

# 2010 Military Health System Conference Way Forward for TBI Care and Initiatives

Sharing Knowledge: Achieving Breakthrough Performance

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**DEFENSE CENTERS  
OF EXCELLENCE**  
For Psychological Health  
& Traumatic Brain Injury

# Agenda



- DoD definition of TBI
- Severity of injury
- Mechanisms of injury
- Post concussive symptoms
- TBI management continuum
- Resources – patient, family, provider
- The way ahead

# High-level Attention

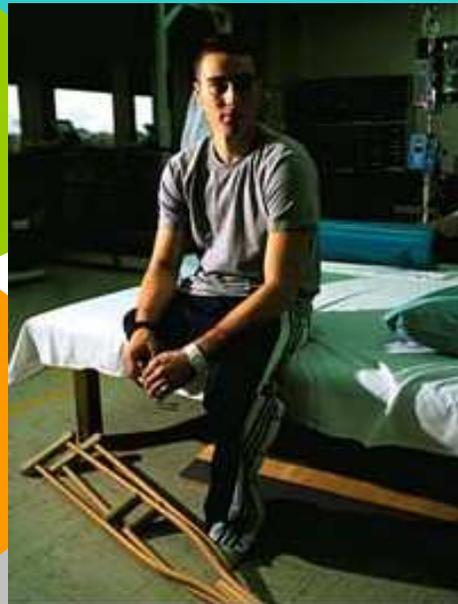


*Task Force on  
Returning Global  
War on Terror Heroes*

*Independent Review  
Group (IRG)*

*DoDIG Review of  
DoD/VA Interagency  
Care Transition*

*Commission on Care  
for America's  
Returning Wounded  
Warriors*



*Mental Health Task  
Force*

*Veterans Disability  
Benefits Commission  
([www.vetscommission.org](http://www.vetscommission.org)  
)*

# DoD TBI Definition (Oct 07)



- 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

# TBI Clinical Standards: Severity, Stages, Environment



## *Types of TBI*

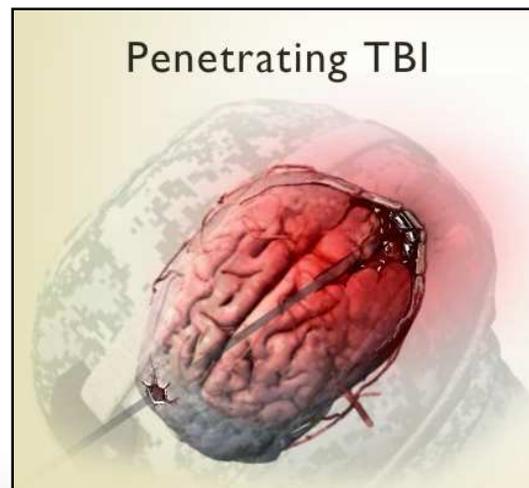
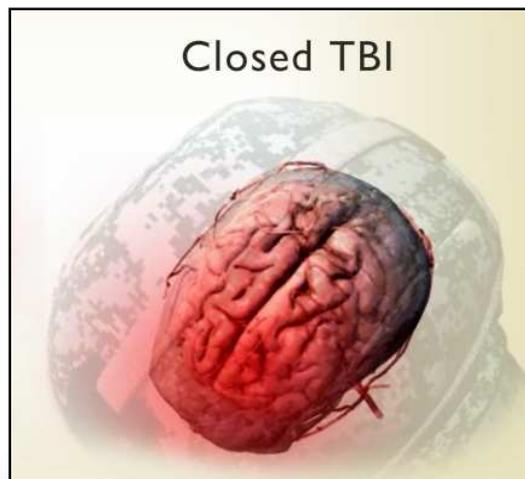
Mild  
Moderate  
Severe  
Penetrating

## *TBI Post-Injury Stages*

Acute  
Sub-acute  
Chronic

## *Levels of TBI Care*

In-theater  
CONUS  
In-patient  
Outpatient  
Community



# Severity Rating for TBI



## Traumatic Brain Injury Description

Severity	GCS	AOC	LOC	PTA
Mild	13-15	≤24 hrs	0-30 min	≤24 hrs
Moderate	9-12	>24 hrs	>30min <24 hrs	>24hrs <7 days
Severe	3-8	>24hrs	≥24 hrs	≥7 days

