

Mild Traumatic Brain Injury Screening, Diagnosis, and Treatment

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ABSTRACT The majority of combat-related traumatic brain injury (TBI) within the U.S. Armed Forces is mild TBI (mTBI). This article focuses specifically on the screening, diagnosis, and treatment aspects of mTBI within the military community. Aggressive screening measures were instituted in 2006 to ensure that the mTBI population is identified and treated. Screenings occur in-theater, outside the contiguous United States, and in-garrison. We discuss specific screening procedures at each screening setting. Current diagnosis of mTBI is based upon self-report or through witnesses to the event. TBI severity is determined by specific Department of Defense criteria. Abundant clinician resources are available for mTBI in the military health care setting. Education resources for both the patient and the clinician are discussed in detail. An evidence-based clinical practice guideline for the care of mTBI was created through collaborative efforts of the DoD and the U.S. Department of Veterans Affairs. Although symptoms following mTBI generally resolve with time, active treatment is centered on symptom management, supervised rest, recovery, and patient education. Medical specialty care, ancillary services, and other therapeutic services may be required.

INTRODUCTION

Traumatic brain injury (TBI) is a widely recognized injury resulting from the current conflicts in Afghanistan and Iraq. TBI occurs when a trauma-induced external force results in temporary or permanent neurologic dysfunction. TBI severity ranges from mild to severe; TBI may be classified as a closed or penetrating injury. The majority of combat-related TBI within the U.S. Armed Forces fall in the mild TBI (mTBI) range, which is commonly known as concussion.¹ The overall Department of Defense (DoD) approach to TBI care follows a continuum of care. This continuum includes the prevention, surveillance, screening/assessment, diagnosis, case management, treatment, rehabilitation, and reintegration of service members who have suffered a TBI.² This article focuses specifically on the screening, diagnosis, and treatment aspects of mTBI within the military community.

SCREENING

Approximately 77% of TBI cases seen within the U.S. military population are classified as mTBI.¹ Aggressive screening measures were instituted in 2006 to ensure that the mTBI population is captured by military TBI surveillance.³ TBI screenings occur in-theater, at Landstuhl Regional Medical Center (LRMC) in Germany, at military treatment facilities (MTFs), at home duty stations after deployment, and within the Veterans Affairs (VA) system. From the year 2000 through November 15, 2011, there have been 233,425 medically diagnosed TBIs worldwide within the DoD, of which 178,961 were classified as mild.⁴ Reliance on service member self-report,^{5,6} and co-occurring conditions^{7,8} can make TBI screening very challenging. If a service member has been exposed to

an external force or mechanism of injury that could potentially cause TBI (i.e., blast exposure, vehicular crash and/or rollover, blunt trauma, fall, sports-related injury, gun-shot wound above the neck, or a combination of these entities), immediate screening is indicated.⁹

In-theater, event-based screening occurs as soon as safely possible following exposure to a traumatic event.¹⁰ This initial evaluation is commonly performed by combat medics/corpsmen on the front line or by forward operating bases. Severe injuries are usually easily recognized, requiring resuscitation and evacuation. Those without obvious injuries are then assessed for TBI. The Military Acute Concussion Evaluation (MACE) is widely used as a screening tool for mTBI (Table 1).¹¹

The cognitive evaluation portion of the MACE uses the Standardized Assessment of Concussion (SAC),³ which is well validated in sports concussion. The MACE has recently been updated in February, 2012 (Table I) with different versions of the SAC to avoid familiarization with repeated administrations. The MACE typically takes less than 10 minutes to administer. In addition to the history and brief neurologic exam (eye, motor, speech, and balance testing), it measures four cognitive domains including orientation, immediate memory, concentration, and delayed recall.¹² Appropriate administration of the MACE requires that the clinician avoid altering the word lists, digit spans, or order of the exam. According to the new version of the MACE, All three components of the MACE should be recorded in the medical record following the mnemonic CNS

- Cognitive results (Total out of 30)
- Neurologic exam results (Green = all normal exam, Red = any abnormal exam results)
- Symptom results (A = No symptoms, B = 1 or more symptoms)

