

TBI Severity



TBI-BH ECHO

Traumatic Brain Injury - Behavioral Health ECHO

UW Medicine | Psychiatry and Behavioral Sciences



Objectives

- Define traumatic brain injury
- Discuss diagnostic criteria for traumatic brain injury
 - Review concussion grading system and discuss why it's no longer used
- Identify criteria to determine TBI severity



Traumatic Brain Injury: Definition & Diagnosis



TBI-BH ECHO

?

- What is the diagnosis?



Case courtesy of A.Prof Frank Gaillard, Radiopaedia.org, rID: 2995



TBI-BH ECHO

TBI: definition

“an alteration in brain **function**, or other evidence of brain pathology, caused by an **external force**”

ACRM

“a traumatically induced **structural injury** and/or physiological **disruption of brain function** as a result of **external force**”

VA/DoD

- Traumatic brain injury is **NOT** the same as head injury

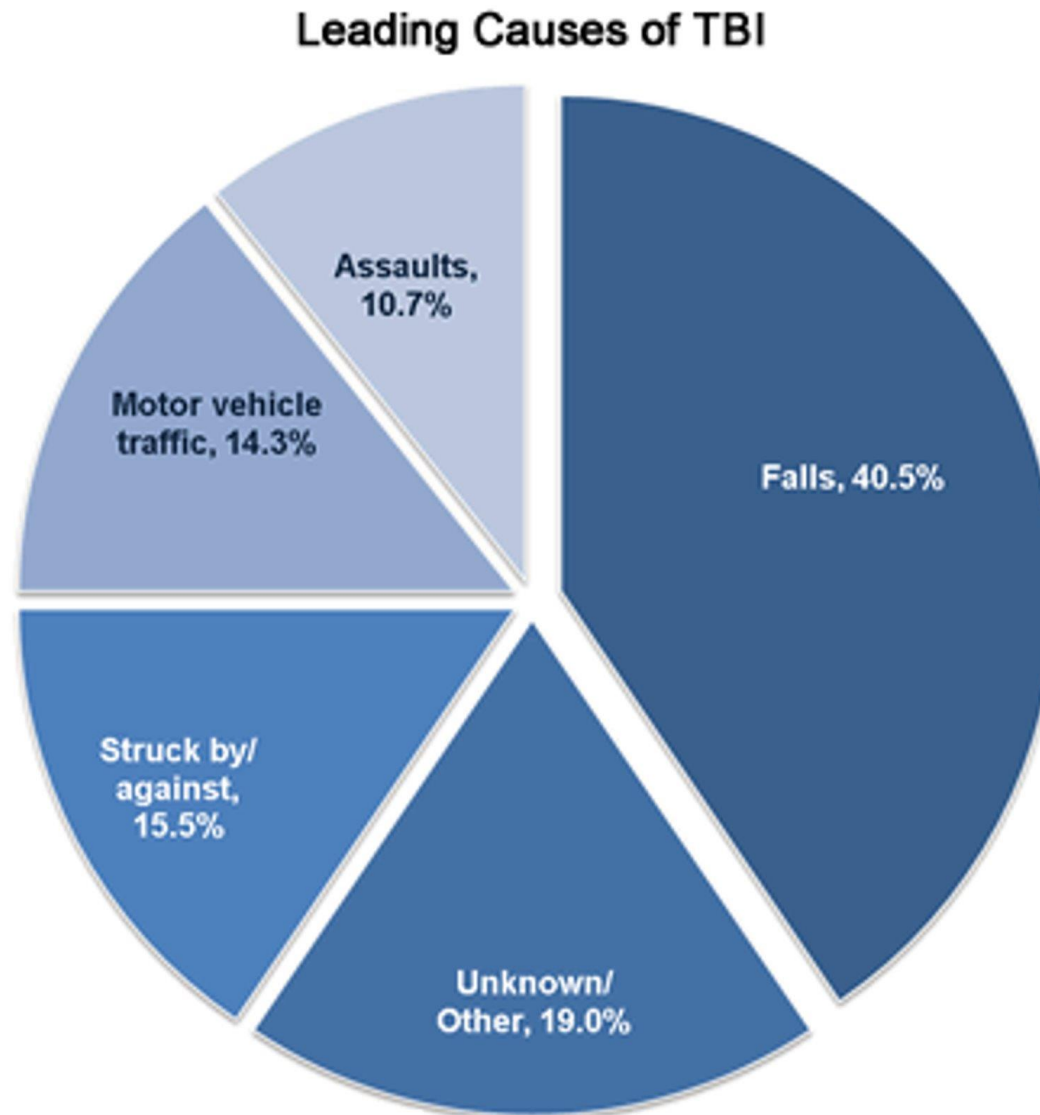
Menon DK, Schwab K, Wright DW, et al: Demographics and Clinical Assessment Working Group of the International and Interagency Initiative toward Common Data Elements for Research on Traumatic Brain Injury and Psychological Health. Position statement: definition of traumatic brain injury, *Arch Phys Med Rehabil* 91:1637- 1640, 2010.



