Joint Theater Trauma System Clinical Practice Guideline

THEATER SCREENING AND MANAGEMENT OF MILD TRAUMATIC BRAIN INJURY (CONCUSSION)

Reference:

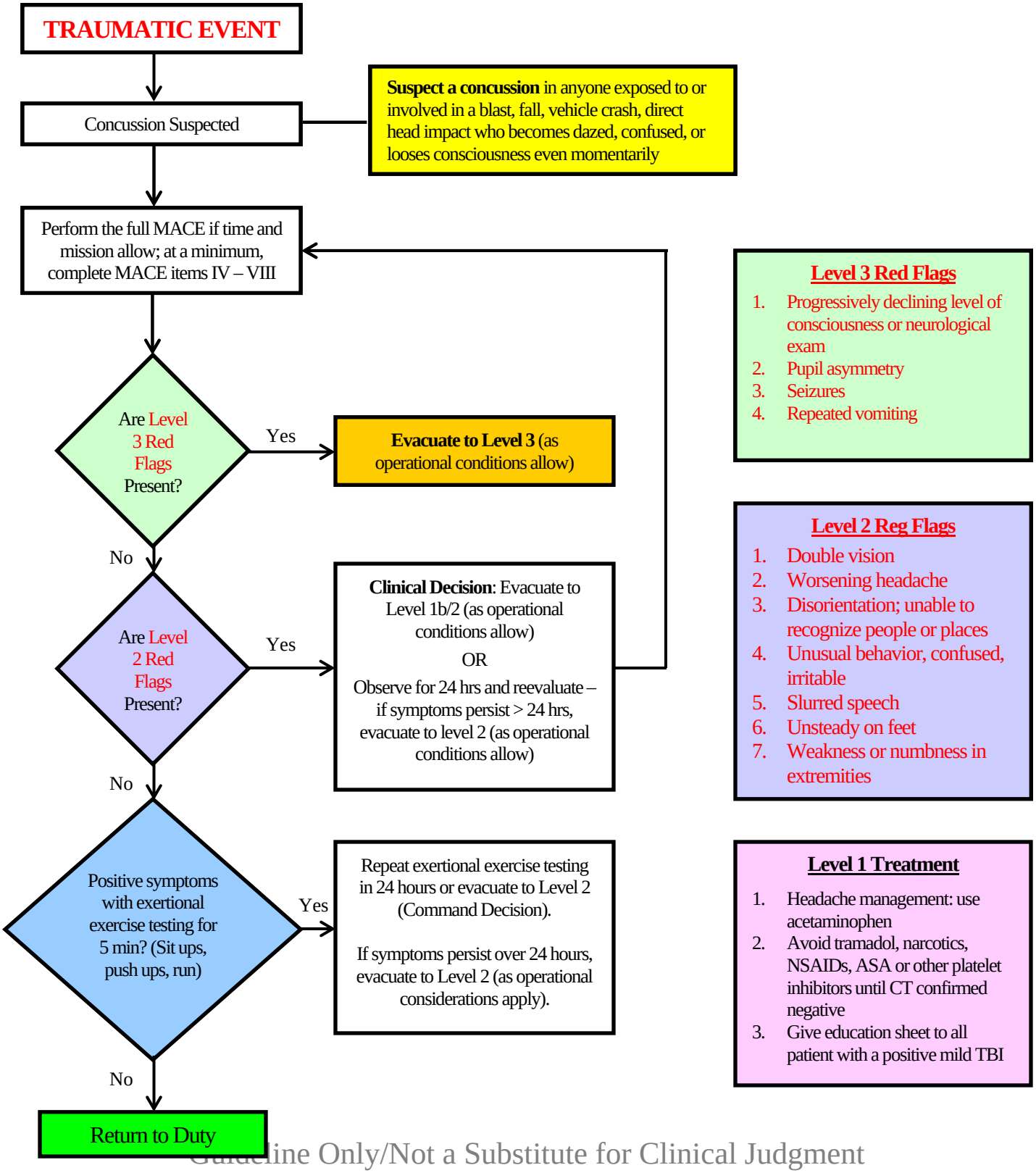
Defense Brain Injury Center Working Group on the Acute Management of Mild Traumatic Brain Injury in Military Operational Settings (December 2006)

BLUF: Suspect a mild traumatic brain injury for all patients exposed to or involved in a blast, fall, vehicle crash, or direct head impact that lose consciousness, have an amnestic event or become dazed or confused, even momentarily.