The MACE is intended to be given during the initial assessment and as part of the cognitive evaluation during

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TABLE I. Major Changes in the 2012 Version of the MACE

- Instructions are now embedded with the questions
- The first two pages focus only on whether or not there was an injury event and AOC/LOC/PTA. Questions about symptoms and previous concussions have been moved to the end of the tool
- The second page clarifies when to stop the MACE
- Three more versions of the cognitive tests have been added
- A balance test has been added to the neurological evaluation
- The neurological evaluation provides better guidance
- The summary page provides more room to record cognitive test scores results
- The last page explains the proper interpretation of the cognitive score, evaluating concussion recovery, and ICD-9 coding tips

exertional testing.¹¹ If no loss of consciousness (LOC) or alteration of consciousness (AOC) is noted during the initial portion of the MACE, the MACE can be stopped, and clinicians should consider other causes for the service member's symptoms. The concussion management algorithm states that a cognitive score of <25 or the presence of symptoms requires consultation with a provider. It is important to remember that MACE scores do not diagnose a concussion.¹¹

Acute assessment of concussion is very important on the battlefield as it may lead to better outcomes and increased rates of return to duty (RTD).¹² Medics must determine which level of care is required next for the service member based on the Concussion Management Algorithms for the deployed setting (discussed in the "Treatment" section).¹⁰ The Concussion Management Algorithm for deployed settings (CMA) was recently updated in 2012 (Table II). A copy of the updated CMA can be requested online: <http://www.dvbc.org/material/concussion-management-algorithm-cma-pocket-cards>. Important updates to the CMA are included (Table II). All service members exposed to a blast or other mechanism of injury, including those who screened negative, are mandated to rest for 24 hours before returning to duty. The commander/commanding officer, however, has the right to waive the rest period if the service member is deemed vital to the mission.¹⁰

Mandatory events requiring concussion evaluation include:

- 1) Any service member in a vehicle with a blast event, collision or rollover
- 2) Any service member within 50 meters of a blast
- 3) Anyone who sustains a direct blow to the head
- 4) Command directed-such as, but not limited to, repeated exposures

If there are any red flags noted immediate provider consultation or emergent evacuation is indicated.

Since March 2006, all service members arriving at LRMC and all Operation Enduring Freedom (OEF) and Operation Iraqi Freedom (OIF) (changed to Operation New Dawn [OND] October 2010) service members returning from theater receive a TBI screen regardless of the medical condition or injury that required medical evacuation. This ensures that the

TABLE II. Major Changes in the 2012 Version of the Concussion Management in Deployed Settings

- **Combat Medic/Corpsman Algorithm:**
 - Includes recommendations for initial management of concussion in consultation with a provider
 - Provides instruction to consult provider with exertional test results for return to duty determination
 - Clarifies directives and emphasizes assessment, identification of red flags, consultation with a provider, and distribution of educational brochures to patients
- **Initial Provider Algorithm:**
 - Includes concussion history with added guidance for first, second and third concussion in 12 months
 - Clarifies guidance on neuroimaging/CT and consultation
- **Comprehensive Concussion Algorithm:**
 - Advises to consider NCAT and functional assessment
- **Recurrent concussion Algorithm:**
 - Advises to consider NCAT and functional assessment
 - Includes the Balance Error Scoring System (BESS) to guide the balance assessment
- **Other:**
 - The list of information sheets now includes: Acute Stress Reaction Fact Sheet, Acute Concussion Educational Brochure, Neurobehavioral Symptom Inventory, Line Leader Fact Sheet, Coding Guidance, and DCoE NeuroCognitive Assessment Tool (NCAT) recommendations
 - Exertional testing clarified
 - ICD-9 coding tips added