GCS- Glasgow Coma Score

AOC- Alteration of consciousness

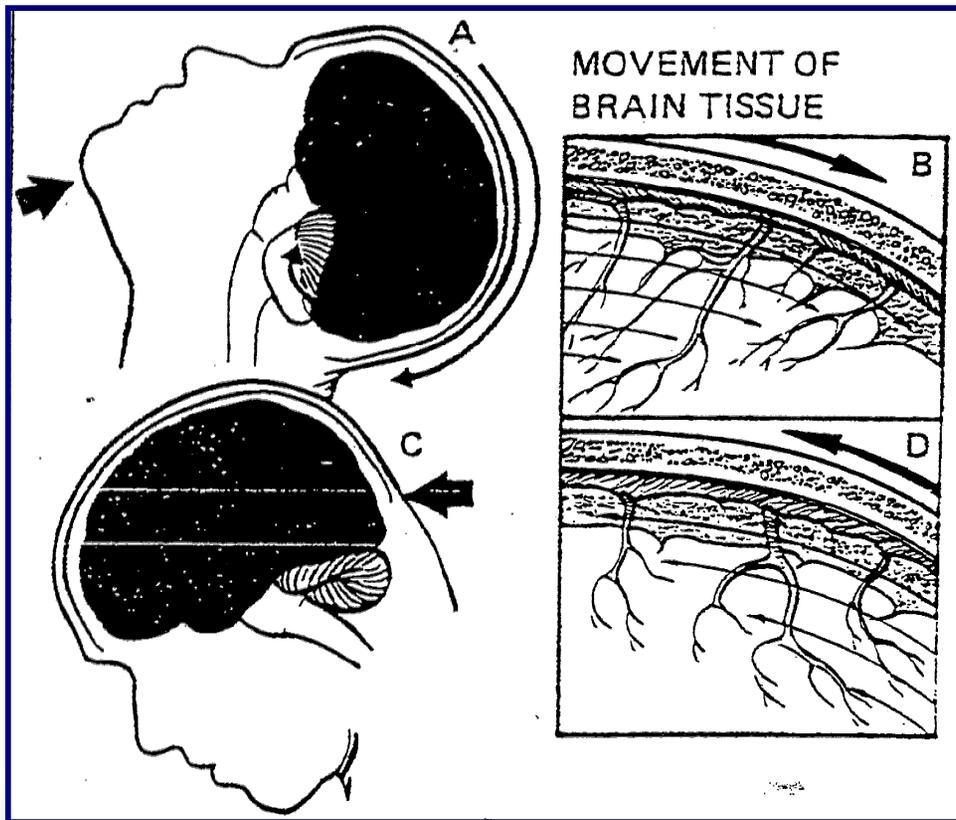
LOC -Loss of consciousness

PTA- Post-traumatic amnesia

# Mechanisms of Injury



- Acceleration-deceleration
  - Combination due to rapid velocity changes of the brain



# Blast Injury



**Primary: Direct exposure to over pressurization wave**

# Impact vs Blast vs Blast “Plus”



- Understanding differences in mechanism of injury
- Differences in DTI between blast and impact TBI
- Inflammatory markers in animal studies
- Computer modeling of blast injury
- Physiological, histological, and/or behavioral differences between blast and non-blast in shock tubes with rodents

\*MRMC Blast Conference May 09



# Post Concussive Symptoms

## Physical

- Headache
- Dizziness
- Balance problems
- Nausea/vomiting
- Fatigue
- Visual disturbances
- Sensitivity to light/noise
- Ringing in the ears

## Emotional

- Anxiety
- Depression
- Irritability
- Mood lability

## Cognitive

- Slowed processing
- Decreased attention
- Poor concentration
- Memory problems
- Verbal dysfluency
- Word-finding
- Abstract reasoning

# Possible Effects of mTBI



## ■ Acute

- Poor marksmanship
- Slower reaction time
- Decreased concentration

## ■ Chronic

- Reduced work quality
- Behavioral problems
- Emotional problems
- “Unexplained” symptoms

TBI-related impairments increase vulnerability to subsequent injury until full recovery occurs

# Cause for Concern



## CONCUSSIVE EFFECTS/TBI

- *A study commissioned by the NFL reports that Alzheimer's disease or similar memory-related diseases appear to have been diagnosed in the league's former players vastly more often than in the national population – including a rate of 19 times the normal rate for men ages 30 through 49.*

*Study conducted by University of Michigan Institute for Social Research*



# TBI and Co-occurring Conditions



- PTSD
- Pain
- Substance Use Disorders
- Dual Sensory Impairments
- Depression
- Anxiety
- Suicide



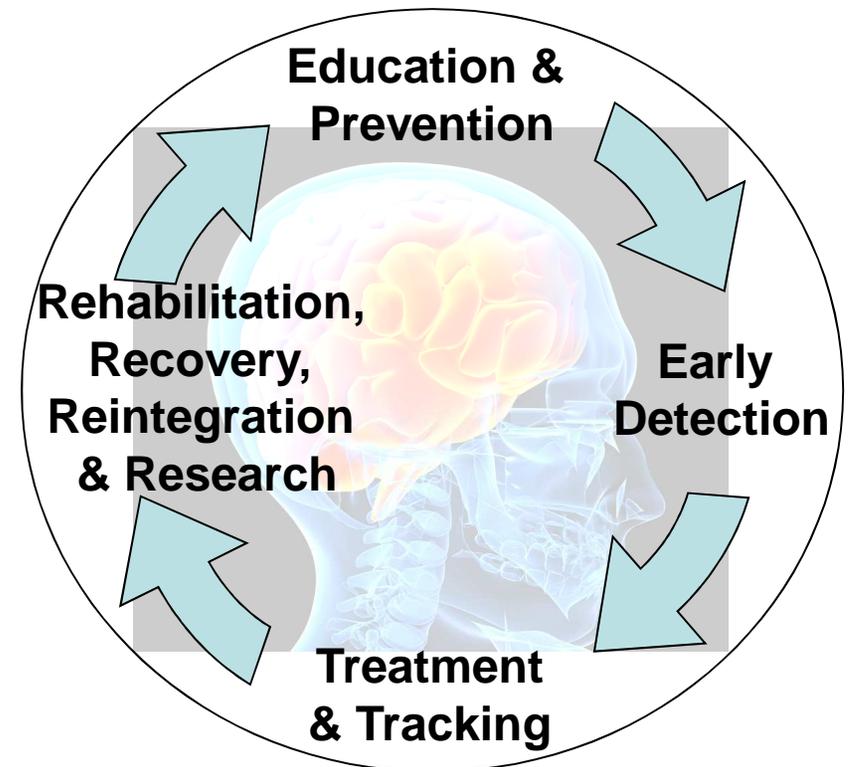
# TBI Management Continuum

GOAL: A *cultural change* in fighter management after concussive events: identification and treatment close to point of injury, documentation of the incident, and expectation of recovery with early treatment

VISION: Every Warrior trained to:

- Recognize the signs/symptoms
  - Reduce the effects
- And in the event of an injury –*
- Treat early to minimize the impact and maximize recovery from TBI

MISSION: Produce an educated force trained and prepared to provide early recognition, treatment, tracking & documentation of TBI in order to protect Warrior health



**Educate – Train – Treat – Track**

# Education & Prevention



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

A photograph of a soldier in full combat gear, including a helmet and goggles, holding a rifle. The soldier is positioned behind a rocky barrier in a desert environment with palm trees in the background.