1. To download the MC4 (CHCS II-T/AHLTA-T) electronic MACE template, click the following hyperlink: https://www.mc4.army.mil/mc4newsletter/2007_4/tips.asp.

Joint Theater Trauma System Clinical Practice Guideline

For Use At Level 1 Facilities



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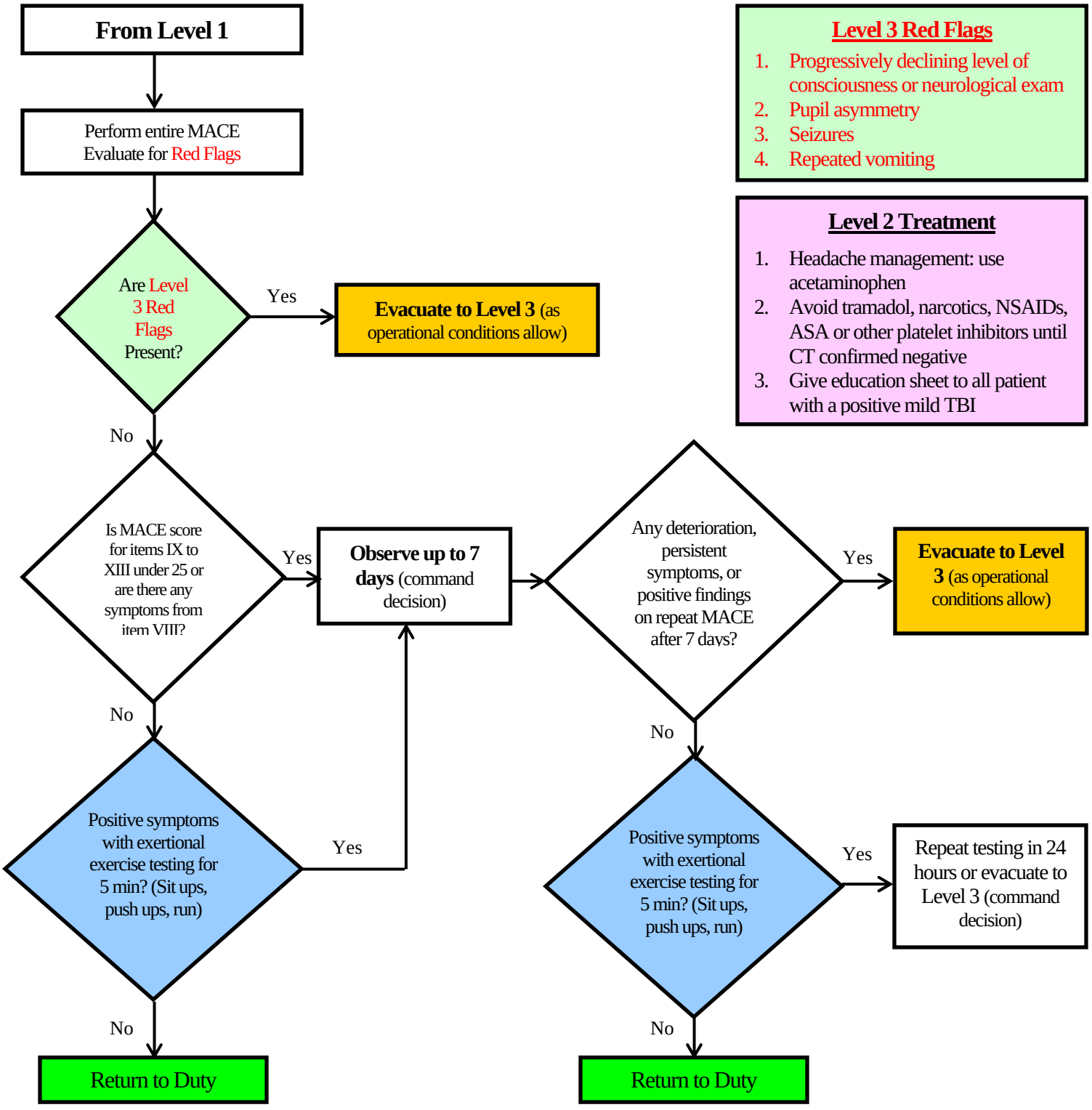
For Use At Level 2 Facilities



