



**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**

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(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**

## **Introduction**

In December 2006 the first mild TBI (mTBI) acute management algorithms in military operational settings were released as part of a Clinical Practice Guideline (CPG) document. Since then, several memorandums were publicized, algorithm revisions were proposed, and more research has been done. Joint Theater Trauma System (JTTS) and CENTCOM leaders requested an updated version of the 2006 guidelines. The terms mTBI and concussion are used interchangeably in the literature, however, for the purpose of risk communication, concussion is used throughout these recommendations.

The Defense and Veterans Brain Injury Center convened 33 military and civilian subject matter experts on 31 July and 1 August 2008 in Washington, DC. Military representatives were appointed by their respective service branch surgeon general offices. Although participants acknowledged that knowledge gaps exist and that ongoing and future research will further illuminate our understanding of TBI, they recommended updates to the original guidelines that will help medics/corpsmen and providers better care for service members who sustain a concussion. The work groups focused on three areas: 1) diagnosis and evaluation, 2) treatment, and 3) follow-up and return to duty. In addition to reviewing current JTTS, Special Forces/Ranger, and MNC-I algorithms, participants evaluated published literature, considered operational conditions, and held group discussions about relevant issues. The goal was to produce a medic/corpsman and provider specific concussion CPG for use in deployed settings. The term CPG is used in congruence with similar JTTS management recommendations, although it is acknowledged that there are not enough Class I studies to support a formal evidence-based guideline.

## **Operational Tenets**

As stated in the 2006 report, mission requirements may supersede individual member welfare in certain operational environments. Considering operational objectives, risks, and costs as determined by combatant commanders; medic/corpsman personnel are best suited to evaluate casualties and recommend medical disposition (i.e., evacuation to a higher level of care, quarters for 24-72 hours, return to duty with restrictions, or return to full duty). Due to limited availability of neuroimaging and neurosurgical treatment, the small risk of deterioration in patients who present with concussion/ mTBI must also be considered.

## **Methodology**

Three work groups were formulated by specialty of background to include neurologists, psychologists, psychiatrists, general practitioners, neuropsychologists, nurses, trauma surgeons, emergency medicine and medics/corpsmen. Input and discussion was also contributed by providers currently in the deployed setting via teleconference. In addition, special operations forces participated.

Specific topics included: 1) mTBI/concussion diagnosis and evaluation, concentrating on diagnosis, red/amber flags, and initial examination, 2) mTBI/concussion treatment, focusing on education, symptom management, and duty restriction and 3) mTBI/concussion follow-up and return to duty, exertional testing, and neurocognitive testing. Each group used the provided seed questions as a basis for their discussions. Sample questions included:

- What model should be used for the algorithm: provider type, level of care, capabilities, and how many layers/levels?
- Should the MACE performance be split (History from the Standardized Assessment of Concussion {SAC})? What constitutes the neurological exam?
- Improve guidance on headache management – medications, for how long?
- Criteria for return to duty and appropriate duty restrictions.
- Should we recommend a policy on restricting duty after several concussions?

Recommended revisions were made based on current literature, knowledge of operational conditions, consensus expert clinical experience and best practice reports from theater.

## **Evaluation and Management of Concussion in the Deployed Setting**

### **Treatment of concussion in the deployed setting**

Treatment can be organized into four different areas: symptom management, rest/return to duty guidance, educational initiatives and supportive therapies. There are no clear randomized trials supporting therapy for mTBI/concussion. Furthermore, few treatments specific to concussion have substantial supporting evidence (Comper et al., 2005). The strongest evidence regards the efficacy of educational interventions (Ponsford et al., 2002). The following consensus based recommendations are established using the available literature and expert clinical experience of an inter-disciplinary workgroup.

#### *Education*

Providing an educational intervention has demonstrated a reduction of symptoms in the civilian population with mTBI (Von Holst et al., 2004; Ponsford et al., 2002). An education sheet with instructions specific to combat environments should be distributed to all concussion patients as well as commanders and squad leaders. The command sheet should outline specific duty recommendations and restrictions to assist in duty assignments and ensure the safety and welfare of the unit (see attached Concussion Patient Information Sheet). A model highlighting the expectation of recovery should be offered in this educational process.

