IT’S ALL IN YOUR HEAD!
CARING FOR CONCUSSIONS IN YOUR COMMUNITY

Stephen K Stacey, DO
CPT, MC, USA
OUTLINE

- Definition
- Epidemiology
- Diagnosis
- Evaluation
- Recovery
- Sequelae
- Prevention
- Resources for providers
CASE

- An 18-year-old high school senior is playing soccer when she collides with the goalpost, hitting her head and falling to the ground.
- She gets up immediately and tries to keep playing.
- Did she sustain a concussion?
DEFINITION
DEFINITION OF CONCUSSION

- Concussion may be caused either by a **direct blow** to the head, face, neck or elsewhere on the body with an “impulsive” **force transmitted** to the head.
- Concussion typically results in the **rapid onset of short-lived impairment** of neurologic function that resolves spontaneously. However in some cases symptoms and signs may evolve over a number of minutes to hours.
- Concussion may result in neuropathological changes but the acute clinical symptoms largely reflect a **functional disturbance** rather than a structural injury and as such, **no abnormality is seen** on standard structural neuroimaging studies.
- Concussion results in a graded set of clinical symptoms that may or may not involve loss of consciousness. Resolution of the clinical and cognitive symptoms typically follows a sequential course. However it is important to note that in some cases, post-concussive symptoms may be prolonged.

*4th International Conference on Concussion in Sport held in Zurich, November 2012*
DEFINITION SIMPLIFIED

- Any head-injury event that causes symptoms falls on the traumatic brain injury (TBI) spectrum
- Mild TBI (AKA concussion) has no structural damage and more limited symptoms
- Symptoms can include:
  - Headache, sleep disturbance, phonophobia, photophobia, dizziness, weakness, fogginess, difficulty concentrating, more irritable or emotional than baseline, unsteadiness or ataxia, loss of consciousness
CONCUSSION VS. MTBI

- MTBI: Mild Traumatic Brain Injury
- Same thing as concussion
- Shown that patients are more concerned about the condition when called MTBI
- “Concussion” is the more common terminology, even in medical contexts
# CLOSED TBI CLASSIFICATION

<table>
<thead>
<tr>
<th>SEVERITY</th>
<th>MILD (CONCUSSION)</th>
<th>MODERATE</th>
<th>SEVERE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Structural imaging</td>
<td>Normal</td>
<td>Normal or abnormal</td>
<td>Normal or abnormal</td>
</tr>
<tr>
<td>Loss of consciousness</td>
<td>0 to 30 minutes</td>
<td>≥30 minutes and ≤24 hours</td>
<td>&gt;24 hours</td>
</tr>
<tr>
<td>Alteration of consciousness</td>
<td>A moment up to 24 hours</td>
<td>&gt;24 hours Severity based on other criteria</td>
<td></td>
</tr>
<tr>
<td>Post-traumatic amnesia</td>
<td>A moment up to 24 hours</td>
<td>&gt;1 day up to 7 days</td>
<td>&gt; 7 days</td>
</tr>
</tbody>
</table>
EPIDEMIOLOGY
EPIDEMIOLOGY

- Concussions account for nearly 15% of all sports-related injuries
- Highest-risk sports: boxing, football, hockey, wrestling, rugby, soccer
- Bike riding is the leading cause of concussion for kids
- Not just athletes

Leading causes of TBI
- Falls 40.5%
- Unknown/other 19%
- Collision 15.5%
- Motor vehicle 14.3%
- Assaults 10.7%

cdc.gov
The athlete is called to the sideline
She says she feels “fine” and wants to return to play
Does she require an evaluation?
EVALUATION
ASSESSMENT TOOLS

- **SCAT3**
  - Sports Concussion Assessment Tool
  - From Concussion in Sport Group
  - Incorporates physical exam
  - Should be administered by trained medical professional
  - Widely adopted, multiple derivatives

- **Child SCAT3**
  - Use for patients <13 years old

- **Pocket concussion recognition tool**
  - From Concussion in Sport Group
  - Useful for laypeople or those with limited experience
  - Does not incorporate physical exam
MORE ASSESSMENT TOOLS