TBI-BH ECHO

External Force

- MVC
- Assault
- Fall
- Sports-related
- Gun-shot wound
- Blast injury



TBI: Diagnosis

Diagnosed by new onset or worsening of at least one of the following clinical signs immediately following the event:

- Any period of loss of or a decreased level of consciousness
- Any loss of memory for events immediately before or after the injury (post-traumatic amnesia)
- Any alteration in mental state at the time of injury (e.g., confusion, disorientation, slowed thinking, alteration of consciousness/mental state)
- Neurological deficits (e.g., weakness, loss of balance, change in vision, apraxia, paresis/plegia, sensory loss, visual-spatial neglect, aphasia) that may or may not be transient
- An intracranial lesion



TBI: Diagnosis -History

- Setting and mechanism of injury
- Severity/duration of altered consciousness and immediate symptoms
 - Including duration of post-traumatic amnesia
- Presence of co-occurring injuries
- Current symptoms and health concerns
- Potentially contributing psychosocial factors



TBI: Diagnosis - Neuro/Psych Assessment

- Mental status and cognition:
 - Disorientation, agitation, confusion
 - Other changes in cognition, behavior, or personality
 - Post-traumatic amnesia
 - Galveston Orientation Amnesia Test
 - Orientation-log
- Glasgow Coma Scale
- Additional neurologic exam:
 - Cranial nerve, MMT, sensory, reflexes, speech pattern, gait and balance



TBI: Diagnosis Complications

Injury to the head

- Reasonable mechanism
- Subjective/objective report
- Imaging findings

Observed?

Loss / Decreased level of consciousness

- Subjective report
- Objective report

**Substance?
Medicated?
Hypotensive?**

Objective Neuro/psych findings

- Data collection

Baseline Symptoms?



