Today’s Webinar is:

Concussion Management in the Deployed Setting: New 2012 Military Acute Concussion Evaluation (MACE) and Clinical Algorithms

July 26, 2012
1-2:30 p.m. (EDT)
Concussion Management in the Deployed Setting: New 2012 Military Acute Concussion Evaluation (MACE) and Clinical Algorithms

DCoE Monthly Webinar, July 26, 2012

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Question-and-answer session
- Submit questions via the Adobe Connect or Defense Connect Online question box
Agenda

- Welcome and Introduction
- Presentations: Concussion Management in the Deployed Setting: New 2012 MACE and Clinical Algorithms
  - Helen C. Coronel, MSN
    - MACE Training: Administration, Use and Interpretation of the MACE
  - Maj. Sarah B. Goldman, Ph.D., OTR/L, CHT
    - Concussion Management in Deployed Settings: 2012 Critical Updates
- Question-and-answer session/discussion
Concussion Management in the Deployed Setting: New 2012 MACE and Clinical Algorithms

- Mild traumatic brain injury, also known as concussion, is the most common form of TBI sustained in the military. Unlike a severe or moderate TBI, mild TBI may not be easily identified.

- Recognizing the importance for early detection, the Defense Department developed the Military Acute Concussion Evaluation, a standardized clinical interview for assessing concussion in a deployed setting.

- Used in conjunction with clinical judgment, MACE and the Concussion Management in Deployed Settings clinical algorithms take approximately 10 minutes to administer, assisting health care providers in proceeding with the cognitive screening, symptom screening and neurological evaluation. In 2012, MACE and the clinical algorithms were significantly redesigned.

- This webinar will review the new 2012 MACE and clinical algorithms.
Helen C. Coronel, MSN
Neuroscience Clinician
Defense and Veterans Brain Injury Center
Required Disclosure

I have no relevant financial relationships and do not intend to discuss the off-label/investigative (unapproved) use of commercial products/devices.
Military Acute Concussion Evaluation (MACE) Training

Administration, Use and Interpretation of the MACE (Release 02/2012)
Learning Objectives

- Identify events mandating MACE administration
- Effectively administer the MACE
  - Concussion screening
  - Cognitive exam
  - Neurological exam
  - Symptom screening
- Accurately summarize and document MACE findings
- Identify and avoid common problems in MACE administration
Presentation Guidance

- This presentation is best reviewed with a copy of the “Concussion Management in Deployed Settings” and MACE pocket cards in hand.
What is the MACE?

- The required tool for assessing concussion in the deployed setting
- A standardized clinical interview and examination for concussion:
  - Takes approximately 10 minutes to administer
  - Helps determine whether or not a concussion occurred and guides the initial assessment
Additional MACE Guidance

- The MACE is an acute concussion screening and assessment tool used when there are no emergent conditions requiring immediate evacuation.

- Consistent administration of the MACE in the proper sequence is crucial to obtaining accurate results.

- The MACE should always be used in conjunction with clinical judgment and other clinical tools such as the "Concussion Management in Deployed Settings" algorithms.

- Factors such as sleep deprivation, medications or pain may affect MACE cognitive scores.
2012 MACE Highlights

- Significantly redesigned to improve usability
- Embedded tips and key questions guide MACE administration
- Includes additional word and number lists to help prevent memorization
- Results of concussion screening (questions 1 and 2) determine whether to stop or continue the MACE
- Neurological exam revisions facilitate proper administration
- Contains four sections, three of which are scored
2012 MACE Format: Orientation to the MACE Cards

- Revised MACE card design facilitates greater ease of use:
  - Black text → action
  - Gray text → helpful hint

- Key questions and assessment tips are typically embedded on the right side of the card
2012 MACE Format: Orientation to the MACE Cards

- Choose one list (A-F) and use that list for the remainder of the MACE
  - The list is color coded for easier use
  - Begin with the newer lists (C, D, E) when possible

- The selected list should be circled or otherwise documented with MACE results
Screening for Concussion
Identifying Concussion