## *Headache Management*

- Acutely, use acetaminophen
- Avoid the use of tramadol, NSAIDs, ASA, or other platelet inhibitors for the first forty-eight hours or until neuroimaging demonstrates the absence of intracranial pathology.
- Avoid narcotics as these are not indicated for the management of post-traumatic headaches.
- After 1 week, consider nortriptyline or amitriptyline, 25mg po qhs for headaches occurring > 2 times/week. It is recommended that only 7-10 pills are dispensed at a time.

## *Return to Duty*

A concussed patient should not return to unrestricted duty until asymptomatic. Once concussion symptoms abate, exertional testing should be performed. Exertional testing may include sit-ups, push-ups, running in place, or other exercise. Further guidance regarding exertional testing, including target heart rate parameters is provided in the CPG. If symptoms, including cognitive difficulties return with exertion, continued observation is warranted. Re-testing should be performed periodically (see attached Considerations for Duty Restrictions and TBI Exertional Testing Procedure).

## **Assessment and Treatment of Acute Mild TBI**

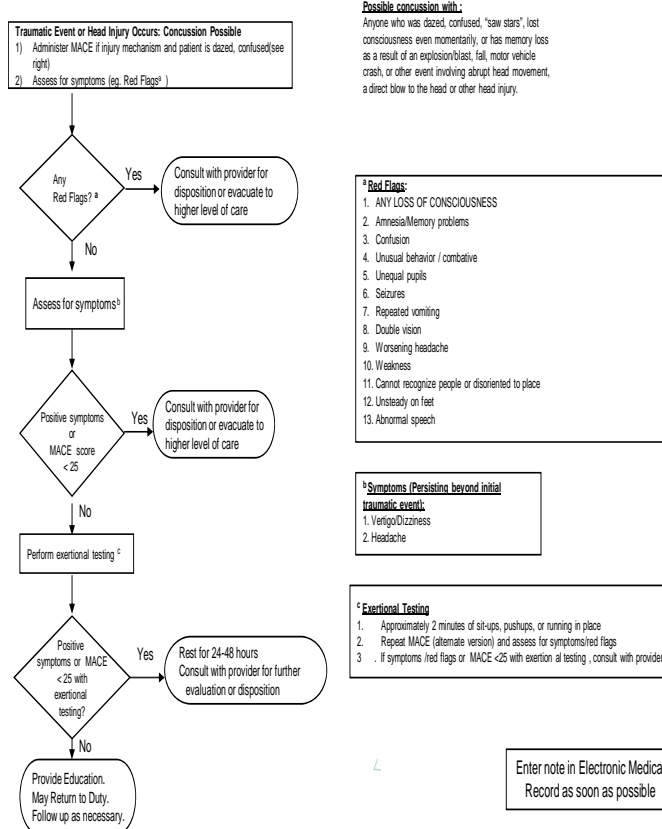
The following three algorithms, offered as clinical practice guidelines, should not be interpreted as a substitute for sound clinical judgment. The Military Acute Concussion Evaluation (MACE) serves as a standardized tool for the evaluation of symptoms and cognitive deficits that may follow concussion. MACE scores do not diagnose concussion. Concussion remains a clinical diagnosis.

Based on reports that the initial version of the MACE was memorized by Service Members, alternate versions of the MACE have been developed, deployed, and are available for immediate use. All algorithms in the CPG rely on utilization of at least two versions of the MACE.

Concerns regarding the appropriate evaluation or management in cases of known or suspected concussion can be directed to [tbi.consult@us.army.mil](mailto:tbi.consult@us.army.mil). TBI experts will review the case and offer recommendations within twenty-four hours. This resource is similar to other available DoD e-consultations such as [derm.consult](#) or [neuron.consult](#).

