment Initiatives**
  – Brief treatment reconditioning course
  – Focus on symptom management and rest with appropriate medications
  – Graduation: symptom resolution & pain free off of medications

**BEST PRACTICES IMPLEMENTATION**
FOB Shank ~ 90% RTD rate; Majority that did not return had pre-existing psychiatric issues
TBI ICD-9 CM Coding

• Standardize communication among providers and agencies (DoD/VA)
• DoD TBI Surveillance efforts
  – Recurrent concussion
• Maximize clinician productivity
  – CPT code for Neurobehavioral Status Exam
• TBI Coding Reference Fact Sheet
  – Available at DVBIC and DCoE booths
DoD TRAUMATIC BRAIN INJURY PROGRAMS

Army (Category 1)
- Ft Gordon, GA; Ft Lewis, WA; Ft Sam Houston, TX; Walter Reed, DC

Army (Category 2)
- Landstuhl, Germany; Tripler, HI

Army (Category 3)
- Ft Benning, GA; Ft Bliss, TX; Ft Bragg, NC; Ft Campbell, KY; Ft Hood, TX

Army (Category 4)
- Bamberg, Germany; Baumholder, Germany; Ft Carson, CO; Ft Drum, NY; Ft Knox, KY; Ft Polk, LA; Ft Riley, KS; Ft Stewart, GA; Schofield Barracks, HI; Schweinfurt, Germany; Vilseck, Germany

Army (Category 4)
- Camp Shelby, MS; Camp Zama, Japan; Ft Belvoir, VA; Ft Buchanan, Puerto Rico; Ft Dix, NJ; Ft Eustis, VA; Ft Huachuca, AZ; Ft Irwin, CA; Ft Jackson, SC; Ft Leavenworth, KS; Ft Lee, VA; Ft Leonard Wood, MO; Ft McPherson, GA; Ft Meade, MD; Ft Monmouth, NJ; Ft Richardson, AK; Ft Rucker, AL; Ft Sill, OK; Ft Wainwright, AK; Grafenwoehr, Germany; Heidelberg/Mannheim, Germany; Redstone Arsenal, AL; Stuttgart, Germany; West Point, NY; Wiesbaden, Germany; Wurzburg, Germany

Navy Facilities
- Marine Corps Base; Camp Lejeune, NC; Marine Corps Base, Camp Pendleton, CA; National Naval Medical Center, MD; Naval Medical Center San Diego, CA; Naval Medical Center Portsmouth, VA; Naval Hospital Okinawa, Japan; Naval Medical Clinic, Hawaii

Navy Research Centers
- Silver Spring, MD and San Diego, CA

Air Force Facilities
- Elmendorf AFB, AK; Lackland AFB, TX
VA TBI Initiatives & Collaboration

- **Clinical**
  - Interdisciplinary team approach to care at VA/DVBIC Polytrauma Sites
  - TBI Assisted Living Initiatives in collaboration with DoD
  - ICD Coding revision in collaboration with DoD
  - Collaboration and Coordination of Veterans Health Initiative
  - VA/DoD Evidence-Based Guidelines for CONUS Management of Subacute-Chronic mild TBI

- **Research**
  - Multi-Center Clinical Trials (e.g., Cognitive Rehabilitation Clinical Trial)
  - New Research Centers of Excellence Incorporating TBI established in 2009
  - Quality Enhancement Research Initiative (QUERI): Polytrauma and Blast Related Coordinating center
  - VA’s Journal of Rehabilitation Research and Development – 2 Special TBI Issues

- **Education**
  - Collaboration with DoD in Development of TBI Family Caregiver Curriculum/Guide
  - Collaboration with DoD in Annual TBI Training Conference, monthly VTC’s
  - Network of Regional Education Coordinators
MILITARY SITES
- Ft. Carson
- Landstuhl Regional Medical Center
- Ft. Bragg
- Camp Pendleton

MILITARY ASSOCIATE SITES
- Walter Reed Army Medical Center
- Wilford Hall Medical Center
- Naval Medical Center San Diego

MILITARY LEAD SITES
- Richmond VAMC
- Tampa VAMC
- Palo Alto VAMC
- Minneapolis VAMC

VA SITES
- Ft. Carson
- Walter Reed Army Medical Center
- Richmond VAMC
- Tampa VAMC
- Palo Alto VAMC
- Minneapolis VAMC

CLINICAL Sites
- Camp Lejeune
- Ft. Hood

CIVILIAN PARTNERS
- Lakeview Virginia Neurocare
- Laurel Highlands Neuro-Rehabilitation Center

- 225 Personnel
- > 20 Disciplines
TBI Prevention and Education

**Head’s up!**
The safest place to be is under your helmet

Protect yourself from concussions, wear your safety gear.