**Protect yourself from concussions,  
wear your safety gear.**

The logo for the Defense and Veterans Brain Injury Center, featuring a stylized brain and the text "DEFENSE AND VETERANS BRAIN INJURY CENTER".

**Defense and Veterans Brain Injury Center**  
**www.DVBIC.org 1-800-870-9244**

# Early Detection: Why Screen for TBI?



## Studies suggest TBI is a common injury in OEF/OIF

- 16% of returning Army Soldiers screened positive<sup>1</sup>
- 15% of returning Army Soldiers screened positive<sup>2</sup>
- 19% of OIF/OEF Veterans screened positive<sup>3</sup>
- 23% of returning Army Soldiers screened positive<sup>4</sup>
- 18.5% of Veterans at VA medical centers screened positive<sup>5</sup>

1. Schwab KA, Ivins B, Cramer G, Johnson W, Sluss-Tiller M, Kiley K, Lux W, Warden B. Screening for traumatic brain injury in troops returning from deployment in Afghanistan and Iraq: Initial investigation of the usefulness of a short screening tool for traumatic brain injury. *J Head Trauma Rehabil* 2007; 22(6): 377-389.

2. Hoge CW, McGuirk D, Thomas JL, Cox AL, Engel CC, Castro CA. Mild traumatic brain injury in US soldiers returning from Iraq. *N Engl J Med* 2008; 358(5): 453-463.

3. Schell TL, Marshall GN. Chapter 4, Survey of individuals previously deployed for OIF/OEF. In Tanielian T and Jaycox LH (eds.) *Invisible Wounds: Mental Health and Cognitive Care Needs of America's Returning Veterans*. Santa Monica, CA: The RAND Corporation; 2008.

4. Terrio H, Brenner LA, Ivins BJ, Cho JM, Helmick K, Schwab K, Scally K, Bretthauer R, Warden D. Traumatic brain injury screening: Preliminary findings in a US Army brigade combat team. *J Head Trauma Rehabil* 2009; 24, 14-23.

5. Unpublished data. UNCLASSIFIED

# Early Detection: Why Screen for TBI? (cont'd)



## Most TBIs are mild (mTBI)

- 76% of current military TBIs are mTBI<sup>1</sup> (recent surveillance program trying to better define “scope of the problem”)
- 75% of civilian TBIs are mTBI<sup>2</sup>

## MTBI is often untreated and undocumented

- As many as 25% of those with mTBI do not seek medical attention<sup>3</sup>
- Many individuals with mTBI who receive medical attention do not have a TBI diagnosis recorded, especially those with multiple trauma<sup>4</sup>

1.DVBIC, unpublished data. UNCLASSIFIED

2.National Center for Injury Prevention and Control. *Report to Congress on Mild Traumatic Brain Injury in the United States: Steps to Prevent a Serious Public Health Problem*. Atlanta, GA: Centers for Disease Control and Prevention; 2003.

3.Sosin DM, Sniezek JE, Thurman DJ. The incidence of mild and moderate brain injury in the United States, 1991. *Brain Inj* 1996; 10: 47-54.

4.Moss NEG, Wade DT. Admission after head injury: How many occur and how many are recorded. *Inj* 1996; 27: 159-161.

# 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 (PDHRA)
- VA Medical Centers



**Numerous screening safety nets to ensure capture of Service members requiring intervention**

**Diagnosis is confirmed through clinical interview**

# Early Detection In-theater Clinical Practice Guidelines



## 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

**Currently Being Codified in Directive Type Memorandum (DTM)**

# Early Detection In-theater Clinical Practice Guidelines



## 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 nurse practitioner
  - Loss of consciousness greater than 5 minutes requires evacuation to Level III facility

# MACE: Military Acute Concussion Evaluation



 **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**  
Ask:  
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      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 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 injuries 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 “blacking out”?  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                      DVBIC.org                      800-870-9244  
This form may be copied for clinical use.  
Page 1 of 6

- 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



# 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

# 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

**Avoid Narcotics & Benzodiazepines**

**Abortive**

**Prophylaxis**  
Onset of action ~ 4 wks

<p><b>NSAIDs</b></p> <ul style="list-style-type: none"> <li>• GI side effects</li> <li>- Ibuprofen</li> <li>- Naproxen</li> <li>- Sodium</li> <li>- Acetaminophen</li> <li>- Aspirin</li> </ul>	<p><b>Triptans</b></p> <ul style="list-style-type: none"> <li>• Contraindicated in patients with CAD</li> </ul>	<p><b>Combination Medications</b></p> <ul style="list-style-type: none"> <li>• Cognitive side effects</li> <li>• Risk of W/D</li> <li>- Fioricet</li> <li>- Fiorinal</li> <li>- Midrin</li> </ul>	<p><b>Alternatives</b></p> <ul style="list-style-type: none"> <li>Promethazine</li> <li>Metoclopramide</li> <li>Prochloroperazine</li> <li>Tizanidine</li> <li><b>Non-medication</b></li> <li>Trigger point injection</li> <li>Occipital nerve block</li> <li>Physical therapy</li> </ul>	<p><b>Anti-depressants</b></p> <ul style="list-style-type: none"> <li>• May improve mood</li> <li>• Improves sleep</li> <li>- Nortriptyline</li> <li>- Amitriptyline</li> <li>- Paroxetine</li> <li>- Fluoxetine</li> </ul>	<p><b>Anti-epileptics</b></p> <ul style="list-style-type: none"> <li>• Neuropathic pain</li> <li>- Gabapentin</li> <li>• Mood lability</li> <li>- Valproic acid</li> <li>- Topiramate</li> </ul>	<p><b>Beta-blockers</b></p> <ul style="list-style-type: none"> <li>• Non-selective may have benefit on autonomic effects of PTSD</li> <li>- Propranolol</li> </ul>
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# Treatment: Cognitive Deficits