Symptoms/Sequelae of TBI

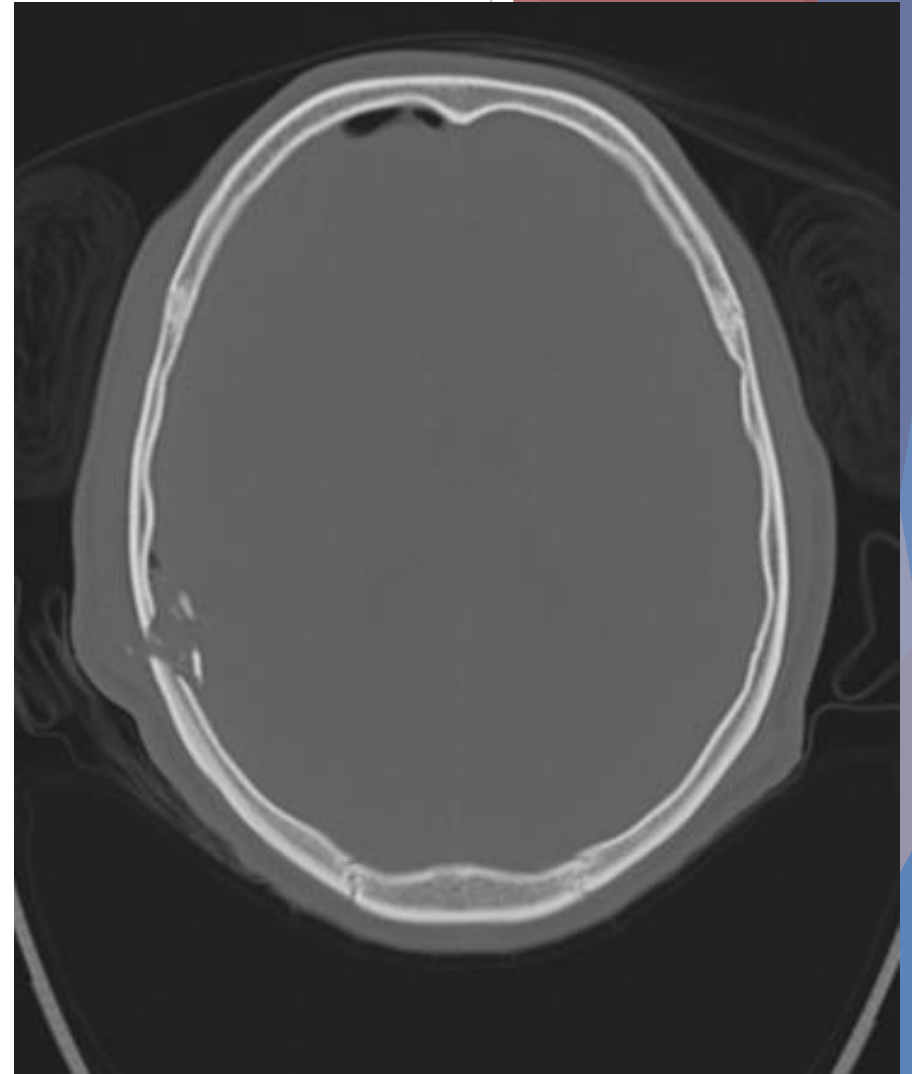
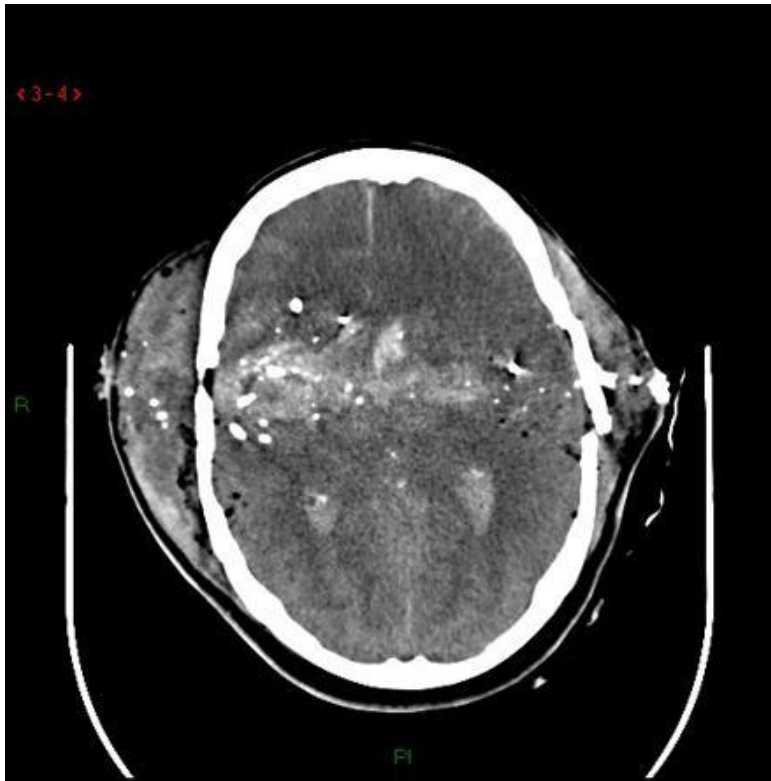
- **Most** manifest **immediately** following the event
- Others may be **delayed** from days to months
 - Headaches, subdural hematoma, spasticity, etc.
- Can occur alone or in combinations