Defense and Veterans Brain Injury Center
www.DVBIC.org  1-800-670-9244
Research has shown that educating mTBI patients about the expected symptoms and natural course of their injury reduces the likelihood that they will develop persistent symptoms\textsuperscript{1-3}

\textit{Therefore…}

It is important to set clear expectations about recovery as soon as possible after the injury

\textsuperscript{3}Alves W, Macciocchi SN, Barth JT. Postconcussive symptoms after uncomplicated mild head injury. \textit{J Head Trauma Rehabil} 1993; 8: 48-59.
Expectation of Recovery

• Appropriate risk communication to service members and veterans who may have had mTBI is crucial for minimizing the incidence of poor outcomes

The key messages:
• Full recovery is expected in most cases within several hours to days to several weeks following the injury
• It is normal to experience post-concussive symptoms prior to recovery
TBI Education Highlights

• **4th Annual DoD TBI Training Conference**
  – SAVE THE DATE: 30 Aug – 1 Sep, Washington DC

• **“Survive, Thrive, and Alive” DVD**
  – Introduced by Gen. Colin Powell

• **Community**
  – WETA BrainLine Multimedia Web Initiative
  – Dept of Labor: “America’s Heroes at Work”
  – CDC: Heads Up and Other Information Sheets and CPGs

• **DoD materials developed through collaboration of the Services**
  – Products recognized by RAND Corporation for clinical accuracy and appropriateness of risk communication

• **Center of Excellence for Medical Multimedia**
  – The Journey Home (www.traumaticbraininjuryatoz.org)

• **Army TBI modules / Navy NCAT Training**
Family Caregiver Curricula

- **4 Modules:**
  - Module 1: Introduction to TBI (learning about the brain, acute care issues, complications)
  - Module 2: Understanding Effects of TBI and What You Can do to Help (physical, cognitive, communication, behavioral, emotional)
  - Module 3: Becoming a Family Caregiver for a Service Member/Veteran with TBI (starting the journey, caring for SM and yourself, finding meaning in caregiving)
  - Module 4: Navigating the system (recovery care, eligibility for compensation and benefits)

- **Center of Excellence for Medical Multimedia**
  - Providing Web / CD Interface
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<tr>
<th>FEDERAL WEBSITES DEVELOPING TBI CONTENT</th>
<th>WEBSITES DEVELOPED FOR MILITARY WITH TBI</th>
<th>TBI WEBSITES DEVELOPING CONTENT FOR MILITARY</th>
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<td>health.mil</td>
<td>realwarriors.net</td>
<td>web.mit.edu/isn</td>
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<td>usuhs.mil</td>
<td>afterdeployment.org</td>
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<td>darpa.mil</td>
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<td>tricare.mil</td>
<td>americasheroesatwork.gov</td>
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<td>polytrauma.va.gov</td>
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<td>dodvets.com</td>
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Provider Resources

- **DCoE**: [www.dcoe.health.mil](http://www.dcoe.health.mil)
  - Outreach Center: 866.966.1020
  - Monthly video teleconferences

- **DVBIC**: [www.dvbic.org](http://www.dvbic.org)
  - Annual TBI Military Training Conference
  - Education coordinators
  - TBI.consult: tbi.consult@us.army.mil

- **VA/DoD mTBI/Concussion CPG Fact Sheet**
- **ICD-9 DoD TBI Coding Fact Sheet**
- **Service TBI Points of Contact**
Consultation requests are answered within 12 hours (average 5 hours)

38 TBI specialists representing 14 clinical disciplines
What’s Ahead for TBI CPGs in 2010

- Review of Combat TBI First Responder CPG
- Sponsoring nursing guidelines for Management of Mild TBI
- Treatment algorithms for patients with persistent symptoms of concussion and co-occurring psychological conditions

Figure 1. Relative distribution of the “Polytrauma Triad” in a sample of 340 OEF/OIF veterans evaluated at the VA Boston Polytrauma Network Site

- TBI: N=231, 67.9%
- Chronic Pain: N=278, 81.8%
- PTSD: N=237, 69.7%