majority of service members get an assessment before returning to their home duty station. LRMC uses a standard patient questionnaire which inquires about any blast exposures, motor vehicle accidents, falls, or direct blows to the head that may have resulted in loss of consciousness (LOC) or AOC.¹³ From May 2006 to October 2008, nearly 18,000 patients completed this initial screening questionnaire at LRMC.¹³ Of these patients, 16% of outpatients and 31% of inpatients screened positively for being at risk for TBI.¹³ If the service member cannot be screened because of medical issues such as intubation and/or heavy sedation, a notation is made in the medical record to re-evaluate for TBI at a later time. The mTBI screen includes the date of injury, service member's recollection of the injury, distance of the blast, position in the vehicle (if applicable), use of protective gear, symptoms at the time of injury, specific injuries to the head/face/neck, and whether there was an on-scene evaluation.¹³ The screener also asks about current symptoms and any previous concussion/head injury history. If it is determined that there was a change in consciousness and it is clinically appropriate (e.g., the service member is not heavily medicated, in pain, or psychiatrically impaired), the MACE is then administered to determine cognitive status.¹¹ Obtaining the history, MACE, initial Glasgow Coma Scale (GCS) score, and reviewing of the computed tomography (CT) scan or magnetic resonance imaging (MRI) scan (if performed),

allows for accurate determination of whether a service member has sustained a concussion. If deemed negative, this is documented and the service member does not need further testing; this service member may potentially RTD if no other medical conditions are present. However, if it is determined that the service member sustained a mTBI, the screening team makes recommendations for disposition. This disposition may be a home duty station or a designated TBI center based upon anticipated treatment needs of the service member.

If the service member's prognosis is presumed critical from other injuries and/or unlikely to report to duty or managed at the LRMC outpatient clinic, he/she is medically evacuated to a major MTF for ongoing care, such as Walter Reed National Military Medical Center (WRNMMC) in Bethesda, Maryland, or San Antonio Military Medical Center (SAMMC) in Texas. Both treat service members from deployments with mTBI and have the added capability of managing severe comorbidities and injuries that may co-occur with mTBI.

At the treatment facility, a screener reassesses all inpatients and outpatients based on their mechanism of injury. For example, if a service member screened positive for a mTBI at LRMC, but was medically evacuated for an unrelated condition, a mTBI consult note including a treatment plan is still completed and recorded in the electronic medical record. Obtaining a good interview is critical, and it is essential that LOC, AOC, post-traumatic amnesia (PTA), imaging findings, and initial and current symptoms are clearly noted. The screening process can be further complicated by ongoing treatment for other injuries such as frequent surgeries for wound cleaning and orthopedic surgeries, necessary sedation, pain, and fatigue. When able, service members fill out symptom questionnaires on concussion-related symptoms and acute stress symptoms.

A service member's current state of health is evaluated soon after returning from the theater (no later than 30 days), using the Post Deployment Health Assessment (PDHA)¹⁴ at the unit during out-processing. The PDHA is an electronic questionnaire mandated by the Assistant Secretary of Defense for Health Affairs that assesses the service member and assists military health providers in identifying and providing present and future medical care.¹⁴ Questions on the PDHA include whether the service member (1) has experienced any mechanism of injury that may have caused a head injury, (2) was diagnosed with a concussion/head injury in theater, (3) is experiencing symptoms, and (4) circumstances following the event (see "Diagnosis" section for specifics).¹⁴ If the service member answers "yes" to any of the questions, a referral is made to a provider for further evaluation. A recent study showed that out of these four questions, questions 1 and 2 above demonstrated a higher correlation to clinician-diagnosed TBI.¹⁵

Another screening tool used within the Defense Department is the Warrior Administered Retrospective Casualty Assessment tool (WARCAT). This was developed at Evans Army Community Hospital, Fort Carson, Colorado, in June 2005. It has subsequently been adopted by some of the other stateside concussion clinics. This tool is used in addition to the

PDHA and PDHRA to capture more detailed information about possible injuries and symptoms. In comparison, the WARCAT is more detailed about type of improvised explosive device blast, direction and approximate distance from blast, specific vehicle type and position, helmet information, and initial treatment on the scene. It also inquires about prior history of concussions, whereas the PDHA and PDHRA inquire only about the recent deployment. The WARCAT is a standardized form that the service member fills out for the provider to review. It can be found at: <http://evans.amedd.army.mil/srp/>.