- **Not** explained by pre-existing conditions or other acute medical, neurological, or psychological causes
 - Can cause exacerbation of pre-existing condition



Open vs Closed TBI

- Open or penetrating TBI:
 - An object breaks the skulls and enters the brain
 - Pneumocephalus
- Closed TBI:
 - Brain is injured but the skull remains intact



Traumatic Brain Injury: Severity



TBI-BH ECHO

TBI Severity Determination

- **Mild**
 - Complicated-mild
- **Moderate**
- **Severe**

- **Based on following criteria:**
 - Duration of loss of consciousness, duration of altered mental status, duration of post-traumatic amnesia
 - Glasgow coma scale
 - Imaging finding



TBI Severity Determination

Criteria	Mild	Moderate	Severe
Structural imaging	Normal	Normal or abnormal	Normal or abnormal
Loss of consciousness	0-30 min	>30 min and <24 hours	>24 hours
Alteration of consciousness/mental state	Up to 24 hours	>24 hours; severity based on other criteria	
Post-traumatic amnesia duration	0-1 day	>1 and <7 days	>7 days
Glasgow Coma Scale (best available score in first 24 hours)	13-15	9-12	<9



Post-traumatic Amnesia (PTA)

- A loss of memory for events surrounding the injury, disorientation, confusion and significant cognitive impairment
- Resolution: working memory returns
- Multiple assessment tools:
 - Galveston Orientation and Amnesia Test (GOAT)
 - Orientation-log (O-log)
 - Abbreviated Westmead Post Traumatic Amnesia Scale (A-WPTAS)



PTA: GOAT

- Assess both remote memory, time of injury memory , and post-injury memory
- Score ranges from: **-3 to 100**
- PTA ends when GOAT scores are greater than **75** for **two consecutive trials, 24 hours apart**



PTA: GOAT

TABLE 78-3. The Galveston Orientation and Amnesia Test	
Name _____	Date of test _____
Age _____ Sex M F	Day of the week S M T W T F S
Date of birth _____	Time _____ A.M. P.M.
Diagnosis _____	Date of injury _____
	Error points
1. What is your name? (2) _____	_____
When were you born? (4) _____	_____
Where do you live? (4) _____	_____
2. Where are you now? (5) (City) _____	_____
Hospital (5) (unnecessary to state name of hospital) _____	_____
3. On what date were you admitted to this hospital? (5) _____	_____
How did you get here? (5) _____	_____
4. What is the first event you can remember after the injury? (5) _____	_____
Can you describe in detail (e.g., date, time, companions) the first event you can recall after the injury? (5) _____	_____
5. Can you describe the last event you recall before the accident? (5) _____	_____
Can you describe in detail (e.g., date, time, companions) the first event you can recall before the injury? (5) _____	_____
6. What time is it now? (1 point for each half hour removed from current time to a maximum of 5 points) _____	_____
7. What day of the week is it? (1 point for each day removed from the correct day) _____	_____
8. What day of the month is it? (1 point for each day removed from the correct day to a maximum of 5 points) _____	_____
9. What is the month? (5 for each month removed from the correct month to a maximum of 15 points) _____	_____
10. What is the year? (10 for each year removed from the correct year to a maximum of 30 points) _____	_____
Total error points	_____
Total score (100 minus total error points)	_____