- Per Defense Department (DoD) definition, a concussion occurs when two conditions are met:
  - an injury event
  - AND at least one of the following
    - an alteration of consciousness (AOC) lasting < 24 hours
    - a loss of consciousness (LOC) lasting for < 30 minutes
    - posttraumatic amnesia (PTA) or memory loss that lasts for < 24 hours because of the injury event


- MACE questions 1 and 2 help obtain the above information
Concussion Screening: Question 1

- Questions 1A-C establish details of the current incident, including:
  - Description of the event
  - Cause of injury
- Use open ended key questions to avoid yes or no answers
Questions 2A-C determine if there was alteration/loss of consciousness or memory:
- Was there AOC?
- Was there LOC?
- Was there PTA?
- Reminder: use the key questions if the service member provides yes or no answers

For each positive response, determine the length of time the service member was affected

Question 2D
- Confirm 2A-C with a witness, if available
Determining when to Continue Administering the MACE

- If the Service member did sustain a head injury (1C) and had either AOC (2A), LOC (2B) or PTA (2C)
- Then the green box on page 2 indicates to complete the entire MACE:
  - Cognitive exam
  - Neurological exam
  - Symptom screening
Determining when to Stop Administering the MACE

- If the service member did not sustain a head injury (1C) AND did not have AOC (2A), LOC (2B) or PTA (2C)
- Then the red box on page 2 indicates to stop the MACE and also:
  - Evaluate for other injuries
  - Document negative screening into electronic medical record (EMR) and use ICD-9 code V80.01
  - Communicate results to both provider and line commanders
  - Review concussion history and refer for appropriate down time
Questions?
Conducting the MACE Cognitive Exam
Part I: Orientation and Immediate Memory
Cognitive Exam: Alternate Word Lists

- Because of extensive memorization of word list A, the revised MACE contains a total of six word lists
  - Encourage use of the newest word list first (D, E or F)
  - Word lists are color-coded to correspond with number lists A-F that will be administered later in the cognitive exam

- As a reminder, use the same word and number lists (matching color and letter) throughout the MACE
Cognitive Exam: Orientation

- The first portion of the cognitive exam assesses orientation
- Score one point per correct answer, for a max score of five
- **Red flag:** If a service member cannot recognize people or is disoriented to place, immediately consult a provider
Cognitive Exam: Immediate Memory Testing

- Read the script as written in question 4
- All three trials are required even if all answers are correct on trials 1 and 2
- Award one point for each correct word recalled, for a max score of 15
- Read the words at a rate of one per second

4. Immediate Memory

Trial 1 Script:
- “I am going to test your memory. I will read you a list of words and when I am done, repeat back to me as many words as you can remember, in any order.”

Trials 2 and 3 Script:
- “I am going to repeat that list again. Repeat back to me as many words as you can remember, in any order, even if you said them before.”

<table>
<thead>
<tr>
<th>List</th>
<th>Trial 1</th>
<th>Trial 2</th>
<th>Trial 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dollar</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Honey</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Mirror</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Saddle</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Anchor</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

IMMEDIATE MEMORY TOTAL SCORE

15

Immediate Memory Alternate Word Lists

List E: Jacket, Arrow, Pepper, Cotton, Movie
List D: Finger, Penny, Blanket, Lemon, Insect
List C: Baby, Monkey, Perfume, Sunset, Iron
List B: Candle, Paper, Sugar, Sandwich, Wagon
List A: Elbow, Apple, Carpet, Saddle, Bubble

Release 02/2012 info@dvbic.org Page 3 of 8
Conducting the MACE Neurological Exam
Neurological Exam

- The neurological exam is strategically placed in the middle of the cognitive exam
  - This allows time to pass to accurately assess delayed recall
  - Reminder: always conduct the MACE in this order

- Changes to the neurological exam include:
  - Embedded tips for guiding the assessment in gray text
  - Tandem Romberg test for assessing balance
Neurological Exam: Eyes

Assess the pupils for:

- Size
  - Should be equal
  - Normal is 2-6 mm
- Shape
  - Should be round
- Reactivity to light
  - Responsive
    - Gets smaller with bright light
    - Becomes larger in dim light (or the dark)
  - Normal is a brisk response to a change in light