- **ACE**
  - Acute Concussion Evaluation
  - From Centers for Disease Control (CDC)
  - Simpler to administer, requires less training
  - Does not take physical exam into account
  - Could be administered by MA screening for clinic visit

- **Military Acute Concussion Evaluation**
  - From Defense and Veterans Brain Injury Center (DVBIC)
  - Utilized in deployed and non-deployed settings
  - Requires trained medical professional
  - Combined with algorithm for comprehensive evaluation and management guidelines
SYMPTOMS

- Somatic (e.g. headache)
- Cognitive (e.g. feeling like in a fog)
- Emotional symptoms (e.g. lability)
- Physical signs (e.g. loss of consciousness, amnesia)
- Behavioral changes (e.g. irritability)
- Cognitive impairment (e.g. slowed reaction times)
- Sleep disturbance (e.g. drowsiness, insomnia)

*4th International Conference on Concussion in Sport held in Zurich, November 2012*
EXAM

- Full neurological exam
  - GCS?
    - AVPU simpler; as accurate when compared head-to-head
  - Eyes
  - Speech
  - Motor
  - Balance
- Cognitive exam
  - Orientation
  - Memory
    - Immediate and delayed
  - Concentration
ADVANCED IMAGING

- Neuroimaging (CT, MRI) is by definition normal in concussion
- Used when red flags indicate the possibility of a cerebral or cranial structural lesion, including fracture and bleeding
- Red flags include:
  - Progressively declining level of consciousness, pupil asymmetry, seizures, repeated vomiting, GCS <15, motor or sensory deficit, worsening/severe headache
- Other modalities such as fMRI have not been shown to be clinically useful, and are not routinely recommended outside of a research setting
NEUROPSYCHOLOGICAL TESTING

- Not required for diagnosis
- May aid rehabilitation
- More useful if baseline testing is performed
- Requires special training to administer
You evaluate the patient and discover that she reports a headache and she seems irritable. She was unable to perform immediate and delayed recall. Her neurological exam shows she is unsteady on her feet, though she has no focal neurologic deficits.
RECOVERY
RECOVERY

- Majority (80%-90%) recover within a week
- May take longer in pediatric patients
- Cornerstone of therapy is physical and cognitive rest until symptoms resolve
  - Physical Rest
    - No training, playing, exercise, weights
    - Beware of exertion with activities of daily living
  - Cognitive Rest
    - No television, extensive reading, video games, homework
- Stepwise return to full activity
- Our job is to educate!
RETURN-TO-PLAY GUIDELINES

- Never return to play the same day, no matter how “small” the concussion
- Must be asymptomatic
- Graded return to play
  - Same guidelines for “elite” and “non-elite” athletes
- Consider the patient’s concerns
  - Are they confident to return?
  - Do they want to continue with the activity?
- These guidelines apply to non-sport concussions
# GRADUATED RTP PROTOCOL

<table>
<thead>
<tr>
<th>Rehabilitation stage</th>
<th>Functional exercise at each stage of rehabilitation</th>
<th>Objective of each stage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. No activity</td>
<td>Symptom limited physical and cognitive rest.</td>
<td>Recovery</td>
</tr>
<tr>
<td>2. Light aerobic exercise</td>
<td>Walking, swimming or stationary cycling keeping intensity &lt; 70% MPHR No resistance training.</td>
<td>Increase HR</td>
</tr>
<tr>
<td>3. Sport-specific exercise</td>
<td>Skating drills in ice hockey, running drills in soccer. No head impact activities.</td>
<td>Add movement</td>
</tr>
<tr>
<td>4. Non-contact training drills</td>
<td>Progression to more complex training drills e.g. passing drills in football and ice hockey. May start progressive resistance training.</td>
<td>Exercise, coordination, and cognitive load</td>
</tr>
<tr>
<td>5. Full contact practice</td>
<td>Following medical clearance participate in normal training activities</td>
<td>Restore confidence and assess functional skills by coaching staff</td>
</tr>
<tr>
<td>6. Return to play</td>
<td>Normal game play</td>
<td></td>
</tr>
</tbody>
</table>