In April 2007, the VA health care system implemented a mandatory computer-based screening tool to identify OEF/OIF veterans who sustained a mTBI.¹⁶ This screen is completed whenever a veteran presents at the VA for any clinical appointment including but not limited to primary care, mental health, or dental appointments.¹⁶ It is not indicated if the veteran has a separation date before September 11, 2001 or did not serve in OEF/OIF or current conflicts. The screen is not necessary if a prior diagnosis of concussion was made. The screen consists of questions very similar to other screening tools. These questions are:

- Whether the veteran experienced any exposures to blast/explosion, vehicular accident, fragment, bullet wound, or fall
- Which symptoms were immediately noticed neurologically and physically
- Symptoms that may have begun or gotten worse after the event
- Current symptoms

When a veteran answers "yes" to one or more questions in each of the four sections, then the VA considers the veteran to have screened positive for a possible mild TBI and this veteran should be offered a follow-up evaluation with a specialty provider who can determine whether the veteran has a mild TBI.

DIAGNOSIS

TBI severity is determined by specific criteria: initial GCS score (if available), AOC, LOC, PTA, and structural imaging (Table III).⁹ The initial GCS score with mTBI is normally between 13 and 15. Theater conditions are often challenging as the attending combat medic/corpsman may be treating several casualties under grueling conditions while under fire and assessing for life or death injuries. The GCS can also be obscured by other factors such as medications or hypovolemic shock. AOC must be immediately related to the head trauma.⁹ Typical symptoms are looking and feeling dazed and uncertain of what is happening, confusion, difficulty thinking clearly or responding appropriately to mental status questions, and being unable to describe events immediately before or after the event.⁹ An AOC of less than 24 hours is considered a mTBI according to the Defense Department severity rating.¹⁷

PTA is any loss of memory for events immediately before or after the injury.⁹ With a mTBI, this period can extend up to

TABLE III. Severity Ratings for TBI

Criteria	Mild	Moderate	Severe
Structural Imaging	Normal	Normal or Abnormal	Normal or Abnormal
LOC	0–30 minutes	>30 minutes and <24 hours	>24 hours
AOC/Mental State	≤24 hours	>24 hours	>24 hours
PTA	≤24 hours	>24 hours and <7 days	>7 days
GCS ^a	Score: 13–15	Score: 9–12	Score: 3–8

^aGCS is not part of the official DoD definition for TBI but is commonly used in practice.

24 hours.⁹ Abnormal structural imaging attributed to the injury will result in the individual being considered clinically to have greater than mild injury.⁹

Symptoms especially the cluster of headaches, dizziness, nausea, and vomiting are common after an acute concussion^{18,19}. However, it is important to note that these symptoms alone do not constitute a diagnosis of mTBI. Further work is needed to identify clinically useful self-report measures that assess mTBI and post-traumatic stress disorder (PTSD) and associated symptoms among OEF/OIF Veterans.^{5,20}

Abnormal physical findings on exam, whether noted on the brief neurological exam (completed by the attending combat medic/corpsman), or the more comprehensive evaluations (Level II–Level V facilities and the VA) are critical signs of potentially serious health conditions. The neurologic exam should include assessment of eyes (pupillary reflex, extraocular movements), speech (fluency and word finding), motor (grip strength and pronator drift), balance (tandem Rhomberg test), and a cognition (concentration, delayed recall). CPGs exist to guide the primary care management of symptoms after the diagnosis is confirmed and are reviewed in the “Treatment” section below.⁹ Those with neurologic deficits should be considered for management at a location where imaging is available.