Tracking (extraocular movement)

- Check eye movement to all areas “H test”
- Ensure eyes are moving together
- Note if the head tilts and/or any abnormal eye movements (nystagmus)
Neurological Exam: Speech

- Speech assessment occurs throughout the MACE
- Abnormal speech can be noted during conversation with the service member
- Ask the service member to repeat a sentence or name an object in view

6. Speech
Test speech fluency and word finding

- Normal
- Abnormal

Tips for assessment:
- Speech should be fluid and effortless – no pauses or unnatural breaks.
- Assess difficulties with word finding:
  - Does service member have trouble coming up with the name of a common object?
Neurological Exam: Motor

7. Motor
Test grip strength and pronator drift

- Normal
- Abnormal

Tips for assessment:
- Assess grip strength.
- Assess for pronator drift for 5-10 seconds by directing patient to close eyes and extend arms forward, parallel to the ground with palms up:
  - Does either palm turn inward?
  - Does either arm drift down?

Grip strength should be equal on both sides

Assess for pronator drift

- Instruct the service member to close their eyes and stretch their arms out in front of them:
  - Level and parallel to the ground
  - Fully extended with the palms facing straight up
- Observe both arms for 5-10 seconds to see if either:
  - Palm turns inward (pronation) or
  - One arm drifts down so that it is no longer even with the other extended arm
Neurological Exam: Balance

- Revised MACE includes a balance assessment called the Tandem Romberg Test
  - With eyes closed, have service member stand heel-to-toe
  - Arms position could be extended with palms up, or resting by the sides
- Observe for 5 to 10 seconds for any shuffling or stumbling

8. Balance
Tandem Romberg Test

- Normal
- Abnormal

Tips for assessment:
- Have patient stand with eyes closed, one foot in front of the other heel-to-toe, arms extended forward, palms up. Observe for 5-10 seconds:
  - Does the service member stumble or shift feet?
Neurological Exam: Scoring

- Results of the full Neurological exam will either be **normal** or **abnormal**
Conducting the MACE Cognitive Exam

Part II: Concentration and Delayed Recall
Cognitive Exam: Concentration Overview

- *Reverse Digits* is the section most likely to be administered incorrectly
- Utilize the same color list (A-F) used in the immediate memory section
- Read the script as written in question 9
- Read the digits at a rate of one per second
- Do not group the digits in any way
- Service members are allowed two attempts at each string length (trial 1 and trial 2)
Cognitive Exam: Concentration cont’d

- Read the first number string: “2-7-1”
  - A correct response would be: “1-7-2”

- If incorrect on the 1st string length
  - Go to Trial 2 of the same string length
  - Read the number string: “4-7-9”
  - Score determined after 2nd attempt

- If correct on 1st or 2nd attempt at the string length:
  - Award one point for that string length
  - Move to Trial 1 of the next string length, in this case: “1-6-8-3”

- If both attempts at a string length are incorrect, STOP and record a zero for that string length AND all remaining lengths
Cognitive Exam: Concentration cont’d

- The *Months in Reverse Order* question also contains a script to guide the provider clearly through the section.

- Award a point only if the entire sequence is repeated back in order.

- Score question 9a & 9b
  - 9a can receive max of 4
  - 9b only 1 point for correct answer
  - Max concentration score of 5
Cognitive Exam: Delayed Recall

- The final component of the cognitive exam is to revisit the same word list used in question 4
- Do NOT repeat the word list
- Do NOT indicate the number of words in the list
- DO read the script and request the service member recall as many words from that list and say them in any order
- For each word remembered, assign one point, for a max score of 5
Screening for Symptoms
Symptom Screening

- Screen for common symptoms associated with concussion
- Symptoms are either present or not
- Reporting symptoms:
  - Symptoms absent = A (no symptoms)
  - Symptoms present = B (one or more symptoms)
Questions?
Scoring & Documenting the MACE Results
Calculating the Results