- 24 hours per step (therefore about 1 week for full protocol)
- If recurrence of symptoms at any stage, return to previous asymptomatic level and resume after further 24 hr period of rest

*4th International Conference on Concussion in Sport held in Zurich, November 2012*
Concussions may cause behavioral symptoms
- Personality changes
- Sleep issues (hypersomnolence vs. insomnia)
- Depression may result from concussion
- Anxiety may result, especially as it applies to the activity that caused the concussion

Medications may be used for prolonged symptoms
- Antidepressants are often used
- Use medication that best treats the combination of symptoms
  - Consider trazodone if insomnia,
  - Consider tricyclic antidepressants if headache is persistent

Multidisciplinary approach
OTHER PROBLEMS

- Neuroendocrine dysfunction
- Dizziness
The patient is pulled from play and sent to her primary care physician the next day.
She is given a graded return-to-play handout and instructed on physical and cognitive rest.
Her father is in the room and he acknowledges and agrees with the plan.
SEQUELAE
POST-CONCUSSION SYNDROME

- Most common complication of concussion
- Persistence of symptoms past 3 months
- Reported in up to 40%–80% of concussion patients, though most sources agree it’s the minority of patients
- Offer reassurance—most patients fully recover
- Refer if primary care management does not resolve symptoms
  - Consider MRI to evaluate possible other cause of symptoms
  - Psychiatry referral
  - Multidisciplinary TBI team, if available
SECOND-IMPACT SYNDROME

- Diffuse cerebral edema occurring when a patient sustains a concussion while still symptomatic from the first concussion
- Can result in increased intracranial pressure, herniation, coma, death
- Patients who survive are often severely disabled
- Extremely rare
CHRONIC TRAUMATIC ENCEPHALOPATHY

- Progressive degenerative disease found in people who have had a severe blow or repeated blows to the head
- Previously known as dementia pugilistica due to its association with boxers
- Educate the patient on the potential for long-term problems and to seek care if concerns arise
Four months later the patient returns, stating she has had difficulty concentrating and has continued headaches since the collision. She has been withdrawn and doesn’t spend as much time with friends. Her grades this semester are slightly worse than usual.
PREVENTION
PREVENTION

- Helmets are designed to prevent skull fracture, not concussion
- Mouthguards prevent dental injury, no effect on concussion
- Rule changes in the sport
- Violent behavior that increases concussion risk should be eliminated
  - Promote fair play and respect
RESOURCES
RESOURCES FOR PROVIDERS

- Defense and Veterans Brain Injury Center
  - https://dvbic.dcoe.mil/resources

- SCAT3
  - http://bjsm.bmj.com/content/47/5/259.full.pdf

- Heads Up
QUESTIONS?

- Feel free to email me at stephenstacey@gmail.com
CONCUSSION ALGORITHM
INITIAL PROVIDER ALGORITHM
(Management of Concussion in Deployed Setting)

Traumatic Event or Head Injury Occurs: Concussion Possible

- Any red flags?  
  - Yes: Refer to higher level Services • Specialty Services • Neuroimaging • Laboratory Capabilities
  - No: Confirm history of events, including any previous concussions in past 12 months • Complete MAC if not already done • Ensure documented 3-part MACE results in EMR

- New concussion
  - No: No new concussion
  - Yes: Confirm symptoms or MACE cognitive score < 25?
    - Yes: Mandatory 24-hour recovery period
    - No: Review acute concussion educational brochure with service member

- Re-assess: symptoms present?
  - Yes: Consider NeuroCognitive Assessment Tool (NCAT) per DCoE clinical recommendation
  - No: Perform exertional testing: Symptoms present?
    - Yes: Consult with higher level of care • Screen for acute stress and consult with combat stress team • Continue concussion and combat stress management for up to 21 days if improving, otherwise evacuate to higher level of care • If symptoms resolve, proceed with exertional testing
    - No: Continue concussion and combat stress management for up to 21 days if improving, otherwise evacuate to higher level of care • If symptoms resolve, proceed with exertional testing