A service member who has prolonged symptoms without signs of improvements should be screened for concomitant psychological distress, which is most commonly an acute stress reaction or PTSD. If positive, the service member is referred to behavioral health for further evaluation.⁹

Conventional head CT and MRI scans are normal for the majority of mTBI patients^{21,22}. Furthermore, these tools are not sensitive to detecting diffuse axonal injuries (DAI) in mTBI.²² The MRI technique of diffusion tensor imaging (DTI) can detect microscopic white matter tract lesions in the brain.²³ DTI has provided a tool for detecting DAI and other microstructural changes in white matter^{24,25} associated with mTBI injury severity.²⁶ The DoD is currently interested in using DTI as a biomarker and has assisted in the research on this modality. Other research studies proposed for TBI diagnosis are serum biomarkers,²⁷ other advanced neuroimaging studies (including spectroscopy and positron emission tomography scans),^{28,29} brain acoustic monitoring,³⁰ state-of-the art developments in research with blast waves,³¹ and cumulative concussions.³²

TREATMENT

There are abundant resources for clinicians caring for mTBI in the military health care setting. Because these resources must

undergo revisions as new information becomes available, it is best for the provider to access the most up-to-date resources online. Resources and references for mTBI treatment in the military are discussed in the following sections.

In general, treatment of mTBI is centered on symptom management, supervised rest, and recovery. Symptoms usually fall into three categories: somatic (e.g., headache, dizziness, weakness, sensitivity to light and sound), cognitive (e.g., difficulties with attention, memory, and language), and psychological/behavioral³³ (e.g., irritability, depression, anxiety, personality changes). All of these symptom areas need to be addressed. Often, there is an overlap of symptoms of concussion and psychological/psychiatric disorders that need to be treated concurrently.^{7,34–37} Physical injuries sustained in addition to the mTBI must also be taken into consideration.^{36,38} Clinicians are being encouraged to treat nonspecific symptoms regardless of etiology.^{39,40} Sleep disorders are also common.⁴¹ In addition to medical specialty care, ancillary services, neuropsychological testing,⁴² and other therapeutic services may be required.⁴¹

In addition to symptom management, patient education regarding expected outcomes can play an important role in mTBI treatment.⁴³ Education should emphasize rest and recovery, gradual supervised resumption of work and social responsibilities, compensatory strategies, and modification of the environment.⁹ Additionally, the service member should be educated about prevention of further injuries.⁹ It is important that the service member understands what their diagnosis is and what the expected course of recovery will be. Approximately 85% to 90% of patients who have sustained a combat mTBI improve with no lasting clinical difficulties.^{9,41} Service members should be reassured and encouraged that their condition is transient and that full recovery is expected. Typically, recovery is seen within hours to days, with a small portion taking longer.^{9,41} In a small minority, symptoms may persist⁴⁴ beyond 6 months to a year.⁹ In the civilian sector, it has been shown that educating individuals regarding this positive expectation for recovery is associated with positive outcomes.⁴⁵

Many free educational resources are offered online. The Defense and Veterans Brain Injury Center (DVBIC) website, dvbic.org,⁴⁶ offers resources about mTBI and include symptom management for memory, sleep, mood changes, and headache difficulties. The Defense Centers of Excellence for Psychological Health and Traumatic Brain Injury (DCoE),⁴⁷

traumaticbraininjuryatoz.org, brainlinemilitary.org, and afterdeployment.org also offer many resources available to service members and providers. Some education materials are meant to be provided in combination with verbal review of the information with their health care provider.⁹

As stated earlier, most service members with recent onset of symptoms following a single mTBI can be successfully managed in the primary care setting. For the majority, referral to specialty care for mTBI is not required.⁹ However, because many service members sustain an mTBI in the context of combat, their care can be complex and multifaceted, requiring consultation with rehabilitation therapists, neurologists, pharmacists, mental health, and social support.^{9,41,48,49}

Service members who are in-garrison and have suffered an mTBI can be cared for using the VA/DoD CPGs.⁹ In April 2009, an evidence-based CPG was created through the collaborative efforts of the Defense Department and VA to establish guidelines for treating service members with ongoing symptoms following mTBI injury. The intent of these in-garrison guidelines is for the service member to receive care from their primary care provider at their home duty station. The following are the three algorithms contained in this CPG: (1) initial presentation, (2) management of symptoms, and (3) follow-up of persistent symptoms. The most up-to-date version of the VA/DoD CPG guidelines with algorithms can be found online at www.dcoe.health.mil.⁹