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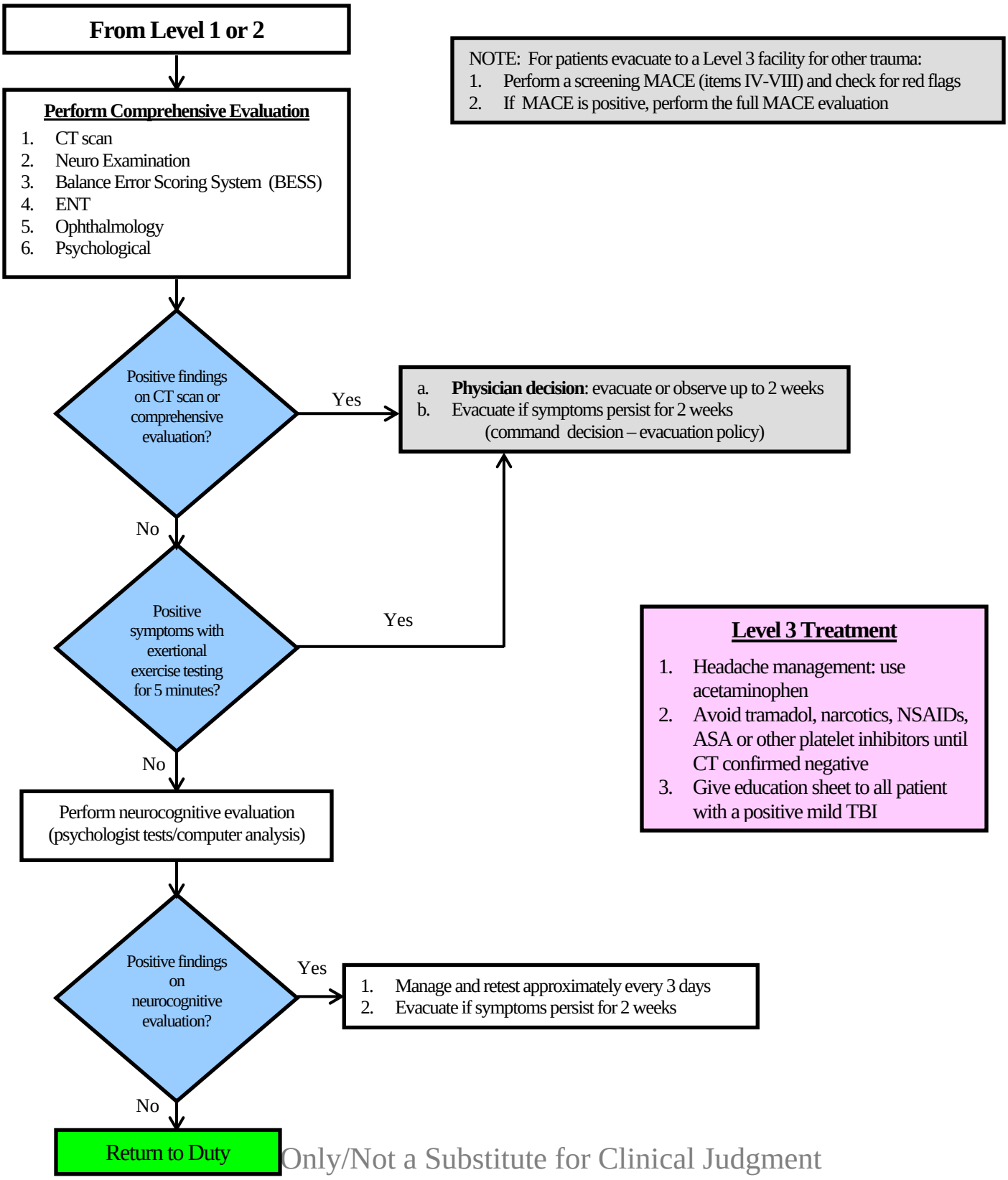
For Use At Level 3 Facilities



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October 2007

Joint Theater Trauma System Clinical Practice Guideline

Mild Traumatic Brain Injury (Concussion)
Patient Information Sheet

What is a concussion?

A concussion is a blow or jolt to the head or a penetrating head injury that disrupts the function of the brain. Not all blows or jolts to the head cause a brain injury. In combat, concussions are usually caused by a bullet, fragment, blast, fall, direct impact, or motor vehicle crash. Some, but not all, persons with a concussion lose consciousness.

What are the signs and symptoms of a concussion?