- Confirm concussion diagnosis • Review records • Perform comprehensive exam

- CT indications present?
  - Yes: Neurosurgery or neurology consult • Consider evacuation to higher level of care
  - No: Symptom present?
    - Yes: Perform CT Scan
    - No: Acute abnormality on CT?
      - Yes: Neurosurgery or neurology consult • Consider evacuation to higher level of care
      - No: Symptoms resolved?
        - Yes: Perform exertional testing
        - No: Symptoms return?
          - Abnormal: Consider functional assessment • Consider NCAT per DCoE clinical recommendation
          - Normal: Consider functional assessment • Consider NCAT per DCoE clinical recommendation

- If 1st concussion in past 12 months, mandatory 24-hour recovery period • If 2nd concussion in the past 12 months, mandatory 7-day recovery period following symptom resolution before RTD • If 3rd concussion in the past 12 months, refer for recurrent concussion evaluation

*See Recurrent Concussion Algorithm (Page 4)
Recurrent Concussion Evaluation
(three or more documented in 12-month span)

1. Comprehensive neurological evaluation by neurologist or otherwise qualified provider
   • Review of prior concussion history with focus on timeline or resolution of symptoms
   • Assessment of symptoms (face-to-face interview by provider)
     Consider:
     ▶ Neurobehavioral Symptom Inventory
     ▶ Acute Stress Reaction questionnaire
   • Balance assessment

2. Neuroimaging per provider judgement

3. Neuropsychological assessment by psychologist
   • Evaluate: attention, memory, processing speed and executive function
   • Perform a psychosocial and behavioral assessment
   • Include measure of effort
   • Consider NCAT per DCoE clinical recommendation

4. Functional assessment completed by occupational therapy/physical therapy

5. Neurologist (or qualified provider) determines RTD status

Traumatic Event or Head Injury Occurs: Concussion Possible

Mandatory Events Requiring Concussion Evaluation:

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

Medic/Corpsman Algorithm Red Flags:

1. Witnessed loss of consciousness (LOC)
2. Two or more blast exposures within 72 hrs
3. Unusual behavior/combat
4. Unequal pupils
5. Seizures
6. Repeated vomiting
7. Double vision/loss of vision
8. Worsening headache
9. Weakness on one side of the body
10. Cannot recognize people or oriented to place

Medic/Corpsman Algorithm Symptoms:
(Persisting beyond initial traumatic event)

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

Medic/Corpsman Initial Management of Concussion:

1. Give acute concussion educational brochure to all concussion patients, available at: dvbic.dcoe.mil
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 pm
5. Avoid tramadol, Fioricet, excessive triptans and narcotics

Available Resources (dvbic.dcoe.mil):

• Acute Stress Reaction Questionnaire
• Acute Concussion Educational Brochure
• Neurobehavioral Symptom Inventory
• Line Leader Fact Sheet
• Coding Guidance
• DCoE NeuroCognitive Assessment Tool (NCAT) Recommendation
Exertional Testing:
1. Exert to 65-85% of target heart rate (THR=220-age) using push-ups, sit-ups, running in place, step aerobic, stationary bike, treadmill and/or hand crank
2. Maintain this level of exertion for approximately 2 minutes
3. Assess for symptoms (headache, vertigo, photophobia, balance, dizziness, nausea, visual changes, etc.)
4. If symptoms/red flags exist with exertional testing, stop testing, and consult with provider

Provider Algorithm Red Flags:
1. Progressively declining level of consciousness
2. Progressively declining neurological exam
3. Pupillary asymmetry
4. Seizures
5. Repeated vomiting
6. Clinically verified GCS < 15
7. Neurological deficit: motor or sensory
8. LOC > 5 minutes
9. Double vision
10. Worsening headache
11. Cannot recognize people or disoriented to place
12. Siurred speech
13. Unusual behavior

Provider Algorithm Symptoms:
1. Confusion (24 hours)
2. Irritability
3. Unsteady on feet
4. Vertigo/dizziness
5. Headache
6. Photophobia
7. Phonophobia
8. Sleep issues