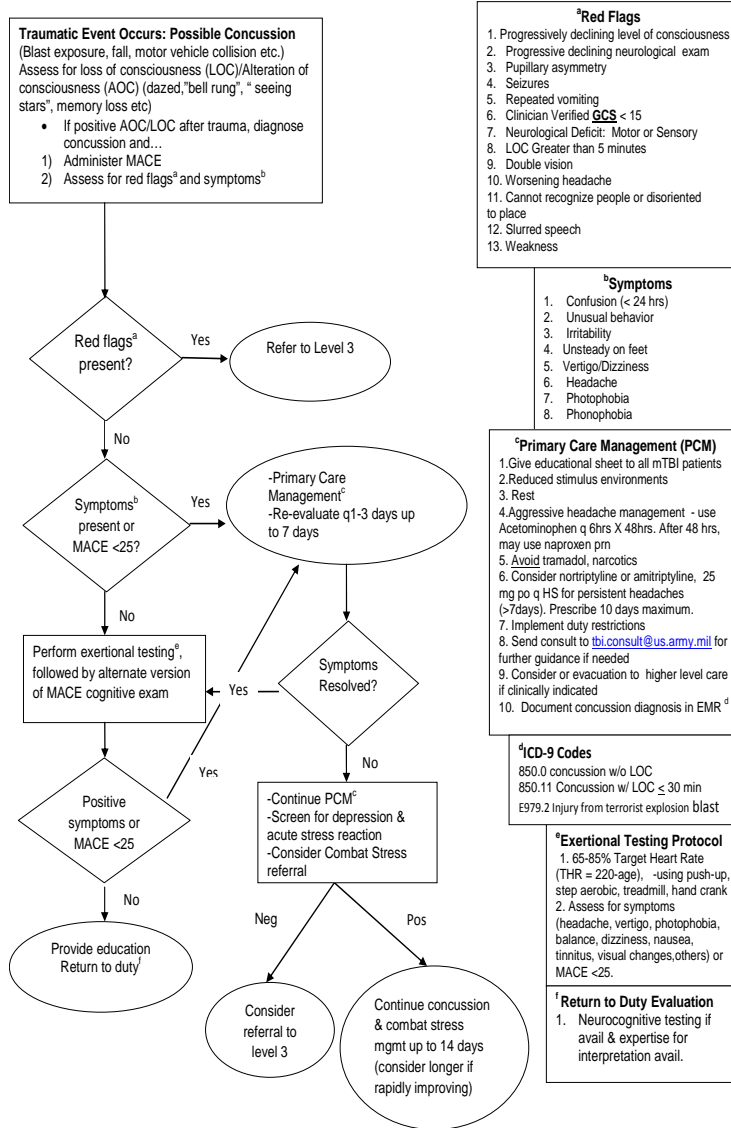
As with any CPG, these are tools and guidance for the clinician. Clinician judgment with regard to evaluation and management should prevail. Operational and tactical considerations may, in some instances, override the CPG.

## Combat Medic/Corpsman Concussion (mild TBI) Triage (Pre-Hospital/No medical officer in the immediate area)



*Intent: With limited resources, the medic/corpsman must make swift decisions regarding concussions. The goal is to assess for red flags quickly and if a service member is found to require further consultation, the medic/corpsman is given guidance to further discuss the injury with a provider.*