PTA: Orientation Log (O-log)

- Like the GOAT, also focuses on disorientation and amnesic symptoms
- Puts more equal weight into scored items and reduces difficulty verifying some responses
- **2 consecutive score of 25 and higher indicate resolution of PTA**



O-log

The Orientation Log (O-Log)

Patient Name:

Key: 3=spontaneous/free recall
2=logical cuing
1=multiple choice, phonemic cuing
0=unable, incorrect, inappropriate

Date																						
Time																						
City																						
Kind of Place																						
Name of Hospital																						
Month																						
Date																						
Year																						
Day of Week																						
Clock Time																						
Etiology/Event																						
Pathology Deficits																						



Rancho Los Amigos Scale

- Rancho Los Amigos Level of cognitive function scale
- Scale to help interpret the cognitive behavioral recovery process after a brain injury
- Ranges from I to VIII
 - Updated one from I to X
- Lower score indicates a more severe impairment of consciousness



Rancho Los Amigos Scale

Level	Description
I	No response
II	Generalized response
III	Localized responses
IV	Confused – agitated
V	Confused – inappropriate
VI	Confused – appropriate
VII	Automatic – appropriate
VIII	Purposeful and appropriate



Severity: Epidemiology

- Mild: 80%
- Moderate: 10%
- Severe: 10%

- Consistent across the US, Europe, Australia and Asia



Mild Traumatic Brain Injury



TBI-BH ECHO

Mild TBI? Concussion?

- Concussion is a type TBI
- Sports-related concussion:
 - Traumatic brain injury induced by biomechanical forces
 - Caused either by a direct blow to the head, face, neck or elsewhere on the body with an impulsive force transmitted to the head
 - Typically, rapid onset of short-lived symptoms
 - Functional disturbance rather than a structural injury. Therefore, no abnormality is seen on standard structural neuroimaging studies



Assessment

Table 1.2. Key Features of mTBI Assessment in an Emergency Department or Doctor's Office

<p>(a) A medical history encompassing a review of:</p> <ul style="list-style-type: none">• Current symptoms and health concerns• Setting and mechanism of injury• Severity/duration of altered consciousness and immediate symptoms• Presence of co-occurring injuries• Pre-existing medical and mental health conditions• Potentially contributing psychosocial factors
<p>(b) An examination including an assessment of:</p> <ul style="list-style-type: none">• Mental status and cognition• Physical status• Cranial nerves• Extremity tone, strength, and reflexes• Gait and balance
<p>(c) An assessment of the patient's clinical status, including whether there has been improvement or deterioration since the time of injury. This may require additional information from others, including eyewitnesses to the injury.</p>
<p>(d) Determination of the need for urgent neuroimaging to exclude a more severe brain injury (see Figure 1.1), such as a structural abnormality or hemorrhage.</p>

Adapted from the NSW Ministry of Health. Closed Head Injury in Adults - Initial Management (PD2012_013).



Features of Sports-Related Concussion

Symptoms/physical signs	Behavioural changes	Cognitive impairment	Sleep disturbances
Headache	Irritability	Slowed reaction times	Drowsiness
Nausea/vomiting	Emotional lability	Difficulty concentrating	Trouble falling asleep
Dizziness	Sadness	Difficulty remembering	Sleeping more than usual
Visual disturbances	Anxiety	Confusion	Sleeping less than usual
Photophobia	Inappropriate emotions	Feeling in a fog	
Phonophobia		Feeling dazed	
Loss of consciousness			
Amnesia			
Loss of balance or poor coordination			
Decreased playing ability			



Concussion Grade

- Numerous grading systems:
 - Cantu Grading System
 - Colorado Medical Society Guidelines
 - American Academy of Neurology Guidelines
- Useful when developed
- No longer recommended