DVBIC/DCoE MAR08		Concussion Management Grid		Table 1
<b>Cognition</b>	<b>Memory loss or lapse</b> <b>Forgetfulness</b> <b>Poor concentration</b> <b>Decreased attention</b> <b>Slowed thinking</b> <b>Executive dysfunction</b>	<u>Administer:</u> <b>MACE</b> if injury within 24 hours, <b>Other neurocognitive testing as available (eg ANAM or other neuropsychological testing)</b> <u>Gather:</u> <b>Collateral information from family, command and others</b>		<b>Normalize sleep &amp; nutrition</b> <b>Pain control</b> <u>Refer:</u> <b>Speech/language pathology</b> <b>Occupational therapy</b> <b>Neuropsychology</b>

# Treatment: Cognitive Rehabilitation in mTBI



- 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 days; 50 members
  - DoD (Quad Service) & DVA representation
  - SOCOM & Reserve Affairs representation
  - Civilian subject matter experts

# Treatment: Cognitive Rehabilitation (cont'd)



- **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**

# Treatment: Return to Duty Determination



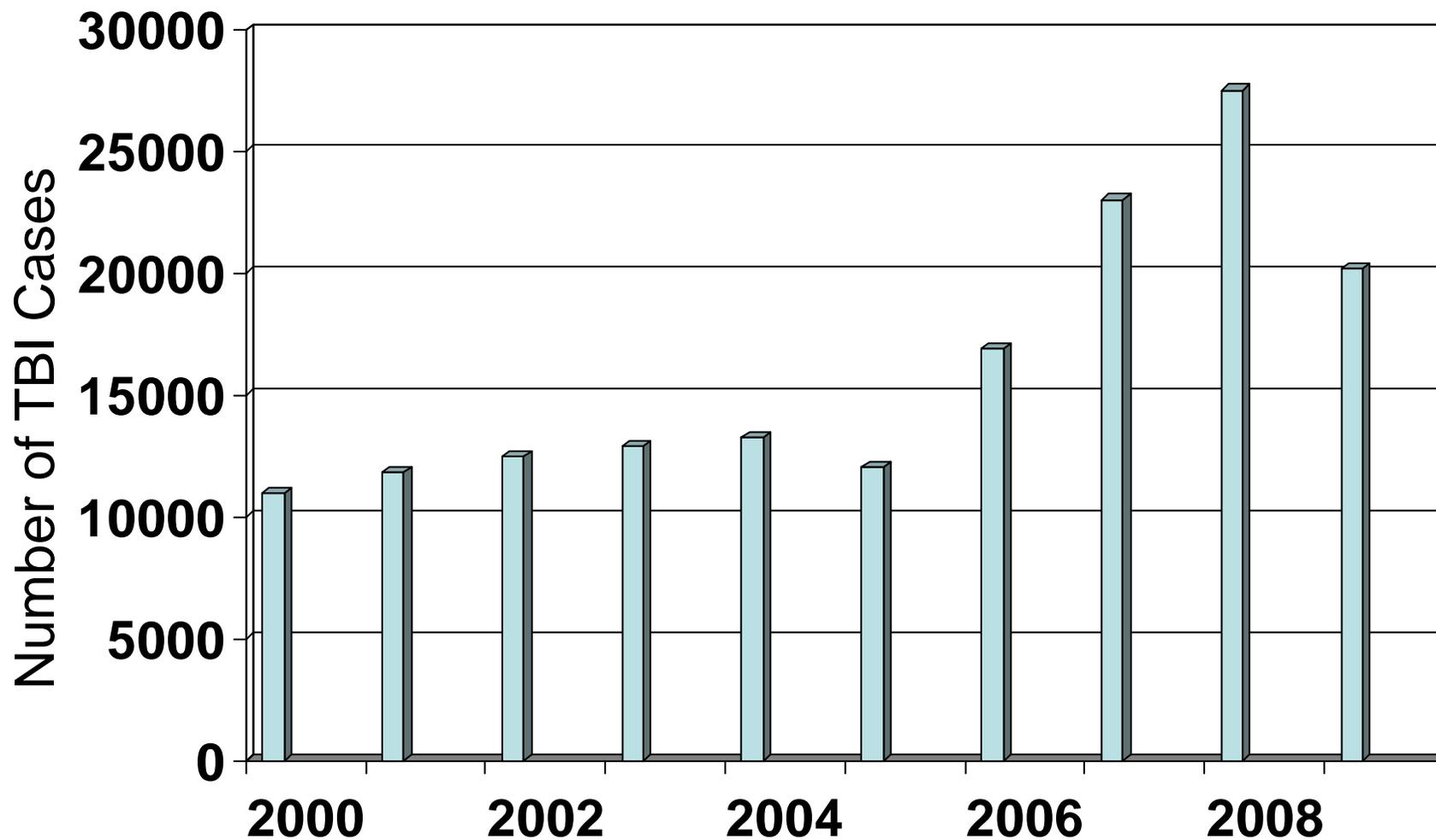
- Objective: better inform return to duty determinations in the field following TBI beyond exertional testing and MACE
- NCAT
  - Over 450K baselines
  - Army ANAM Ops
- Vestibular Balance Plate Testing
  - Under development
- Nystagmus Detection
  - Under development

# Neurocognitive Assessment Tool (NCAT) Automated Neuropsychological Assessment Metrics (ANAM)



- Computerized neurocognitive assessment tool
- Purpose:
  - Establish an accurate assessment of pre-injury cognitive performance for comparison in post-injury return to duty (RTD) decisions
    - One piece of clinical picture
    - Selective use for those with more clinically challenging cases
- Takes 20 minutes to complete
- Current policy (May 08):
  - All pre-deployers receive baseline cognitive testing with ANAM within one year of deployment
- Other tools being studied head-to-head
- Better assessment if injured SM is compared to their baseline scores as opposed to a normative databank