- Headache
- Nausea/vomiting
- Dizziness
- Fatigue
- Insomnia/sleep disturbances
- Drowsiness
- Sensitivity to noise and light
- Vision changes/blurred vision
- Difficulty remembering
- Difficulty concentrating
- Ringing ears
- Confusion
- Loss of balance
- Excessive tiredness
- Irritability

Symptoms of mild TBI or concussion often resolve within hours to days and almost always improve over 1-3 months. However if symptoms persist and do not improve, seek medical treatment.

How is mild traumatic brain injury diagnosed?

First, a physician or physician assistant (PA) examines you. One part of the exam involves the Military Acute Concussion Evaluation (MACE). The MACE was specifically designed to screen and guide treatment for someone with a concussion. Second, the physician or PA will also learn information from people who were with you when the concussion happened. This is very important, especially if you are confused or if you cannot remember event.

Based upon these findings, the physician or PA assistant will decide whether to conduct further testing, refer you to another specialist or hospital, give you a profile for rest, perform a follow-up examination, or return you to duty. In more serious cases, your doctor will want to get special x-rays of your head, called CT scans.

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). Always ask your doctor before you take any medicine. If you e had a concussion, avoid Motrin, aspirin, or any stronger pain medications.

Warning signs

Certain signs and symptoms of a concussion require immediate care. **If you experience any of the following you should seek medical care immediately, at any time of day or night**.

- Progressively declining level of consciousness
- Unequal pupils
- Seizures
- Repeated vomiting
- Double vision
- Worsening headache

- Unable to recognize people and places
- Weakness or numbness in arms or legs
- Slurred speech
- Unsteady feet

When can I return to duty?

After your medical evaluation, the physician or PA will likely write a limited duty profile. The profile is intended to give your brain time to heal. You should not return to full duty while you have any signs of concussion, like headache or dizziness. If your concussion was very mild, you may be allowed to return to duty after one day. If you had memory loss or loss of consciousness, you may not be able to return to full duty for one to two weeks. After a severe concussion, you may not be able to return to full duty for a month. If this was not your first concussion, you may be referred to a specialist and return to full duty may take longer.

What are the risks of returning to full duty too early?

If you return too early, you could suffer from "second impact syndrome," which may be fatal. This problem is caused by a loss of the automatic control of blood vessels to the brain. Never return to a full duty until you are cleared by a doctor.

Are there any lasting effects to a concussion?

Most people get better after a concussion without any permanent damage. But, you may have signs and symptoms of the concussion for weeks to months. Repeated concussions could cause permanent damage.

What else should I know about my recovery?

- Get plenty of sleep at night; do not over exert yourself during the day.
- Return to normal activities gradually, not all at once.
- Until you are better, avoid activities such as contact or recreational sports that could lead to a second brain injury. Remember to wear helmets and safety belts to decrease your risk of having a second brain injury.
- Do not drink alcohol; it may slow your brain recovery and put you at further risk of injury.
- If it is harder to remember things, write them down.
- If you find you are losing important items, begin putting them in the same place all the time. Park in the same place so that you can find your car.
- If you are easily distracted or having difficulty concentrating, try doing only one thing at a time in a quiet, non-distracting environment.
- If you feel irritable, remove yourself from the situation that is irritating you or use relaxation techniques to help manage the situation. Irritability is worse when you are tired, so rest will help.
- Be patient!!!! Healing from a brain injury takes time.
- Keep your brain active by doing activities that require strategies and fine motor skills; such as crossword puzzles, playing musical instrument, drawing, writing, painting, playing cards or board games.

References:

Military Acute Concussion Evaluation (MACE). Defense and Veterans Brain Injury Center, 2006.

Defense Veterans Brain Injury Center Working Group Clinical Practice Guideline and Recommendations, December 2006.

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 _____

Examination: (IX – XIII)

Evaluate each domain. Total possible score is 30.

IX. Orientation: (1 point each)

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

Orientation Total Score _____/5

X. Immediate Memory:

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

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

Immediate Memory Total Score _____/15

XI. Neurological Screening

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

XII. Concentration

Reverse Digits: (go to next string length if correct on first trial. Stop if incorrect on both trials.) 1 pt. for each string length.

