TBI in the Military
A Brief Overview

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DCoE Primary Operational TBI Component

TBI Clinical Standards
Severity, Stages, Environment

Types of TBI

Mild

Moderate

Severe

Penetrating

TBI Post-Injury Stages

Acute

Sub-Acute

Chronic

Levels of TBI Care

In-Theater

CONUS

In-patient

Out-Patient

Community

DVBIC Recognition from SECDEF

- Secretary Gates:
- “The military now has more thorough reporting mechanisms, requiring that any one affected by a blast or blunt trauma in theater go through an evaluation and screening. We have a single TBI registry and a single point of responsibility – the Defense and Veterans Brain Injury Center – to consolidate all TBI-related incidents and information.”
    - 5 June 2008

Locations Where TBI Screening Occurs

- In-Theater
- Landstuhl Regional Medical Center (LRMC)
- CONUS, during Post Deployment Health Assessment (PDHA) and Post Deployment Health Re-Assessment
- VA Medical Centers

Detection Population in OIF/OEF

- TBI ID in theater → Require Air Evac
- TBI ID in theater → RTD
  - Use of Guidelines and Appropriate Tools

- Injured in Theater → Require Air Evac
- TBI Not ID until LRMC (co-morbid trauma)
  - Use of Appropriate Tool

- Post-Deployment Screening
  - Use of Appropriate Screening Questions
  - Proper Evaluation for (+) Screen

Patient Movement

Guideline Development

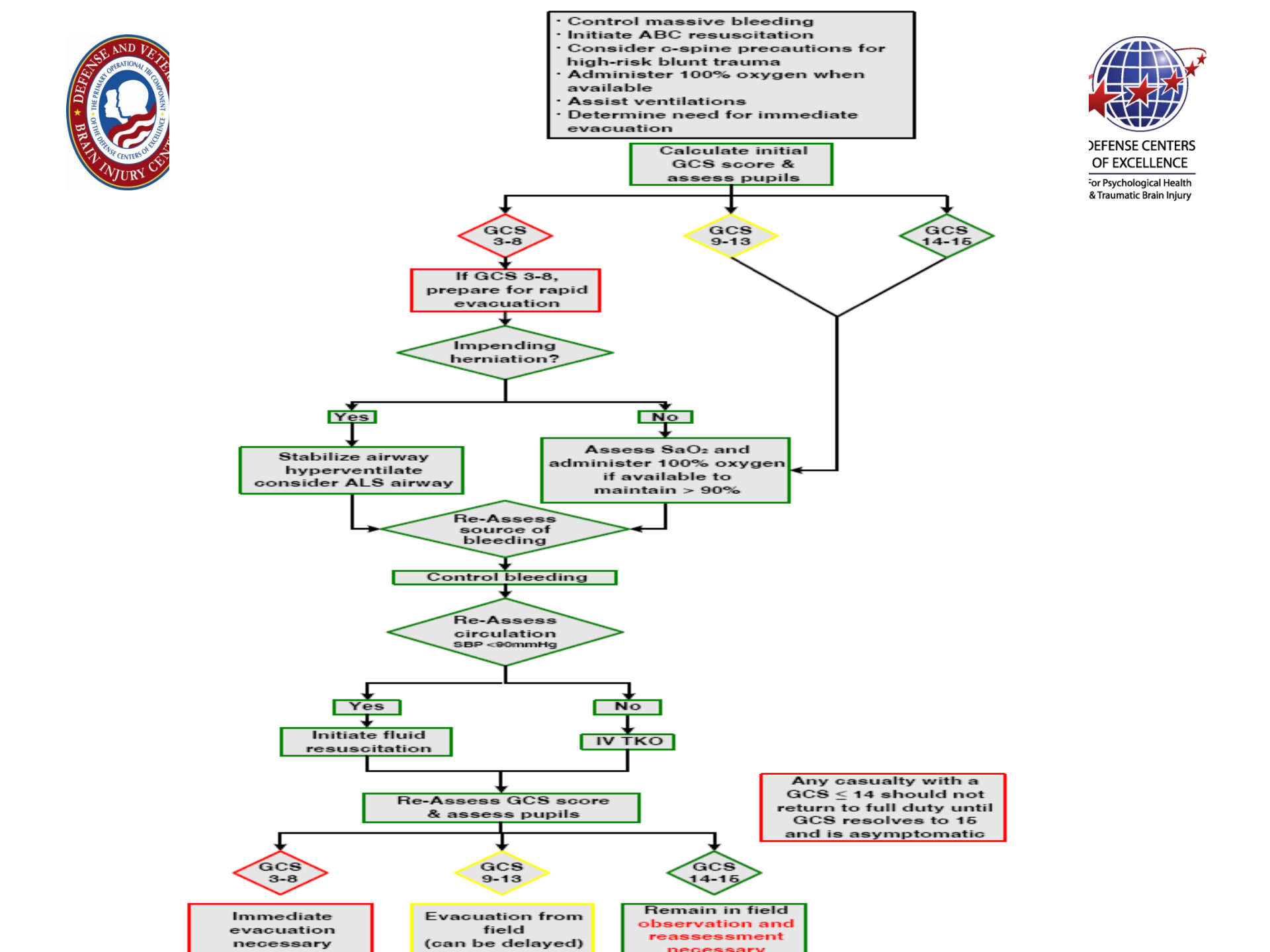
- SME Panel
  - SG appointed military experts
  - Civilian experts
- Use of evidence when available
  - Expert opinion when evidence lacking
- Approval /staffing process
  - OSD/HA
  - Joint Chiefs
- Distribution of tool via various outlets
  - Service schools and courses
  - Joint Theater Trauma System
  - Websites: OSD, DVBIC, etc.
  - Individual command outreach