Algorithm A of the CPG describes next steps that a provider should follow once a service member has been diagnosed with an mTBI. If he or she has no concussion-related symptoms at the time of diagnosis, then mTBI education is to be provided. The service member should also be screened for stress, substance use, and mental health conditions. If the service member is symptomatic, algorithms B, C, or in-theater guidelines can be used depending on the situation.⁹

Algorithm B of the CPG outlines management of symptoms of mTBI in steps (Table IV). Steps are explained in further detail in the full version of the CPG.⁹

Algorithm C is used when a concussed service member continues to have persistent symptoms beyond 4 to 6 weeks

TABLE IV. Steps Outlined in Algorithm B of the CPG for Management of Symptoms

- (1) History and physical exam (labs, MSE, psychosocial evaluation)
- (2) Clarify symptoms and build therapeutic alliance
- (3) Evaluate and treat co-occurring disorders
- (4) Determine treatment plan
- (5) Educate patient and family on symptoms and expected recovery
- (6) Provide early (nonpharmacologic) interventions
- (7) Sleep hygiene, relaxation techniques, limit caffeine/tobacco/alcohol, graded exercise, monitored progressive RTD/work/activity
- (8) Initiate symptom-based treatment (consider case management)
- (9) Follow-up and reassess in 4–6 weeks
- (10) If symptoms are unresolved, proceed to Algorithm C: follow-up of persistent symptoms
- (11) If symptoms are resolved, follow-up with patient as needed and address: RTD, community participation, and family/social issues

and is not responding to initial treatment. Reassessment of symptoms and functional status is recommended as well as a complete psychosocial evaluation.⁹ If symptoms such as mood, behavior, or sleep difficulties have not improved, the service member is assessed for possible alternative causes for the persisting symptoms. It has been found that a service member may not demonstrate psychological impairment in the immediate time frame following a concussion and may arise as a result of returning home and readjusting from a combat deployment.^{20,50} Alternative causes should be treated according to VA/DoD guidelines, and the service member should be considered for a referral to mental health for evaluation and treatment. If persisting symptoms are physical, cognitive, or emotional, they may also need a specialty referral for services.⁹ Available interventions for mTBI patients throughout the services can be found in Table V.⁴¹

A useful tool for any clinician caring for a service member with mTBI is the Mild Traumatic Brain Injury Pocket Guide created by the Defense Department, DCoE and DVBIC (Fig. 1). This pocket guide includes management guides for common mTBI symptoms such as headache, dizziness, fatigue, vision difficulties, irritability, and appetite changes. It also provides guidance for physical examination, medication management, and referrals. A mobile application of this guide is available to the provider at <http://t2health.org/apps/mtbi>. Table VI describes the information contained in this pocket guide.

The Co-occurring Conditions Toolkit: mTBI and Psychological Health, is another tool that can be accessed online from the DCoE website. This toolkit has additional management guides for sleep, mood, attention, and chronic pain. A companion video is available, which is designed to show the provider how to use the toolkit. A copy of both of these pocket guides can be found online (www.dcoe.health.mil/ForHealthPros/TBIInformation.aspx)⁵¹ or obtained by contacting info@dvbic.org or calling 1800-870-9244.

In addition to the CPG, another resource to consider is the Clinical Guidance for Evaluation and Management of Concussion/mTBI management for both acute and subacute nondeployed care. This guide was updated in May 2008. It was created by an interdisciplinary work group through the DVBIC. The work group included both U.S. military services

TABLE V. Core TBI Therapies and Interventions Available Throughout the Services¹²

Medication Management
Vestibular Rehabilitation
Vision Therapy
Cognitive Rehabilitation
Driving Rehabilitation
Balance Training
Life skills Training
Assistive Technology
Tinnitus Management
Complementary and Alternative Medicine Interventions