# Tracking: DoD Totals

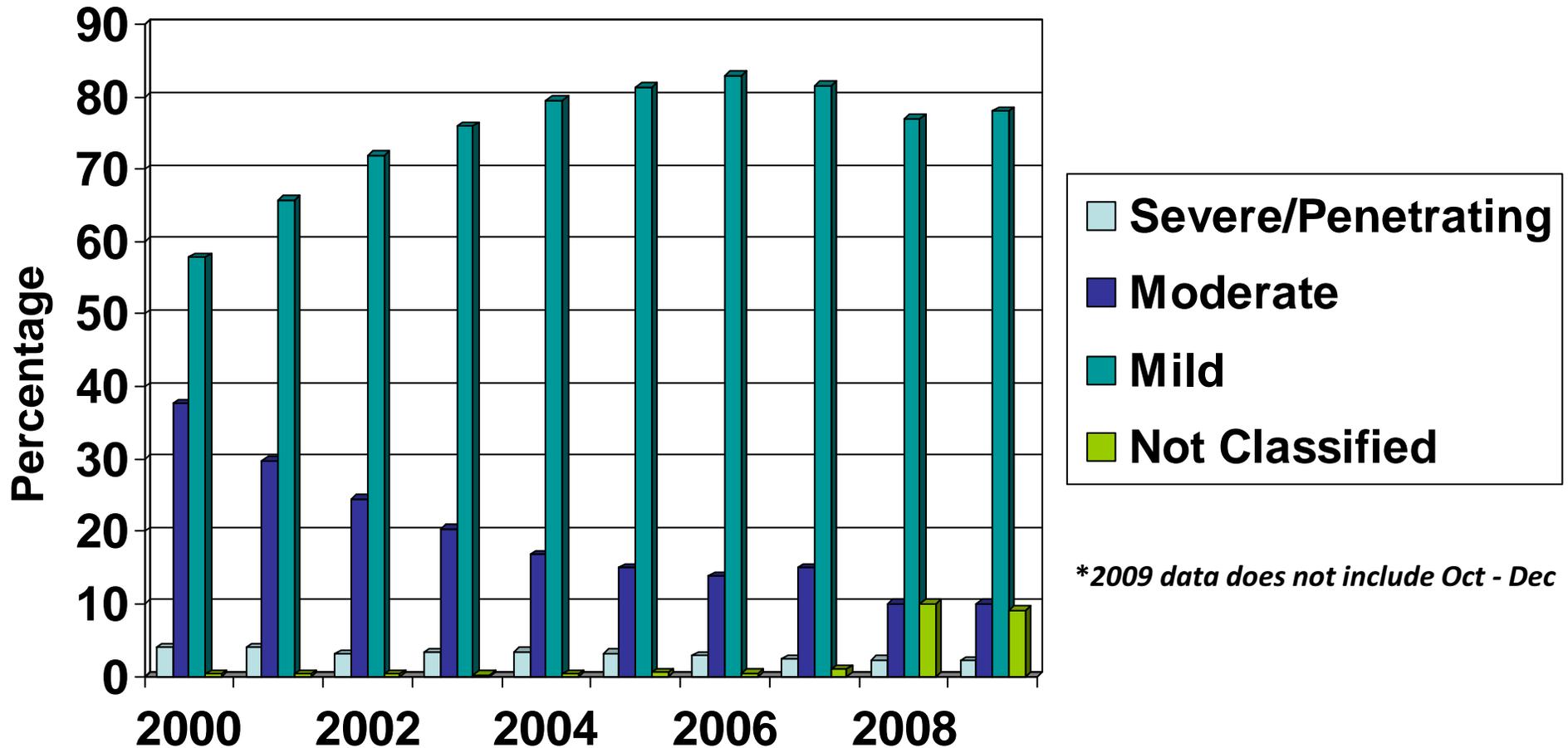


Data Source: [www.DVBIC.org](http://www.DVBIC.org)