- New summary box guides provider through scoring
- Cognitive summary scoring and results = \[ \frac{30}{30} \]
- Neurological results =
- Symptom results =
- MACE results will yield a three-part CNS score:

For those who stop at the red box on page 2, report the score as N/A, with appropriate ICD-9 screening code.
Coding Pearls

- DoD policy requires that both screenings and diagnosed concussions must be documented in the EMR

- The 2012 MACE includes ICD-9 coding tips

**Coding Tips for Concussion:**

1. Primary Code (Corpsmen/Medics require co-sign)
   - 850.0 – Concussion without LOC
   - 850.11 – Concussion with LOC ≤ 30 min.
2. Personal history of TBI in Global War on Terror (GWOT)
   - V15.52_2 – Injury related to GWOT, Mild TBI
3. Symptom codes
   - As appropriate
4. Deployment Status Code
   - V70.5_5 – During deployment encounter
5. Screening code
   - V80.01 – Special screening for TBI code
6. E-code (external cause of injury)
   - E979.2 (if applicable) – Terrorism involving explosions and fragments

- If recorded on AHLTA-mobile or MACE module in AHLTA-T, then documentation with appropriate codes are automatically captured in the EMR
How to Code MACE Results

● Example #1 (No concussion)
  – *While out on patrol, the unit corpsman is called to evaluate a Marine who was 50 meters away from an improvised explosive device blast. The Marine has minor lacerations to his hands and face from taking cover.*
  – After asking questions 1 and 2 of the MACE, the corpsman stops at the bottom of page 2 because the Marine denied feeling the blast wave and did NOT have AOC, LOC or PTA.

● This encounter is documented/coded as:
  1. MACE score = N/A
  2. Screening code V80.01
How to Code MACE Results

- Example #2 (Concussion)
  - A Soldier presents to medical after his MRAP rolled over in extremely harsh terrain. While he didn’t sustain any injuries requiring urgent treatment, he is complaining of a headache and his platoon leader reports that he was “acting funny.”
  - After performing the MACE and using the deployed medic algorithm and noting a score of 24/Green/B, code this initial encounter as:

- This encounter is documented/coded as:
  - **Primary diagnosis:**
    - 850.00 Concussion without LOC
  - **Secondary diagnoses:**
    - V15.52_2 Personal history of TBI, GWOT related, mild
    - 784 Headache
    - V70.5_5 During deployment encounter
    - V80.01 Special screening for TBI
    - E979.2 Terrorism involving other explosions/fragments
Using the MACE to Guide the Algorithms
Concussion History

- At the conclusion of the MACE, review the service member’s concussion history during the past 12 months
  - The information obtained from question 12 will impact rest/recovery times
  - Refer to the “Concussion Management in Deployed Settings” cards for managing first, second or third concussions sustained within a 12-month period

CONCUSSION HISTORY IN PAST 12 MONTHS
12. During the past 12 months have you been diagnosed with a concussion, not counting this event?

- [ ] YES  - [ ] NO
If yes, how many? _______

Refer to Concussion Management Algorithm for clinical care guidance.
MACE Cognitive Score <25

- The revised “Concussion Management in Deployed Settings” cards require provider consultation for a cognitive score of <25 or the presence of symptoms.

- In studies of non-concussed subjects, the mean total cognitive score = 28.

- Therefore, a cognitive score <30 does not necessarily indicate that concussion has occurred.
Additional Resources

- The following websites contain additional TBI training for Providers, Medics/Corpsmen, Commanders, and service members
  - Army Training Network (https://atn.army.mil)
  - Navy Knowledge Online (https://wwwa.nko.navy.mil/)

- Additional TBI educational materials available
  - Defense & Veterans Brain Injury Center (www.dvbic.org)
  - Defense Centers of Excellence for Psychological Health and Traumatic Brain Injury (www.dcoe.health.mil)

- New MACE and Concussion Management Algorithm cards have been issued as of 2012
  - Contact info@DVBIC.org to request cards
Questions?
Throughout the webinar, you are welcome to submit questions via the Adobe Connect or Defense Connect Online question box located on the screen.

The question box is monitored during the webinar, and questions will be forwarded to our presenters for response during the question-and-answer session of the webinar.