TBI Evidence-Based Treatment

- **Mild TBI (mTBI)**
  - Deployed (developed by JTTS and DVBIC/DCoE)
    - **CENTCOM**
      - **Acute**
  - 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
  - **CONUS**
    - **OSD/HA Clinical Guidance**
      - **Acute: up to 7 days**
      - **Subacute**
    - **DoD/VA Guidelines: Spring 09 Release**
      - **Subacute: beyond 7 days**
      - **Chronic**
  - Class III (Consensus) Guidelines

- **Moderate/Severe/Penetrating TBI**
  - Guidelines for Management of Severe TBI,(1995, 2004, 2007)
    - Brain Trauma Foundation
  - Field Mgt of Combat Related Head Trauma (2006)
    - DVBIC and Brain Trauma Foundation
  - Surgical Management for TBI
  - Penetrating Brain Injury Guidelines
  - Guidelines for the Pharmacologic Treatment of Neurobehavioral Sequelae of TBI (2006)
    - DVBIC
  - Nursing Management of Adults with Severe TBI (2008)
    - DVBIC/DCoE Supported
  - *In-Theater Team to Improve System of Care for All Severities*

Collaboration Between DVBIC and Brain Trauma Foundation


· Control massive bleeding
· Initiate ABC resuscitation
· Consider c-spine precautions for high-risk blunt trauma
· Administer 100% oxygen when available
· Assist ventilations
· Determine need for immediate evacuation
Calculate initial GCS score & assess pupils
GCS 3-8
GCS 9-13
GCS 14-15
If GCS 3-8, prepare for rapid evacuation
Impending herniation?
Yes
No
Stabilize airway hyperventilate consider ALS airway
Assess SaO2 and administer 100% oxygen if available to maintain > 90%
Re-Assess source of bleeding
Control bleeding
Re-Assess circulation
SBP <90mmHg
Yes
No
Initiate fluid resuscitation
IV TKO
Re-Assess GCS score & assess pupils
Any casualty with a GCS ≤ 14 should not return to full duty until GCS resolves to 15 and is asymptomatic
GCS 3-8
GCS 9-13
GCS 14-15
Immediate evacuation necessary
Evacuation from field (can be delayed)
Remain in field observation and reassessment necessary

Critical Issues in Severe TBI

- **The following must be corrected and monitored;**
  - **Hypotension < 90 mm Hg systolic**
    - **Fluid resuscitation; avoid dextrose in water**
    - **Vasopressors if necessary**
  - **Hypoxia 02 sats < 90% or Pa02 < 60 mm Hg**
    - **Secure airway**
    - **Apply supplemental oxygen**
    - **Intubate if necessary or supply surgical airway**
    - **Keep PaC02 at 35 mm Hg, only lower if s/sx of brain herniation**

Defense and Veterans Brain Injury Center Consensus Conference on

the Acute Management of Concussion/Mild Traumatic Brain Injury (mTBI) in the Deployed Setting

31 July and 1 August 2008, Washington, DC

Working Group Members:

Jeff Bazarian MD, MPH, Heidi Boerman PA-C, Rose Bolenbacher, RN, MSN, COL Diamond Dalton, Lt Col Marla De Jong, Selina Doncevic MSN, RN, CDR James Dunne, COL Stephen Flaherty, Capt Joel Foster (T), Elizabeth Fudge-Morse CRNP, COL William Gamble, Kathy Helmick, CRNP, COL Charles Hoge, MAJ Barron Hung (T), Maj William Isler, Col (sel) Michael S. Jaffee , COL Luther Johansen (T), Maj Connie Johnmeyer, Robert Kane PhD, Jim Kelly MD, CAPT Robert Koffman , COL Robert Labutta , MSG Michael Lambert, MSC James Menke, Kim Meyer ARNP, David Moore MD, Maria Mouratidis PsyD, COL Edward Neely, Cindy Petit CRNP, LTC Mike Russell, CDR William Tanner, CPT Windsor Thompson, Col Chris Williams