Primary Care Management (PCM):
1. Give acute concussion educational brochure to all concussion patients, available at: dvbic.dcoe.mil
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
5. Avoid tramadol, Flucit, excessive triptans and narcotics
6. Consider nortriptyline q HS or amitriptyline q HS for persistent headache (> 7 days)
   - Prescribe no more than 10 pills.
7. Implement duty restrictions
8. Review current medications and sleep hygiene (Healthy Sleep fact sheet available at dvbic.dcoe.mil) and consider short-term low dose non-benzodiazepine hypnotic (e.g., zolpidem 5mg)
9. Pain management if applicable
10. Send consult to med.consult.army@mail.mil
   - for further guidance if needed
11. Consider evacuation to higher level of care if clinically indicated
12. Document concussion diagnosis in EMR


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 dvbic.dcoe.mil.

For ANAM baseline results send requests to: usarmy.ja.ashd.mbx.otsg-anam-baselines@mail.mil

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

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.

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. Stopping, stumbling or falling
2. Opening eyes
3. Hands lifted above the iliac crest
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


med.consult.army@mail.mil is a Department of Defense email consultation service provided by the Army OTSG Telemedicine Teleconsultation Programs to assist deployed clinicians with the treatment of TBI and RTD decisions.

Version 4.2 - Revised: April 2015 info@DVBIC.org
MACE ALGORITHM
CONCUSSION SCREENING – continued

2. Alteration of Consciousness or Memory (AOC/LOC/PTA)

A. Was there Alteration of Consciousness (AOC)?
AOC is temporary confusion or "having your bell rung."

☐ YES  ☐ NO
If yes, for how long? ___ minutes

Key question:
• Were you dazed, confused, or did you "see stars" immediately after the injury?

B. Was there Loss of Consciousness (LOC)?
LOC is temporarily passing out or blacking out.

☐ YES  ☐ NO
If yes, for how long? ___ minutes

Key question:
• Did you pass out or black out?

C. Was there any Post Traumatic Amnesia (PTA)?
PTA is a problem remembering part or all of the injury events.

☐ YES  ☐ NO
If yes, for how long? ___ minutes

Key questions:
• What is the last thing you remember before the event?
• What is the first thing you remember after the event?

Tips for assessment:
• Ask witness to verify AOC/LOC/PTA and estimate duration.

D. Was there a witness?

☐ YES  ☐ NO
If yes, name of witness:

CONCUSSION SCREENING RESULTS (Possible Concussion?)

YES to 1C
AND
YES to 2A, 2B or 2C

OR
NO to 1C

NO to 2A, 2B and 2C

CONTINUE the MACE:
• Complete the Cognitive, Neurological and Symptoms portions of the MACE

STOP the MACE:
• Evaluate and treat any other injuries or symptoms
• Enter negative screening result into electronic medical record (V80.01)
• Communicate results with provider and line commanders
• Check for history of previous concussions and refer to Concussion Management Algorithm for appropriate rest period

3. Orientation
Score 1 point for each correct response.

Ask This Question  Incorrect  Correct
"What month is this?"  0   1
"What is the date or day of the month?"  0   1
"What day of the week is it?"  0   1
"What year is it?"  0   1
"What time do you think it is?"  0   1

Correct response must be within 1 hour of actual time.

ORIENTATION TOTAL SCORE 5

4. Immediate Memory
Choose one list (A-F below) and use that list for the remainder of the MACE.

Read the script for each trial and then read all 5 words. Circle the response for each word for each trial. Repeat the trial 3 times, even if the service member scores perfectly on any of the trials.

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."