Our presenters will respond to as many questions as time permits.
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Army TBI Program Director
Office of the Surgeon General, Rehabilitation and Reintegration Division
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Learning Objectives

- Review critical changes to 2012 clinical algorithms for concussion/mild traumatic brain injury (mTBI) management in the deployed setting
- Describe factors that prompt provider consultation or referral to higher level of care
- Examine specific protocols for anyone sustaining two or more concussions within 12 months
- Discuss concussion care policy to include recurrent concussion and implication for return to duty (RTD)
2012 Key Updates

- Current version 4.0
- Formatting updated to improve usability
- Guidance regarding:
  - Neurocognitive Assessment Tool (NCAT)
  - Balance Error Scoring System (BESS)
  - ICD-9 Coding
- Military Acute Concussion Evaluation (MACE) also updated in 2012
Combat Medic/Corpsman Algorithm

Revisions to Algorithm 1
Key Updates to Combat Medic/Corpsman Algorithm

- Clarifies role of provider consultation
- Provides guidance for medic/corpsman initial management
- Emphasizes concussion history and subsequent action for two or more concussions
Consult with Provider Prior to Evacuation

- Advises consultation with a provider, when appropriate, to determine the need for evacuation

- This may occur if:
  - Red flags
  - Abnormal neurological exam
Medic/Corpsman Initial Management

- When concussion symptoms exist, medic/corpsman proceed with initial management under provider supervision
- Card S1 guides medic/corpsman initial management (superscript D)

**Medic/Corpsman Initial Management of Concussion:**

1. Give acute concussion educational brochure to all concussion patients, available at: [www.DVBIC.org](http://www.DVBIC.org)
2. Reduce environmental stimuli
3. Mandatory 24-hour recovery period
4. Aggressive headache management
   - Use acetaminophen q 6 hrs x 48 hrs
   - After 48 hours may use naproxen prn
5. Avoid tramadol, Fioricet, excessive triptans and narcotics
Concussion History

- Revised algorithms place emphasis on assessing the current incident and reviewing history of previous concussions.
- Additional actions are required if the service member has a history of two or more concussions.
Questions?
Initial Provider Algorithm

Revisions to Algorithm 2
Key Updates to Initial Provider Algorithm

- Expands upon concussion management procedures
- Provides guidance on NCAT testing
- Clarifies length of primary care management
Clarifying Concussion Management

- Expanded guidance for concussion management procedures applied when symptoms of concussion are present or MACE cognitive score < 25

- Courses of action include:
  - Mandatory 24-hour recovery period
  - Review acute concussion education brochure
  - Primary care management
  - Re-evaluate daily up to seven days
  - Perform exertional testing
  - Consider NCAT
NCAT Recommendation

- Consider post-injury NCAT (e.g., Automated Neuropsychological Assessment Metrics (ANAM) or ImPACT) prior to RTD
- NCAT recommendation on card S3 (superscript J) provides guidance for administering a post-injury ANAM
- Full clinical recommendation for post-injury NCAT testing is available at: www.DVBIC.org

**DCoE NeuroCognitive Assessment Tool (NCAT) Recommendation:**
Current DoD policy is that all service members must be tested with a neurocognitive assessment tool (NCAT) prior to deployment. Among several tests that are available, the DoD has selected the Automated Neuropsychological Assessment Metrics (ANAM) as the NCAT to use for both pre-deployment baseline testing and for post-concussion assessment in theater. Detailed instructions for administering a post-injury ANAM are provided at www.DVBIC.org.
Length of Primary Care

- Provider may continue with primary care, including concussion and stress management, for up to 21 days
- If not improving, evacuate to higher level of care

Available Resources (www.DVBIC.org):
- Acute Stress Reaction Questionnaire
- Acute Concussion Educational Brochure
- Neurobehavioral Symptom Inventory
- Line Leader Fact Sheet
- Coding Guidance
- DCoE NeuroCognitive Assessment Tool (NCAT) Recommendation
Comprehensive Concussion Algorithm