Assessment Tools: Concussion

- Acute Concussion Evaluation (ACE)
- Military Acute Concussion Evaluation (MACE2)
 - Military personnel
- Sports Concussion Assessment Tool 3 (SCAT3)
 - Athletes
 - For those \geq 13 years of age
 - Child-SCAT3 for children 5 to 12 for more age appropriate cognitive test
- Concussion Recognition Tool



Acute Concussion Evaluation (ACE)



ACUTE CONCUSSION EVALUATION (ACE)

PHYSICIAN/CLINICIAN OFFICE VERSION

Gerard Gioia, PhD¹ & Micky Collins, PhD²
¹Children's National Medical Center
²University of Pittsburgh Medical Center

Patient Name: _____
 DOB: _____ Age: _____
 Date: _____ ID/MR# _____

A. Injury Characteristics Date/Time of Injury _____ Reporter: Patient Parent Spouse Other

1. Injury Description _____

1a. Is there evidence of a forcible blow to the head (direct or indirect)? Yes No Unknown
 1b. Is there evidence of intracranial injury or skull fracture? Yes No Unknown
 1c. Location of Impact: Frontal Lt Temporal Rt Temporal Lt Parietal Rt Parietal Occipital Neck Indirect Force

2. Cause: MVC Pedestrian-MVC Fall Assault Sports (specify) _____ Other _____

3. Amnesia Before (Retrograde) Are there any events just BEFORE the injury that you/ person has no memory of (even brief)? Yes No Duration _____

4. Amnesia After (Anterograde) Are there any events just AFTER the injury that you/ person has no memory of (even brief)? Yes No Duration _____

5. Loss of Consciousness: Did you/ person lose consciousness? Yes No Duration _____

6. EARLY SIGNS: Appears dazed or stunned Is confused about events Answers questions slowly Repeats Questions Forgetful (recent)

7. Seizures: Were seizures observed? No Yes Detail _____

B. Symptom Check List* Since the injury, has the person experienced any of these symptoms any more than usual today or in the past day?
 Indicate presence of each symptom (0=No, 1=Yes). *Lovell & Collins, 1998 JHTR

PHYSICAL (10)		COGNITIVE (4)		SLEEP (4)	
Headache	0 1	Feeling mentally foggy	0 1	Drowsiness	0 1
Nausea	0 1	Feeling slowed down	0 1	Sleeping less than usual	0 1 N/A
Vomiting	0 1	Difficulty concentrating	0 1	Sleeping more than usual	0 1 N/A
Balance problems	0 1	Difficulty remembering	0 1	Trouble falling asleep	0 1 N/A
Dizziness	0 1	COGNITIVE Total (0-4) _____		SLEEP Total (0-4) _____	
Visual problems	0 1	EMOTIONAL (4)			
Fatigue	0 1	Irritability	0 1		
Sensitivity to light	0 1	Sadness	0 1		
Sensitivity to noise	0 1	More emotional	0 1		
Numbness/Tingling	0 1	Nervousness	0 1		
PHYSICAL Total (0-10) _____		EMOTIONAL Total (0-4) _____			
(Add Physical, Cognitive, Emotion, Sleep totals)					
Total Symptom Score (0-22) _____					

Exertion: Do these symptoms worsen with:
 Physical Activity Yes No N/A
 Cognitive Activity Yes No N/A

Overall Rating: How different is the person acting compared to his/her usual self? (circle)
 Normal 0 1 2 3 4 5 6 Very Different

C. Risk Factors for Protracted Recovery (check all that apply)

Concussion History? Y <u> </u> N <u> </u>	✓	Headache History? Y <u> </u> N <u> </u>	✓	Developmental History	✓	Psychiatric History
Previous # 1 2 3 4 5 6+		Prior treatment for headache		Learning disabilities		Anxiety
Longest symptom duration Days <u> </u> Weeks <u> </u> Months <u> </u> Years <u> </u>		History of migraine headache <u> </u> Personal <u> </u> Family		Attention-Deficit/ Hyperactivity Disorder		Depression
If multiple concussions, less force caused reinjury? Yes <u> </u> No <u> </u>				Other developmental disorder _____		Sleep disorder
Other psychiatric disorder _____						