List F Incorrect Correct Incorrect Correct Incorrect Correct
Dollar 0   1   0   1   0   1
Honey 0   1   0   1   0   1
Mirror 0   1   0   1   0   1
Saddle 0   1   0   1   0   1
Anchor 0   1   0   1   0   1

IMMEDIATE MEMORY TOTAL SCORE 15

Immediate Memory Alternate Word Lists

List E  List D  List C  List B  List A
Jacket  Finger  Baby  Candle  Elbow
Arrow  Penny  Monkey  Paper  Apple
Pepper  Blanket  Perfume  Sugar  Carpet
Cotton  Lemon  Sunset  Sandwich  Saddle
Movie  Insect  Iron  Wagon  Bubble
5. Eyes
Test pupil response to light, tracking
☐ Normal
☐ Abnormal

Tips for assessment:
• Pupils should be round, equal in size and briskly constrict to a direct, bright light.
• Both eyes should smoothly track your finger side-to-side and up and down.

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?

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?

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?

COGNITIVE EXAM® - Continued

9. Concentration
A. Reverse Digits
Read the script and begin the trial by reading the first string of numbers in Trial 1.
Script:
• “I am going to read you a string of numbers. When I am finished, repeat them back to me backward. That is, in reverse order of how I read them to you. For example, if I said 7 - 1 - 9, then you would say 9 - 1 - 7.”

Circle the response for each string.
• If correct on string length of Trial 1, proceed to the next longer string length in the same column.
• If incorrect on string length of Trial 1, move to the same string length of Trial 2.
• If incorrect on both string lengths in Trials 1 and 2, STOP and record score as zero for that string length. Record total score as sum of previous correct trials.

<table>
<thead>
<tr>
<th>List F</th>
<th>Trial 1</th>
<th>Trial 2</th>
<th>Incorrect</th>
<th>Correct</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2-7-1</td>
<td>4-7-9</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>1-6-8-3</td>
<td>3-9-2-4</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>2-4-7-5-8</td>
<td>8-3-9-6-4</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>5-8-6-2-4-9</td>
<td>3-1-7-8-2-6</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>

REVERSE DIGITS SCORE (9A) 4

Concentration Alternate Number Lists
Note: Use the same list (A-F) that was used in Question 4.
MACE - Military Acute Concussion Evaluation

9. Concentration - Continued
B. Months in Reverse Order

Script:
• “Now tell me the months of the year in reverse order. Start with the last month and go backward. So you’ll say: December, November...Go ahead.”

Correct Response:
Jun – May – Apr – Mar – Feb – Jan

<table>
<thead>
<tr>
<th>Incorrect</th>
<th>Correct</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALL months in reverse order</td>
<td>0</td>
</tr>
</tbody>
</table>

MONTHS IN REVERSE ORDER (9B) 1

CONCENTRATION TOTAL SCORE

Sum of scores:
9A (0-4 points) and 9B (0 or 1 point) 5

10. Delayed Recall

Read the script and circle the response for each word. Do NOT repeat the word list.

Note: Use the same list (A-F) that was used in Question 4.

Script:
• “Do you remember that list of words I read a few minutes earlier? I want you to tell me as many words from that list as you can remember. You can say them in any order.”

<table>
<thead>
<tr>
<th>List F</th>
<th>Incorrect</th>
<th>Correct</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dollar</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Honey</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Mirror</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Saddle</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Anchor</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>

DELAYED RECALL TOTAL SCORE 5

SYMPTOM SCREENING

11. Symptoms — Check all that apply:
- Headache
- Balance Problems
- Irritability
- Dizziness
- Nausea/Vomiting
- Visual Disturbances
- Memory Problems
- Difficulty Concentrating
- Ringing in the Ears
- Other

SUMMARY

Record the data for correct MACE documentation.

Cognitive Summary
- Orientation Total Score - Q3
- Immediate Memory Total Score (all 3 trials) - Q4 15
- Concentration Total Score (Sections A and B) - Q9 5
- Delayed Recall Total Score - Q10 5

COGNITIVE RESULTS

NEUROLOGICAL RESULTS (Page 4)
- Normal (Green)
- Abnormal (Red)

SYMPTOM RESULTS
- No symptoms (A)
- 1 or more symptoms (B)

MACE RESULTS (Report all 3 parts.) Example: 24/Red/B
Abnormality in any area should be discussed with provider.

C   N   S
Cognitive Neurological Symptoms

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.
OTHER QUESTIONS?

- Feel free to email me at stephenstacey@gmail.com