(T) denotes in-theater participant

Working Groups:

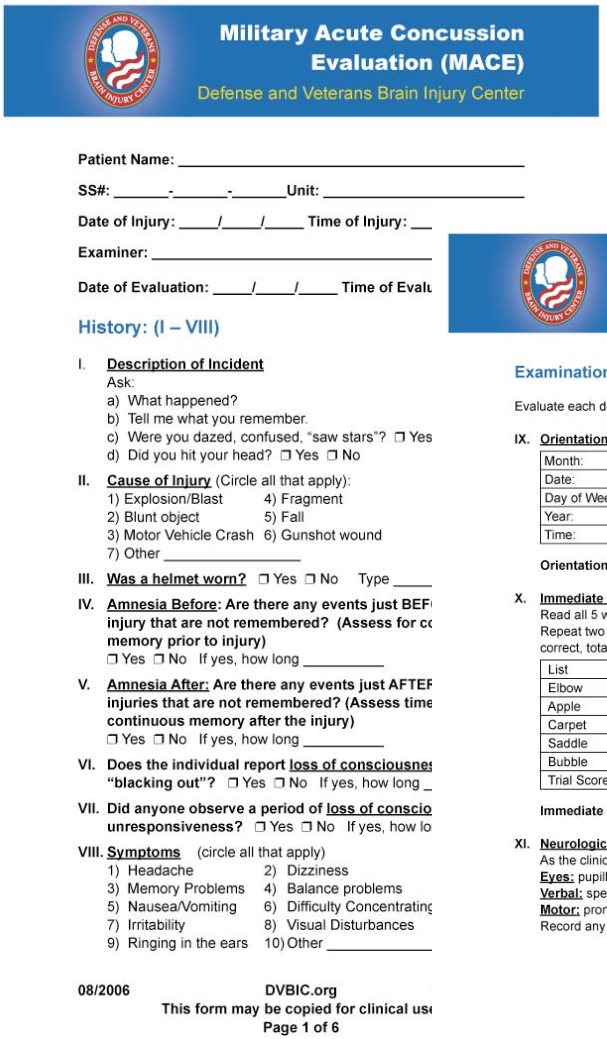
1. **Concussion/mTBI Diagnosis and Evaluation**
2. **Concussion/mTBI Treatment**
3. **Concussion/mTBI Follow-up and Return to Duty**

Military Acute Concussion Evaluation (MACE)

DEFENSE CENTERS OF EXCELLENCE
For Psychological Health & Traumatic Brain Injury

- MACE was developed by the DVBIC and released in Aug 2006

- 3 Components
  - History and symptoms
    - Items I-VIII
  - Screening Neuro Exam
    - Item XI
  - Cognitive Screen w/ score



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 Evalu

History: (I – VIII)

I. **Description of Incident**
Ask:
a) What happened?
b) Tell me what you remember.
c) Were you dazed, confused, "saw stars"? ❒ Yes
d) Did you hit your head? ❒ Yes ❒ No

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

III. **Was a helmet worn?** ❒ Yes ❒ No Type ____

IV. **Amnesia Before: Are there any events just BEF injury that are not remembered? (Assess for cc memory prior to injury)**
❒ Yes ❒ No If yes, how long _____

V. **Amnesia After: Are there any events just AFTEF injuries that are not remembered? (Assess time continuous memory after the injury)**
❒ Yes ❒ No If yes, how long _____

VI. **Does the individual report loss of consciousnes "blacking out"?** ❒ Yes ❒ No If yes, how long _

VII. **Did anyone observe a period of loss of conscio unresponsiveness?** ❒ Yes ❒ No If yes, how lo

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

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

Examination: (IX – XIII)

Evaluate each domain. Total possible score is 30.

IX. **Orientation:** (1 point each)

Month:	0	1
Date:	0	1
Day of Week:	0	1
Year:	0	1
Time:	0	1

Orientation Total Score _____/5

X. **Immediate Memory:**
Read all 5 words and ask the patient to recall them in any order. Repeat two more times for a total of three trials. (1 point for each correct, total over 3 trials)

List	Trial 1	Trial 2	Trial 3
Elbow	0 1	0 1	0 1
Apple	0 1	0 1	0 1
Carpet	0 1	0 1	0 1
Saddle	0 1	0 1	0 1
Bubble	0 1	0 1	0 1
Trial Score			