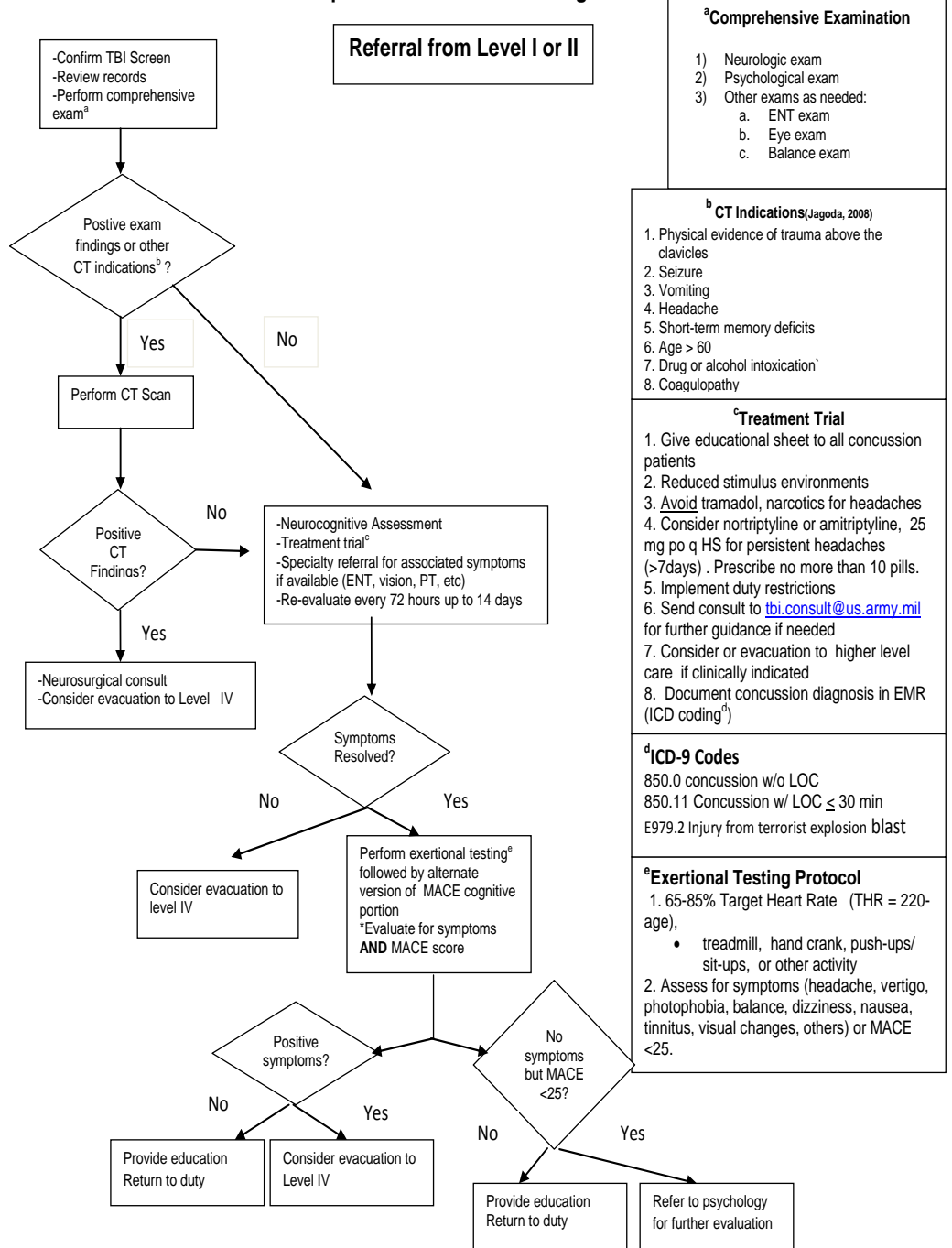
## Initial Management of Concussion in Deployed Setting



Enter note in Electronic Medical Record as soon as possible

*Intent: Definitive assessment and care is given by providers to include a more detailed assessment, management recommendations and consideration for evacuation to a higher level of care.*

# Comprehensive Concussion Algorithm



### <sup>a</sup>Comprehensive Examination

- 1) Neurologic exam
- 2) Psychological exam
- 3) Other exams as needed:
  - a. ENT exam
  - b. Eye exam
  - c. Balance exam

### <sup>b</sup>CT Indications(Jagoda, 2008)

1. Physical evidence of trauma above the clavicles
2. Seizure
3. Vomiting
4. Headache
5. Short-term memory deficits
6. Age > 60
7. Drug or alcohol intoxication
8. Coagulopathy

### <sup>c</sup>Treatment Trial

1. Give educational sheet to all concussion patients
2. Reduced stimulus environments
3. Avoid tramadol, narcotics for headaches
4. Consider nortriptyline or amitriptyline, 25 mg po q HS for persistent headaches (>7days). Prescribe no more than 10 pills.
5. Implement duty restrictions
6. Send consult to [tbi.consult@us.army.mil](mailto:tbi.consult@us.army.mil) for further guidance if needed
7. Consider or evacuation to higher level care if clinically indicated
8. Document concussion diagnosis in EMR (ICD coding<sup>d</sup>)

### <sup>d</sup>ICD-9 Codes

- 850.0 concussion w/o LOC
- 850.11 Concussion w/ LOC ≤ 30 min
- E979.2 Injury from terrorist explosion blast

### <sup>e</sup>Exertional Testing Protocol

1. 65-85% Target Heart Rate (THR = 220-age),
  - treadmill, hand crank, push-ups/sit-ups, or other activity
2. Assess for symptoms (headache, vertigo, photophobia, balance, dizziness, nausea, tinnitus, visual changes, others) or MACE <25.