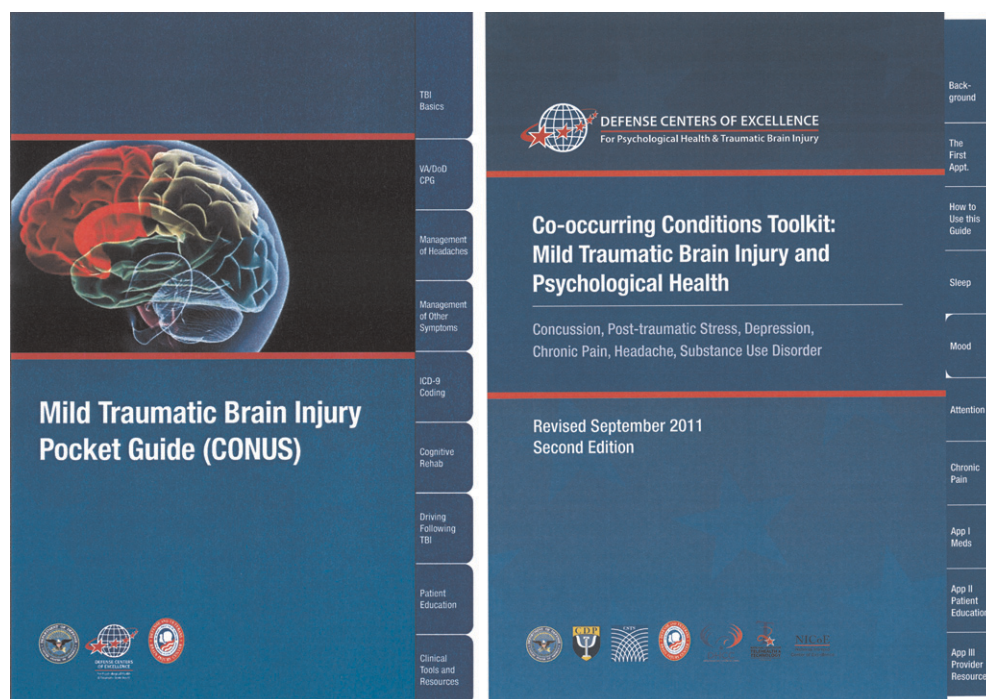


FIGURE 1. Pocket guides that are available to help clinicians caring for mTBI service members.

and civilian representation. The group provided expert guidance regarding appropriate management of symptomatic concussed service members in a military setting. The full report with algorithms for the clinician can be found online (www.dcoe.health.mil).⁵¹

Regarding concussion management in the Deployed setting, the Concussion Management in the Deployed Settings

pocket guide was updated in 2012 (Table II) and offers three algorithms which include:

- 1) Combat Medic/Corpsman Algorithm
- 2) Initial Provider Algorithm
- 3) Comprehensive Concussion Algorithm

This pocket guide can be obtained by submitting a request online at: <http://www.dvbic.org/material/concussion-management-algorithm-cma-pocket-cards>.

Telemedicine services are currently being used for mTBI identification, management of symptoms in theater, and improving the overall care of TBI throughout the Defense Department and VA. TBI.consult@us.army.mil is an electronic consultation service specifically for deployed military health care providers. It is monitored 7 days a week, staffed by TBI medical specialists, and offers a response within hours. This service provides consultation on a variety of TBI-related questions including how to screen for a TBI, RTD decisions, strategies for symptom management, and TBI and psychological health overlap questions. The tele-TBI clinic⁵² uses neurologists, neuropsychologists, pain management specialists, and rehabilitation therapists via video teleconferencing to assist service members in more remote sites.⁵²

Duty restrictions after mTBI vary among the services. RTD status should be based upon the service members symptoms and allow for progressive return to full duty.⁹ The service member may need to restrict some work and other activities to allow for healing and to decrease risk of further injury. When a service member has recovered from symptoms that

TABLE VI. Information Contained in the mTBI Pocket Guide (CONUS)