Immediate Memory Total Score _____/15

XI. **Neurological Screening**
As the clinical condition permits, check
Eyes: pupillary response and tracking
Verbal: speech fluency and word finding
Motor: pronator drift, gait/coordination
Record any abnormalities. **No points are given for this.**

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International Collaborations

- Several NATO Allies have adapted DVBIC/DCoE Deployed Guidelines
  - Two DVBIC Personnel Named to 3-person U.S. Delegation to NATO Exploratory Team on mTBI

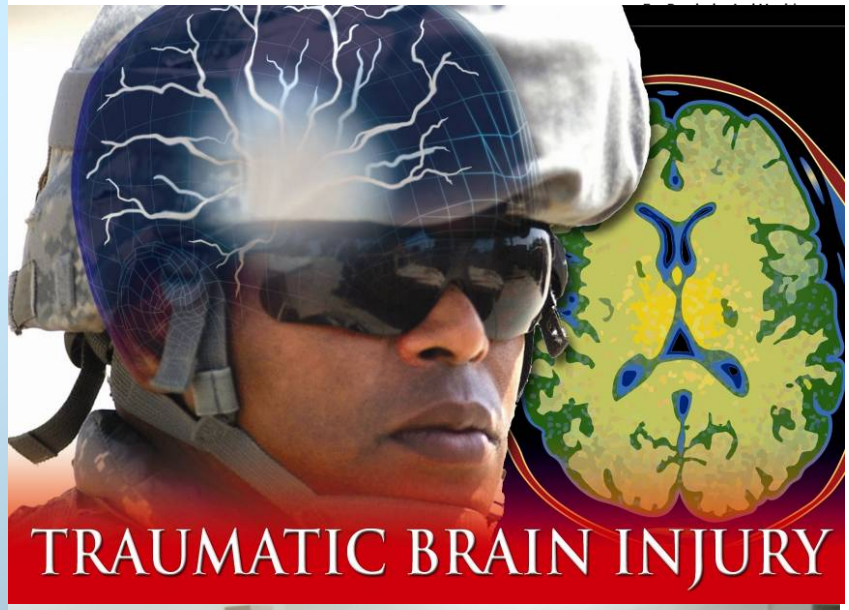
- ROK: Military Medical Exchange
- UK: Consulted MoD Leaders
- Israel: Shoresh Military Medical Exchange

- Japan: 1st Annual U.S.-Japan Goodwill Exchange and International Symposium

TBI Research—Current Investment Intramural and Extramural

DEFENSE CENTERS OF EXCELLENCE

- ❑Field Epidemiology (TBI and Psychological Health)
- ❑Diagnostics (biomarkers and imaging)
- ❑Treatment (neuroprotectant drugs, tissue engineering, & other)
- ❑Rehabilitation/Reintegration Strategies (return-to-duty standards, telemedicine, & other technologies)
- ❑“Physics of Blast” (tissue-level injury mechanisms and computational modeling)
- ❑Effects of Repeated Blast Exposures
- ❑Treatment of Related Illnesses (e.g., heterotopic ossification)



TBI Education

- DoD TBI Training Conference for 800 providers
- Co-sponsor meetings
  - NIH/NINDS, International Brain Injury Association, and Congressional Brain Injury Task Force
- Pre-Deployment Training for DoD
- Service Collaboration
  - Proponency for Rehabilitation and Reintegration

- Congressionally-Mandated TBI Family Caregiver Curriculum

- “Survive, Thrive, and Alive” DVD
  - Intro by Gen. Colin Powell
- WETA BrainLine Multimedia Web Initiative
- Dept of Labor: “America’s Heroes at Work”

- Over 90 products for patients and families
  - Developed with national/international experts
  - RAND praise for clinical accuracy and risk communication

Institute of Medicine Recommendations and DoD

- Use BTBIS and MACE for every SM with a history of blast
  - BTBIS and MACE developed by DoD;
  - Adapted into PDHA and VA Clinical Reminder
- Support Prospective Longitudinal Studies to Evaluate Long-Term Effects of Blast
  - DVBIC named as EA for congressionally mandated 15-year longitudinal study
- Support Research on Animal Models of Blast-Induced Neurotrauma
  - DARPA, AFRL, AFIP, etc.
- Include in Development of the TBI Veterans Health Registry other SMs who could provide valid comparison for analysis
  - DVBIC named as collaborator on DVA Registry and coordinating as DoD Office of Responsibility for DoD TBI Registry
- All Deployed SMs undergo predeployment neurocognitive testing in addition to postdeployment neurocognitive testing of representative samples of SMs
  - OSD/HA Directed DVBIC to do Head-to-Head Study of NCAT Products
  - DVBIC Completed a Post-Deployment ANAM Study at FT Bragg on 956 returning SMs

DVBIC/DCoE Foster System Collaboration