Revisions to Algorithm 3
Key Updates to Comprehensive Concussion Algorithm

- Refines decision-making criteria for obtaining a CT scan
- Provides clarification on when to consider NCAT or functional testing
- Recommends primary care re-evaluation at least every 48 hours for up to 30 days
CT Scan Guidance

- Clarifies guidance for obtaining a CT scan shown on card S3 (superscript K)

**S3**

**K** CT Indications:

1. Physical evidence of trauma above the clavicles
2. Seizures
3. Vomiting
4. Headache
5. Age > 60
6. Drug or alcohol intoxication
7. Coagulopathy
8. Focal neurologic deficits

NCAT and Functional Assessment Guidance

- Consider post-injury NCAT and functional assessment if no symptoms exist following exertional testing
- Superscripts J and L include detailed guidance for these assessments

**Functional Assessment:**
Assess the service member's performance of military-relevant activities that simulate the multi-system demands of duty in a functional context. Selected assessment activities should concurrently challenge specific vulnerabilities associated with mTBI including cognitive (such as executive function), sensorimotor (such as balance and gaze stability), and physical endurance. Rehabilitation providers should not only evaluate the service member's performance but also monitor symptoms before, during and after functional assessment.
Regular Re-evaluation

- Provider must ensure service member is re-evaluated at least every 48 hours for up to 30 days.
- Consider evacuation to higher level of care if no improvements noted during re-evaluation.
Recurrent Concussion Evaluation Algorithm

Revisions to Algorithm 4
Key Updates to Recurrent Concussion Evaluation Algorithm

- Includes parameters for performing the balance assessment listed on card S3 (superscript M)

**The Balance Error Scoring System (BESS - Modified):**

Stand on flat surface, eyes closed, hands on hips in 3 positions:
1. On both feet (20 seconds)
2. On one foot (20 seconds)
3. Heel-to-toe stance (20 seconds)

For each position, score 1 point for any of the following errors:
1. Stepping, stumbling or falling
2. Opening eyes
3. Hands lifted above the iliac crests
4. Forefoot or heel lifted
5. Hip moved > 30 degrees flexion or abduction
6. Out of test position > 5 seconds

Score 10 points if unable to complete

Total Balance Score __________________________

Key Updates to Supplemental (S) Cards

- Cards S1-S4 offer supplemental information on superscripts listed in cards 1-4
- Additional content includes:
  - Medic/corpsman initial management
  - Definition of concussion
  - Expanded coding guidance
  - Key algorithm directives
  - MACE documentation guidance
  - Repeat MACE tips
  - Functional assessment
  - BESS
Additional Resources

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- Additional TBI educational materials available
  - Defense & Veterans Brain Injury Center (www.dvbic.org)
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Questions?
Question-and-Answer Session

- Submit questions via the Adobe Connect or Defense Connect Online question box located on the screen.
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Resources for Official Training

- **Today’s webinar** about the new 2012 Military Acute Concussion Evaluation (MACE) and clinical algorithms is provided for awareness and informational purposes only.

- **This webinar will not be archived or available for download** after the webinar.

- **For more information about the topic and additional TBI training** for providers, medics/corpsmen, commanders and service members please visit the following:
  - Army Training Network ([https://atn.army.mil](https://atn.army.mil))
  - Navy Knowledge online ([https://wwwa.nko.navy.mil/](https://wwwa.nko.navy.mil/))

- **To request new MACE and Concussion Management Algorithm cards** issued in 2012 email info@DVBIC.org.
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- Or send comments to DCoE.MonthlyWebinar@tma.osd.mil
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- Did you pre-register on or before Monday, **July 23, 2012**?
  - If yes, please visit [conf.swankhealth.com/dcoe](http://conf.swankhealth.com/dcoe) to complete the online CEU/CME evaluation and download your continuing education certificate.

- Did you pre-register between Tuesday, **July 24, 2012**, and now?
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- The Swank Health website will be open until **August 20, 2012**.
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DCoE Monthly Webinar:

*PTSD 101: Education for the Civilian Health Care Provider Treating Service Members*

August 23, 2012
1-2:30 p.m. (EDT)

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