*\*2009 data does not include Oct - Dec*



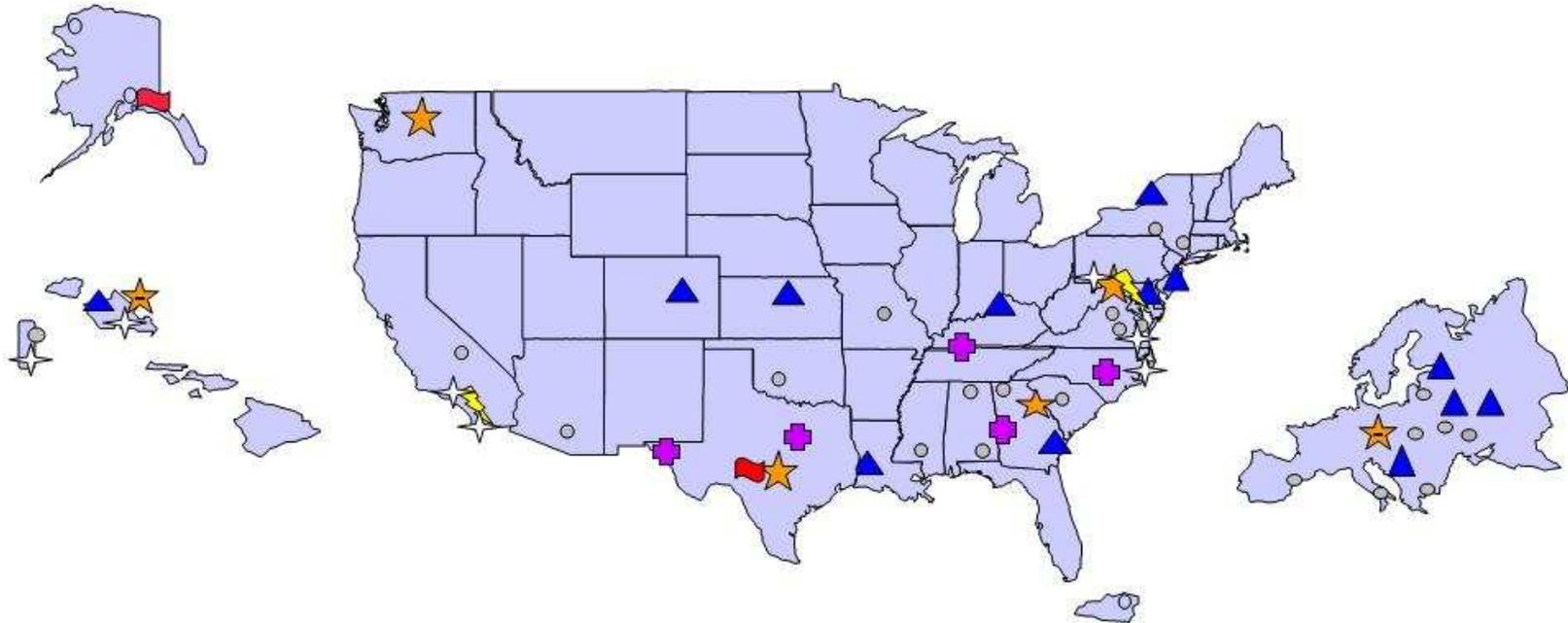
# TBI Tracking: Severity Data



*\*2009 data does not include Oct - Dec*

Data Source: [www.DVBIC.org](http://www.DVBIC.org)

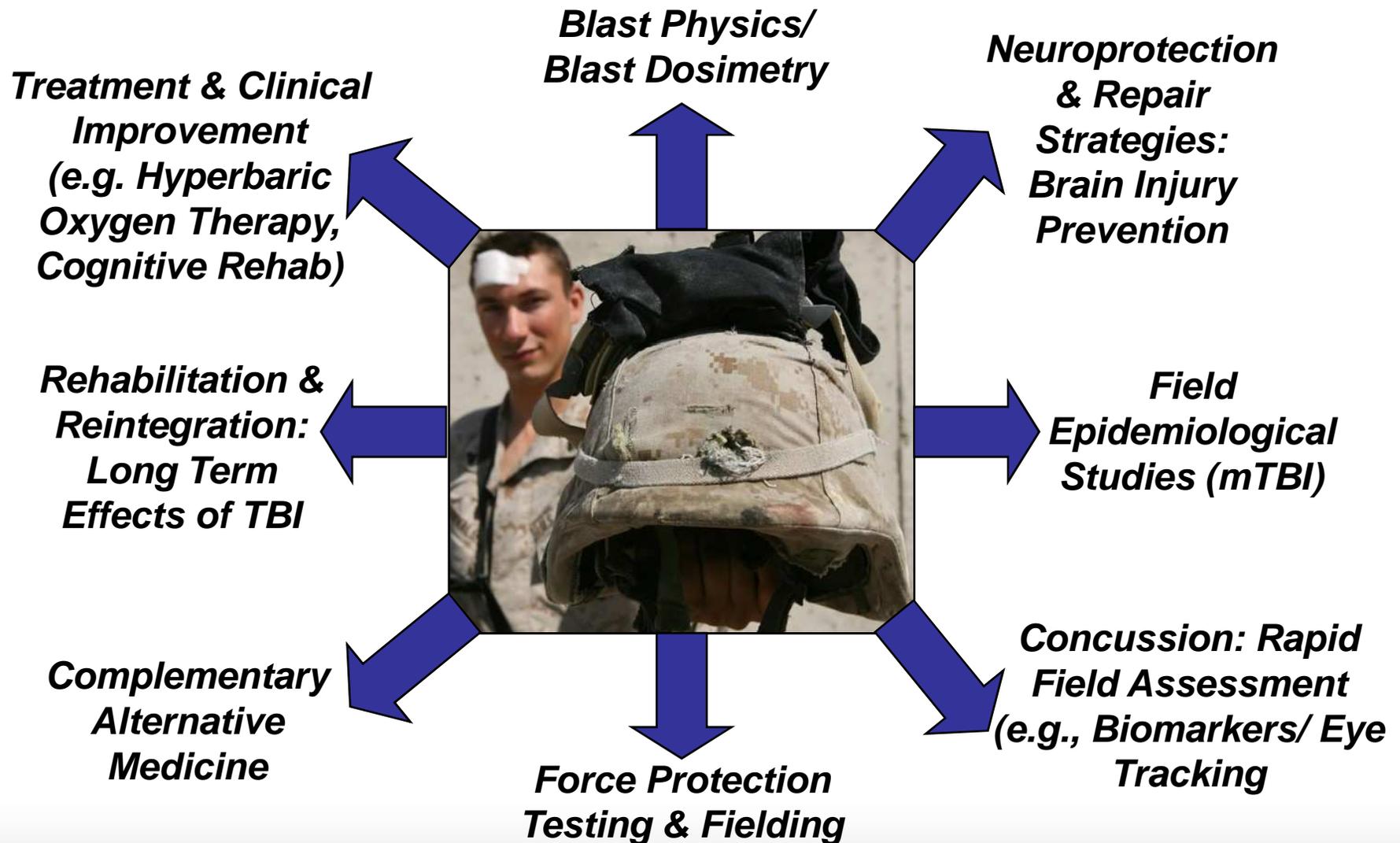
# Rehabilitation, Recovery, Reintegration DoD TBI Programs



-  **Army (Category 1)**  
- Ft Gordon, GA; Ft Lewis, WA; Ft Sam Houston, TX; Walter Reed, DC
-  **Army (Category 1-)**  
-Landstuhl, Germany; Tripler, HI
-  **Army (Category 2)**  
-Ft Benning, GA; Ft Bliss, TX; Ft Bragg, NC; Ft Campbell, KY; Ft Hood, TX
-  **Army (Category 3)**  
-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