Intent: Additional resources available at Level III facilities allow further evaluation & more comprehensive management for those patients with persistent symptoms.

Enter note in Electronic Medical Record as soon as possible

## Concussion Information Sheet

### What is a concussion?

A concussion, sometimes called a mild TBI, is an injury that is caused by a blow or jolt to the head that briefly knocks you out (loss of consciousness) or makes you confused or “see stars” (change in consciousness, getting your “bell rung”). In combat, concussions are usually caused by an explosion, fall, direct impact, or motor vehicle crash. Some, but not all, persons with a concussion lose consciousness.

### Why is this important?

Often after a concussion service members think they are OK, yet a concussion may affect your ability to perform at your best. You should seek medical treatment from the nearest aid station as soon as possible after any injury where there may be a chance of a concussion. Your provider will help decide when it is safe for you to return to duty. It is important that your provider decides this; because if you get another concussion before healing from the first one, you may be at greater risk for a more serious injury.

### What are the symptoms associated with concussion?

Headache	Nausea/Vomiting	Dizziness
Fatigue/Excessive tiredness	Insomnia/Drowsiness/Sleep disturbances	Difficulty remembering
Sensitivity to noise and light	Vision changes/blurred vision	Confusion
Difficulty concentrating	ringing in the ears	Loss of balance
		Irritability

It is common to have some of the symptoms listed above for a brief period of time after a concussion. Symptoms of concussion usually go away quickly, often within a few minutes to hours. However, if symptoms persist or do not improve within 24 hours, seek medical treatment.

### How is concussion diagnosed?

A concussion diagnosis is based on specific circumstances of your injury, your symptoms at the time of injury, and an examination. Your provider may use the Military Acute Concussion Evaluation (MACE) to guide his/her assessment. The MACE also includes measures of memory and concentration to see if there are any effects from your concussion. Physical exertion may also be included in your evaluation.

### Does medicine help?

The treatment for concussion is limited duty and rest. If you have a headache, you can usually take acetaminophen (brand name: Tylenol). Non-steroidal medications like aspirin and ibuprofen (Advil, Motrin) may increase the risk of bleeding; therefore these medications should only be taken upon the advice of a medical provider. Narcotics may cause significant sedation and interfere with your ability to perform; therefore narcotics like hydrocodone (Vicodin) or oxycodone (Percocet) should be avoided unless you have another medical reason to take them. Over-use of any of these medicines may lead to rebound headaches, making you feel worse.

## Warning Signs

Certain signs and symptoms of a concussion require immediate care. If you experience any of the following go **immediately** to the nearest aid station or emergency room, at any time of day or night.

Progressively declining level of alertness  
Seizures  
Double vision  
Slurred speech  
Unable to recognize people and places

Unequal pupils  
Repeated vomiting  
Worsening headache  
Weakness or numbness in arms or legs  
Unsteadiness on feet

## When can I return to duty?

After your medical check-up, you may be given a short period of duty restrictions to give you time to heal. If your concussion was very mild, you may be allowed to return to duty immediately. You should not return to full duty until the symptoms of concussion, like headache or dizziness are gone. It's important to let your provider help decide when it's time to return to duty.

## Are there any lasting effects to a concussion?

Almost all people recover completely following a concussion. If you have had multiple concussions, you may have a longer recovery time. Even if you've had more than one concussion during deployment, recovery is expected.

## What else should I know about my recovery?

### DO

- Get plenty of sleep
- Return to normal activities gradually, not all at once.
- Drink plenty of fluids. Dehydration may aggravate your symptoms.

### DON'T

- Do not overexert yourself.
- Until you are better and cleared by a medical provider, avoid activities such as contact or recreational sports that could lead to another injury or concussion. Remember to wear helmets, safety belts, and other personal protective equipment.
- Do not drink alcohol; it may slow your brain recovery and put you at further risk of injury.

## Considerations for Duty Restriction

The following should be considered when prescribing duty restrictions. Tactical settings should be considered when stipulating functional limitations.