List other comorbid medical disorders or medication usage (e.g., hypothyroid, seizures) _____

D. RED FLAGS for acute emergency management: Refer to the emergency department with sudden onset of any of the following:

- * Headaches that worsen
- * Looks very drowsy/ can't be awakened
- * Can't recognize people or places
- * Neck pain
- * Seizures
- * Repeated vomiting
- * Increasing confusion or irritability
- * Unusual behavioral change
- * Focal neurologic signs
- * Slurred speech
- * Weakness or numbness in arms/legs
- * Change in state of consciousness

E. Diagnosis (ICD): Concussion w/o LOC 850.0 Concussion w/ LOC 850.1 Concussion (Unspecified) 850.9 Other (854) _____
 No diagnosis

F. Follow-Up Action Plan Complete **ACE Care Plan** and provide copy to patient/family.

 No Follow-Up Needed
 Physician/Clinician Office Monitoring: Date of next follow-up _____
 Referral:
 Neuropsychological Testing
 Physician: Neurosurgery Neurology Sports Medicine Psychiatrist Psychiatrist Other _____
 Emergency Department

ACE Completed by: _____ © Copyright G. Gioia & M. Collins, 2006
 This form is part of the "Heads Up: Brain Injury in Your Practice" tool kit developed by the Centers for Disease Control and Prevention (CDC).



TBI-BH ECHO

Military Acute Concussion Evaluation (MACE2)

MILITARY ACUTE CONCUSSION SCREENING

Complete this section to determine if there was an injury event AND an alteration of consciousness or memory.

1. Description of Incident

A. Record the event as described by the service member or witness.

Use open-ended questions to get as much detail as possible.

Key questions:

- Can you tell me what you remember?
- What happened?
- Who were you last with?

B. Observable Signs

At the time of injury were any of these observable signs witnessed?

Visual clues that suggest a possible concussion include:

- Lying motionless on the ground
- Slow to get up after a direct or indirect blow to the head
- Disorientation, confusion, or an inability to respond appropriately to questions
- Blank or vacant look
- Balance difficulties, stumbling, or slow labored movements
- Facial injury after head trauma
- Negative for all observable signs

C. Record the type of event.

Check all that apply:

- Blunt object
- Fall
- Fragment
- Sports injury
- Assault
- Motor vehicle crash
- Gunshot wound
- Explosion/blast
- Estimated distance
- Other

D. Was there a blow or jolt to the head?

- Did your head hit any objects?
- Did any objects strike your head?
- Did you feel a blast wave? (A blast wave that is felt striking the body or head is considered a blow to the head.)
- Did you have a head acceleration or deceleration?

2. Alteration of Consciousness or Memory

A. Was there alteration of consciousness (AOC)?

AOC is temporary confusion or "having your bell rung."

YES NO

If yes, for how long? seconds
 minutes

UNKNOWN

B. Was there loss of consciousness (LOC)?

LOC is temporarily passing out or blacking out.

YES NO

If yes, for how long? seconds
 minutes

UNKNOWN

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? seconds
 minutes

UNKNOWN

D. Was the AOC, LOC or PTA witnessed?

YES NO

If yes, for how long? seconds
 minutes

UNKNOWN

3. Symptoms

Common symptoms after a concussion are listed below. For this event, check a that apply.

- Headache
- Dizziness
- Difficulty concentrating
- Irritability

Key questions:

- Were you dazed, confused, or did you "see stars" immediately after the event?
- Did you feel like you were in a fog, slowed down, or "something was not right"?

Key questions:

- Did you pass out or black out
- Is there a period of time you cannot account for?