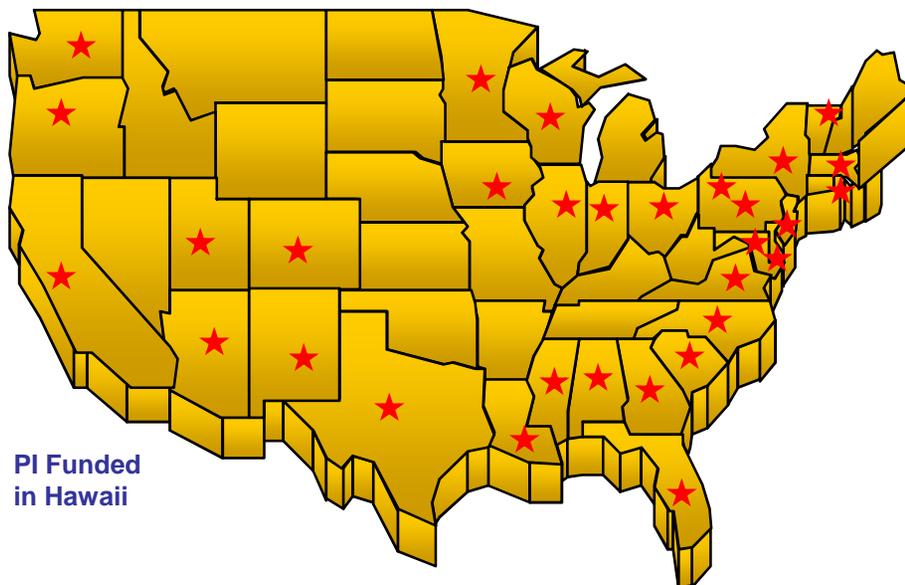
# Research & Development



# Research & Development CDMRP Funded Studies



## Funded TBI Investigators

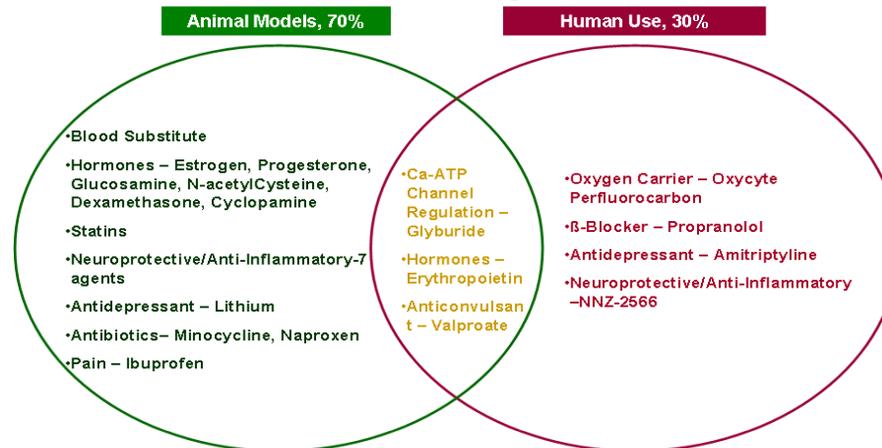


Awards range from \$150K over 18 months to \$4M over 4 years  
201 Proposals selected from a pool of 2110 applicants

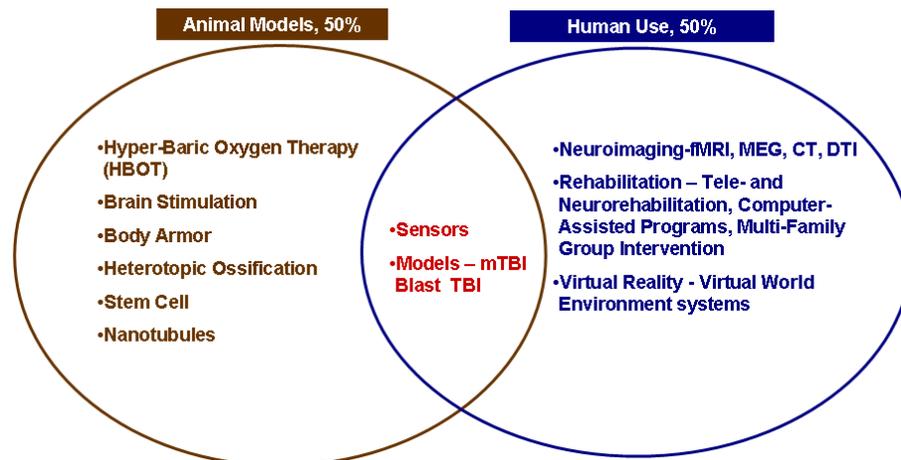
### TBI Research Gaps

Treatment and Clinical Management  
Neuroprotection and Repair  
Rehabilitation/Reintegration  
Field Epidemiology  
Physics of Blast