4-9-3	6-2-9	0	1
3-8-1-4	3-2-7-9	0	1
6-2-9-7-1	1-5-2-8-5	0	1
7-1-8-4-6-2	5-3-9-1-4-8	0	1

Months in reverse order: (1 pt. for entire sequence correct)
Dec-Nov-Oct-Sep-Aug-Jul-Jun-May-Apr-Mar-Feb-Jan
0 1

Concentration Total Score ____/5

XIII. Delayed Recall (1 pt. each)

Ask the patient to recall the 5 words from the earlier memory test (Do NOT reread the word list.)

Elbow	0	1
Apple	0	1
Carpet	0	1
Saddle	0	1
Bubble	0	1

Delayed Recall Total Score ____/5
TOTAL SCORE _____/30

Notes: _____

_____

Diagnosis: (circle one or write in diagnoses)

No concussion
850.0 Concussion without Loss of Consciousness (LOC)
850.1 Concussion with Loss of Consciousness (LOC)

Other diagnoses _____

_____

Defense & Veterans Brain Injury Center
1-800-870-9244 or DSN: 662-6345

Instruction Sheet

Purpose and Use of the MACE

A concussion is a mild traumatic brain injury (TBI). The purpose of the MACE is to evaluate a person in whom a concussion is suspected. The MACE is used to confirm the diagnosis and assess the current clinical status.

Tool Development

The MACE has been extensively reviewed by leading civilian and military experts in the field of concussion assessment and management. While the MACE is not, yet, a validated tool, the examination section is derived from the *Standardized Assessment of Concussion* (SAC) (McCrea, M., Kelly, J. & Randolph, C. (2000). *Standardized Assessment of Concussion (SAC): Manual for Administration, Scoring, and Interpretation.* (2nd ed.) Waukesa,WI: Authors.) which is a validated, widely used tool in sports medicine. Abnormalities on the SAC correlate with formal comprehensive neuropsychological testing during the first 48 hours following a concussion.

Who to Evaluate

Any one who was dazed, confused, "saw stars" or lost consciousness, even momentarily, as a result of an explosion/blast, fall, motor vehicle crash, or other event involving abrupt head movement, a direct blow to the head, or other head injury is an appropriate person for evaluation using the MACE.

Evaluation of Concussion

History: (I – VIII)

I. Ask for a description of the incident that resulted in the injury; how the injury occurred, type of force. Ask questions A – D.

II. Indicate the cause of injury

III. Assess for helmet use. Military: Kevlar or ACH (Advanced Combat Helmet). Sports helmet, motorcycle helmet, etc.

IV – V Determine whether and length of time that the person wasn't registering continuous memory both **prior** to injury and **after** the injury. Approximate the amount of time in seconds, minutes or hours, whichever time increment is most appropriate. For example, if the assessment of the patient yields a possible time of 20 minutes, then 20 minutes should be documented in the "how long?" section.

VI – VII Determine whether and length of time of **self reported** loss of consciousness (LOC) or **witnessed/observed** LOC. Again, approximate the amount of time in second, minutes or hours, whichever time increment is most appropriate.

VIII Ask the person to report their experience of each specific symptom since injury.

Examination: (IX – XIII)

Standardized Assessment of Concussion (SAC):

Total possible score = 30
Orientation = 5
Immediate Memory = 15
Concentration = 5
Memory Recall= 5

IX Orientation: Assess patients awareness of the accurate time
Ask: WHAT MONTH IS THIS?
WHAT IS THE DATE OR DAY OF THE MONTH?
WHAT DAY OF THE WEEK IS IT?
WHAT YEAR IS IT?
WHAT TIME DO YOU THINK IT IS?
One point for each correct response for a total of 5 possible points. It should be noted that a correct response on time of day must be within 1 hour of the actual time.

X Immediate memory is assessed using a brief repeated list learning test. Read the patient the list of 5 words once and then ask them to repeat it back to you, as many as they can recall in any order. Repeat this procedure 2 more times for a total of 3 trials, even if the patient scores perfectly on the first trial.
Trial 1: I'M GOING TO TEST YOUR MEMORY, I WILL READ YOU A LIST OF WORDS AND WHEN I AM DONE, REPEAT BACK AS MANY WORDS AS YOU CAN REMEMBER, IN ANY ORDER.
Trial 2 &3: I AM GOING TO REPEAT THAT LIST AGAIN. AGAIN, REPEAT BACK AS MANY AS YOU CAN REMEMBER IN ANY ORDER, EVEN IF YOU SAID THEM BEFORE.
One point is given for each correct answer for a total of 15 possible points.