TBI Basics
A Summary of the CPG
A Management Guide to mTBI
A Management Guide to Headaches
A Management Guide to Other Symptoms: dizziness, fatigue, vision, irritability, appetite changes
DoD ICD-9 Coding Guidance
Cognitive Rehabilitation for mTBI Consensus Conference Clinical Recommendations
Patient Education
Clinical Tools and Resources
Dizziness Handicap Inventory
Epworth Sleepiness Scale
GCS
Multidimensional Assessment of Fatigue
Neurobehavioral Symptom Inventory
Patient Health Questionnaire
PTSD Checklist (PCL-M)
Other Tools
Additional Resources

were previously functionally limiting, exertion testing should be performed.⁹ This includes a brief period of aerobic activity followed by re-evaluation for both physical symptoms and cognitive function. Before full duty status, the service member should be able to

- Pass a physical fitness test
- Pass “warrior training” if needed for duty
- Have psychological health issues controlled and monitored by a primary care clinician
- Have neuropsychological testing that is within functional limits if cognitive impairment was noted after injury.⁹

In 2008, the National Defense Authorization Act HR 4986 was signed into law, which led to the Defense Department to establish a Neurocognitive Assessment Tool (NCAT) program.⁵³ The program establishes and monitors a predeployment neurocognitive battery of tests to assess and document cognitive functioning of service members before deployment. The Automated Neurocognitive Assessment Metrics (ANAM) was the tool chosen by a Defense Department expert consensus panel as an interim program pending further evaluation of other NCATs. The Army Neurocognitive Assessment Branch office has distributed to OEF and OND numerous laptops loaded with ANAM capability for postinjury assessments by theater providers. Following injury, the ANAM can be repeated and compared to the individuals own baseline when considering cognitive function and RTD.^{53,54} It is important to note that the ANAM is not intended to be a diagnostic tool for TBI (as many other conditions may cause decreased cognitive function), but is meant to assist providers in making medical and report-to-duty decisions. Capabilities are developing for web-based access to predeployment ANAM scores, but currently providers in need of an individual’s baseline ANAM to compare with a postinjury assessments should submit the request with demographic information to anam.baselines@amedd.army.mil.

There are numerous opportunities available for more in-depth training regarding mTBI. Some of the learning opportunities available include:

- DVBIC’s Annual Defense and Veterans Military TBI Summit
 - Annual training conference held annually since 2007 in Washington, DC area
- Annual Blast Conference
 - Held annually since 2004 hosted by DVBIC and the James A. Haley Veterans’ Hospital
- TBI modules via Military Health System Learning Portal
 - Defense Department personnel may access online training courses
- Staff lecture series (WRNMMC)

TABLE VII. Resources for TBI Information

Defense Centers of Excellence for Psychological Health and Traumatic Brain Injury (DCoE); http://www.dcoe.health.mil DVBIC; http://www.dvbic.org Deployment Health Clinical Center (DHCC); http://pdheath.mil/TBI.asp The Center of Excellence of Medical Multimedia; http://www.traumaticbraininjuryatoz.org Brain Injury Association of America; http://www.biausa.org Brainline (WETA); http://www.brainlinemilitary.org
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- First Thursday of every month 2 to 3 p.m. (EST)
- Available through tele/video conference
- TBI Grand Rounds
 - Second Tuesday of each month
 - Access via tele/video conference from participating sites

Table VII lists other TBI information resources in addition to those included in this article.

CONCLUSIONS

Since 2006, many initiatives have been implemented to improve care for service members with TBI, specifically mTBI. Surveillance efforts aimed at identifying the incidence and prevalence of combat-related TBI have improved the availability of TBI-specific resources both in-theater and in-garrison. This is largely attributable to enhanced screening methods, which occur at various locations throughout the deployment cycle. Mandated CPGs standardize care and provide both evaluation and treatment recommendations to those on the battlefield as well as stateside. Opportunities for TBI education have expanded, now including regional/national conferences, online case studies, training modules and instruction at some deployment platforms. The evolution of telehealth capabilities allows providers the ability to treat injured service members in-theater, which may minimize the need for evacuation from theater or transfer to major MTF. Finally, ongoing research seeks to identify ways to mitigate blast exposure and effects, determine similarities/differences between blunt and blast TBI, and establish treatment paradigms to enhance TBI care.

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