## TBI Drugs



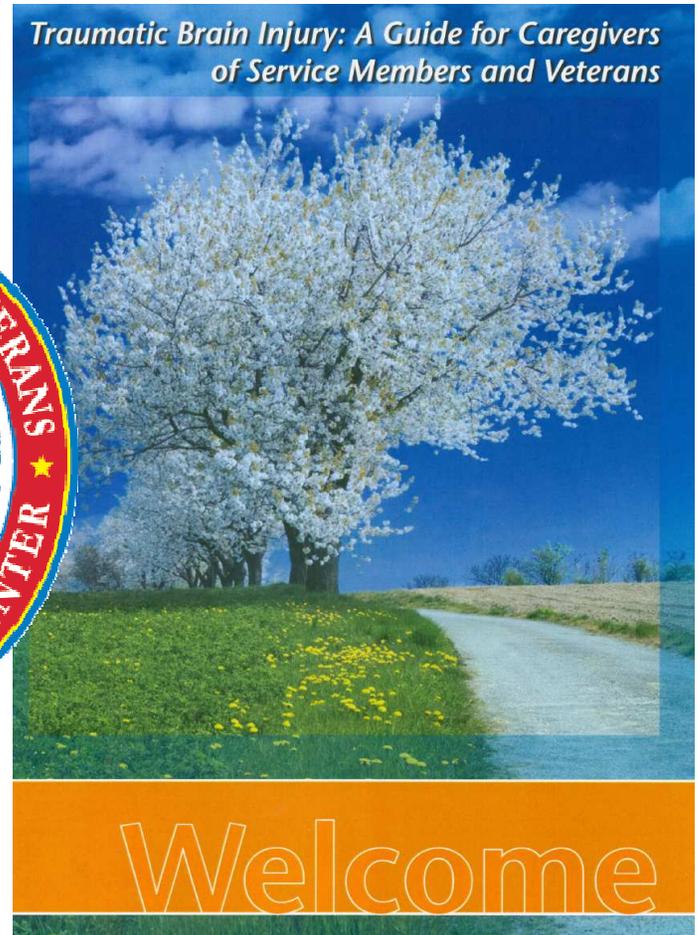
## TBI Other Interventions



# Patient, Family and Caregiver Education



**Office of the Surgeon  
General/Army Medical  
Department  
Health Policy & Services  
Proponency Office for  
Rehabilitation &  
Reintegration  
Curriculum for  
Traumatic Brain Injury**



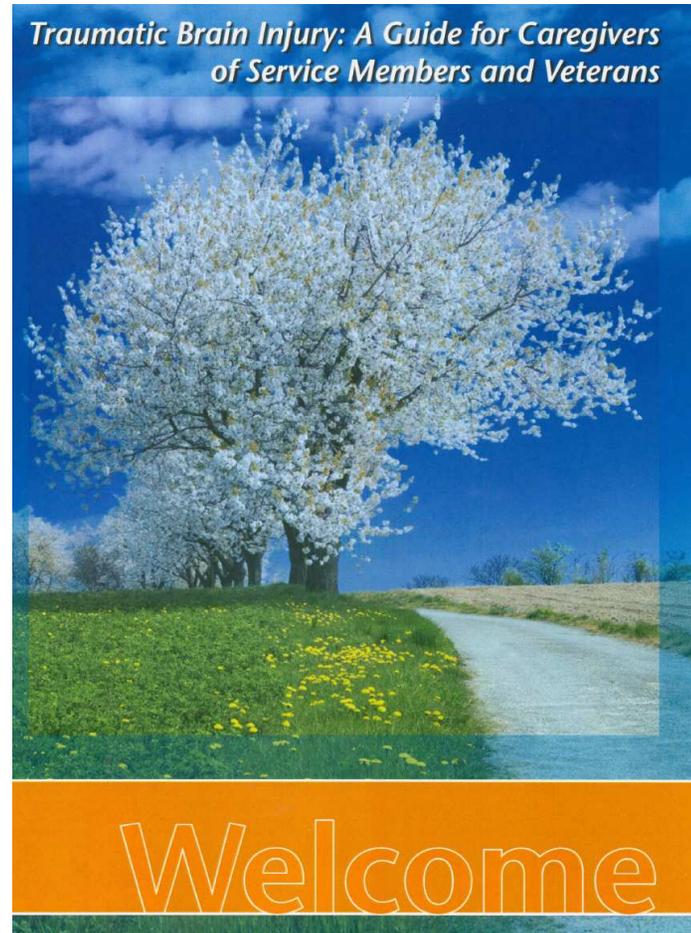
# Family Caregiver Curricula



## ■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)

■Due to be released by March 2010



# Regional Care Coordination Program launched Nov 2007



- Provide 100% follow-up to identified Service Members with Traumatic Brain Injury (mild, moderate, severe and penetrating) from 13 regional catchment areas across the US
- Monitor the care continuum for traumatic brain injury to include potential rehabilitation needs, education, advocacy and support to Service members with TBI and their families from injury to return to duty and/or re-entry into the community
- Identify and connect Service members to available TBI resources within DoD, VA and civilian communities
- Provide education and support serving as a TBI subject matter expert to all involved in the care and support of the Service member and family.
- Identify barriers and/or gaps in service delivery for TBI Service members as they transition between systems and settings
- Functional outcomes picture to look at quality of life issues related to home, work and social environments



# DVBIC Virtual TBI Clinic

- TBI screening, assessment, consultation & care to:
  - Patients at remote military medical centers
  - Troop intensive sites where demand fluctuates with mass mobilizations
- Direct specialty care via VTC
- Local PCPs provide on-site testing and therapy
- Multiple specialties
  - Neurology, neuropsychology, pain management, rehabilitation
- Contact DVBIC if interested in establishing dedicated connection to Tele-TBI Clinic
  - 800.870.9244



# 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](mailto:tbi.consult@us.army.mil)
- VA/DoD mTBI/Concussion CPG Fact Sheet
- ICD-9 DoD TBI Coding Fact Sheet
- Service TBI POC

# **4<sup>th</sup> Annual TBI Military Training Conference**



**SAVE THE DATE**

**30 August – 1 September 2010**

**Washington, DC**

**Organized by DVBIC**

# Way Forward



- Fast tracking of medical research projects to translate findings to Service members in the field
- TBI & Co-occurring disorders
  - PTSD
  - Dual Sensory Impairments: Visual and Auditory
  - CPG's addressing these
- Directive-type memorandum (DTM)
  - Early detection and Early treatment
- In theater based care
  - Role II centers
- Ongoing efforts to promote the linkage of blast tracking with medical data/science
- Training and Education efforts

# Questions?



2010 MHS Conference