XI Neurological screening
Eyes; check pupil size and reactivity.
Verbal: notice speech fluency and word finding
Motor: pronator drift- ask patient to lift arms with palms up, ask patient to then close their eyes, assess for either arm to "drift" down. Assess gait and coordination if possible. Document any abnormalities.
No points are given for this section.

XII Concentration: Inform the patient:
I'M GOING TO READ YOU A STRING OF NUMBERS AND WHEN I AM FINISHED, REPEAT THEM BACK TO ME BACKWARDS, THAT IS, IN REVERSE ORDER OF HOW I READ THEM TO YOU. FOR EXAMPLE, IF I SAY 7-1-9, YOU WOULD SAY 9-1-7.
If the patient is correct on the first trial of each string length, proceed to the next string length. If incorrect, administer the 2nd trial of the same string length. Proceed to the next string length if correct on the second trial. Discontinue after failure on both trials of the same string length. Total of 4 different string lengths; **1** point for each string length for a total of **4** points.
NOW TELL ME THE MONTHS IN REVERSE ORDER, THAT IS, START WITH DECEMBER AND END IN JANUARY.
1 point if able to recite ALL months in reverse order.
0 points if not able to recite ALL of them in reverse order.
Total possible score for concentration portion: **5.**

XIII Delayed Recall
Assess the patient's ability to retain previously learned information by asking he/she to recall as many words as possible from the initial word list, without having the word list read again for this trial.
DO YOU REMEMBER THAT LIST OF WORDS I READ A FEW MINUTES EARLIER? I WANT YOU TO TELL ME AS MANY WORDS FROM THE LIST AS YOU CAN REMEMBER IN ANY ORDER.
One point for each word remembered for a total of 5 possible points.
Total score= Add up from the 4 assessed domains: immediate memory, orientation, concentration and memory recall.

Significance of Scoring

In studies of non-concussed patients, the mean total score was 28. Therefore, a score less than 30 does not imply that a concussion has occurred. Definitive normative data for a "cut-off" score are not available. However, scores below 25 may represent clinically relevant neurocognitive impairment and require further evaluation for the possibility of a more serious brain injury. The scoring system also takes on particular clinical significance during serial assessment where it can be used to document either a decline or an improvement in cognitive functioning.

Diagnosis

Circle the ICD-9 code that corresponds to the evaluation. If loss of consciousness was present, then circle 850.1. If no LOC, then document 850.0. If another diagnosis is made, write it in.

MACE Form B

Due to test- retest issues (e.g. service members memorizing words and numbers) validated, alternative versions B or C should be used.

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

List	Trial 1	Trial 2	Trial 3
Candle	0 1	0 1	0 1
Paper	0 1	0 1	0 1
Sugar	0 1	0 1	0 1
Sandwich	0 1	0 1	0 1
Wagon	0 1	0 1	0 1
Total			

Concentration
Reverse Digits: (go to next string length if correct on first trial. Stop if incorrect on both trails.) 1 pt. for each string length.

5-2-6	4-1-5	0	1
1-7-9-5	4-9-6-8	0	1
4-8-5-2-7	6-1-8-4-3	0	1
8-3-1-9-6-4	7-2-4-8-5-6	0	1

Delayed Recall (1 pt each)
Ask the patient to recall the 5 words from the earlier memory test (DO NOT reread the word list.)

Candle	0 1
Paper	0 1
Sugar	0 1
Sandwich	0 1
Wagon	0 1

MACE Form C

Due to test- retest issues (e.g. service members memorizing words and numbers) validated, alternative versions B or C should be used.

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

List	Trial 1	Trial 2	Trial 3
Baby	0 1	0 1	0 1
Monkey	0 1	0 1	0 1
Perfume	0 1	0 1	0 1
Sunset	0 1	0 1	0 1
Iron	0 1	0 1	0 1
Total			

Concentration
Reverse Digits: (go to next string length if correct on first trial. Stop if incorrect on both trails.) 1 pt. for each string length.

1-4-2	6-5-8	0	1
6-8-3-1	3-4-8-1	0	1
4-9-1-5-3	6-8-2-5-1	0	1
3-7-6-5-1-9	9-2-6-5-1-4	0	1

Delayed Recall (1 pt each)
Ask the patient to recall the 5 words from the earlier memory test (DO NOT reread the word list.)

Baby	0	1
Monkey	0	1
Perfume	0	1
Sunset	0	1
Iron	0	1