### Safety-related

- Quarters for 24 hours
  - Do not leave base camp for duration of limited duty
- No airborne operations
- May carry weapon
- Identify a nearby battle buddy/wingman who can periodically check up on you or who you can contact for assistance

### Functional limitations

- Maximum lifting or carrying: 48 pounds up to one mile, to include fighting load (helmet, boots, uniform, LBE, weapon, protective mask, pack etc.)
- No close combat maneuvering unless cleared by medical or necessary for safety.
- No impact activities
- No prolonged standing >20 minutes in formation.

# **TBI Exertional Testing Procedure**

Created and implemented May 2007 by Landstuhl Regional Medical Center

1. History
2. Assess history of adequate brain imaging
3. Achieve 65% - 85% of Target Heart Rate (THR)
  - a.  $THR = 220 - Age$
  - b. Exertion Testing minimum goal =  $0.65(220 - age)$  bpm
  - c. Does not need to be sustained, but must reach the goal
4. Methods
  - a. Capability determined, monitored heart rate
  - b. Maximum push-up effort as fast as possible
  - c. Step aerobic to metronome
  - d. Run on treadmill or in place x 5 minutes
  - e. Hand crank maximum effort as fast as possible
5. Assess for symptoms immediately upon reaching goal
  - a. Headache
  - b. Vertigo
  - c. Photophobia
  - d. Balance problems
  - e. Nausea
  - f. Tinnitus
  - g. Dizziness
  - h. Visual changes
6. Administer MACE (Military Acute Concussion Evaluation)
  - a. Memory
  - b. Orientation
  - c. Concentration
  - d. Neurologic Brief Exam
  - e. Delayed Recall
  - f. Total Score
7. Assess for symptoms produced by bright light shined in the eyes
8. Assess for symptoms produced by loud noise (i.e. dropping book on floor/desk)

## Accessing Consultation Services

TBI Specialists are available to answer any questions or concerns you may have related to TBI screening, assessment, symptom management, return to duty, and all aspects of this guidance.

For assistance please e-mail [tbi.consult@us.army.mil](mailto:tbi.consult@us.army.mil)

\* Available to military healthcare providers in all service branches from any location

**Instructions:** [tbi.consult@us.army.mil](mailto:tbi.consult@us.army.mil)

Send de-identified history and physical to the above email. Information should include:

- Description of traumatic event to include mechanism of injury and time since injury
- Relevant medical history and physical findings
- MACE score if known
- Symptoms experienced
- Any treatment to date (if any)

General concerns related to TBI assessment and care are also accepted.

An interdisciplinary team will review consult and respond via email within twenty-four hours (average response time is 5 hours).

Typical requests involve symptom management, evacuation needs, and concerns regarding additional work-up. However, any request will be addressed. Repeat and follow-up consultation is encouraged.

Similar e-consultation services are available from other clinical services to include neuron.consult.

### **Additional Future Discussion Points Identified by Workgroups:**

- Potential use of DoD medical facilities near hostile areas of responsibility as recovery centers to allow injured service members likely to improve given the ability of these facilities to continue recovery for up to thirty days.
- Identify methods for data capture across the multiple electronic records to ensure continuity of communication and care.
- Provide consultation to Personnel and Manpower departments to assist with criteria for Purple Heart decoration as requested.
- Discussion of Acute Stress Reaction and TBI overlay.
- Convene subgroup to address comprehensive neuropsychological testing to occur at Level III facilities and to clarify the role of automated neurocognitive testing (NCAT) in theater.
- Revise the MACE to incorporate red flags, and clarify instructional verbage.
- Investigate the vestibular complaints associated with concussion and determine appropriate screening test.
- Extend current efforts to reduce likelihood that the MACE is memorized by service members.

### **Recommendations for Action from Workgroup:**

- Incorporate training for the proper use of clinical practice guidelines to include the MACE to all deploying medical assets.
- Create mechanism to collect operational data on the use and efficacy of the CPG in the deployed setting to facilitate evaluation and future revisions of the CPG.
- Make use of [tbi.consult@us.army.mil](mailto:tbi.consult@us.army.mil) which offers case- specific diagnostic, assessment, and management responses from TBI Subject matter experts.
- Develop DD Forms for recording duty restrictions to facilitate accurate recording and interpretation of limitations across the service branches.
- Develop an in-theater support team or officer that can provide guidance to deployed general medical officers. Barriers to utilization of the CPG may be identified through this team or officer.

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