Key questions:

- Is there a period of time you cannot account for?
- 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 or PTA and estimate duration.

COGNITIVE EXAM

5. Orientation

Score one 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 one hour of actual time.

ORIENTATION TOTAL SCORE

 5

6. Immediate Memory

Choose one list (A-F below) and use that list for the remainder of the MACE 2.

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

Trial 1 script: Read the script exactly as written.

- "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: Read the script exactly as written.

- "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 A	Trial 1		Trial 2		Trial 3	
	Incorrect	Correct	Incorrect	Correct	Incorrect	Correct
Jacket	0	1	0	1	0	1
Arrow	0	1	0	1	0	1
Pepper	0	1	0	1	0	1
Cotton	0	1	0	1	0	1
Movie	0	1	0	1	0	1

IMMEDIATE MEMORY TOTAL SCORE

 15

Immediate Memory Alternate Word Lists

List B	List C	List D	List E	List F
Dollar	Finger	Baby	Candle	Elbow

SCAT5

1

IMMEDIATE OR ON-FIELD ASSESSMENT

The following elements should be assessed for all athletes who are suspected of having a concussion prior to proceeding to the neurocognitive assessment and ideally should be done on-field after the first first aid / emergency care priorities are completed.

If any of the "Red Flags" or observable signs are noted after a direct or indirect blow to the head, the athlete should be immediately and safely removed from participation and evaluated by a physician or licensed healthcare professional.

Consideration of transportation to a medical facility should be at the discretion of the physician or licensed healthcare professional.

The GCS is important as a standard measure for all patients and can be done serially if necessary in the event of deterioration in conscious state. The Maddocks questions and cervical spine exam are critical steps of the immediate assessment; however, these do not need to be done serially.

STEP 1: RED FLAGS

RED FLAGS:

- Neck pain or tenderness
- Double vision
- Weakness or tingling/burning in arms or legs
- Severe or increasing headache
- Seizure or convulsion
- Loss of consciousness
- Deteriorating conscious state
- Vomiting
- Increasingly restless, agitated or combative

STEP 2: OBSERVABLE SIGNS

Witnessed Observed on Video

Lying motionless on the playing surface	Y	N
Balance / gait difficulties / motor incoordination: stumbling, slow / laboured movements	Y	N
Disorientation or confusion, or an inability to respond appropriately to questions	Y	N
Blank or vacant look	Y	N
Facial injury after head trauma	Y	N

STEP 3: MEMORY ASSESSMENT MADDOKS QUESTIONS²

²I am going to ask you a few questions, please listen carefully and give your best effort. First, tell me what happened?

Name: _____
 DOB: _____
 Address: _____
 ID number: _____
 Examiner: _____
 Date: _____

OFFICE OR OFF-FIELD ASSESSMENT

Please note that the neurocognitive assessment should be done in a distraction-free environment with the athlete in a resting state.

STEP 1: ATHLETE BACKGROUND

Sport / team / school: _____
 Date / time of injury: _____
 Years of education completed: _____
 Age: _____

Gender: M / F / Other

Dominant hand: left / neither / right

How many diagnosed concussions has the athlete had in the past?: _____

When was the most recent concussion?: _____

How long was the recovery (time to being cleared to play) from the most recent concussion?: _____ (days)

Has the athlete ever been:

STEP 4: EXAMINATION

GLASGOW COMA SCALE (GCS)

Time of assessment

Date of assessment

Best eye response (E)

No eye opening

Eye opening in response to pain

Eye opening to speech

Eyes opening spontaneously

Best verbal response (V)

No verbal response

Incomprehensible sounds

Inappropriate words

Confused

Oriented

Best motor response (M)

No motor response

Extension to pain

Abnormal flexion to pain

Flexion / Withdrawal to pain

Localizes to pain

Obeys commands

Glasgow Coma score (E + V + M)

CERVICAL SPINE ASSESSMENT

Does the athlete report that their neck is pain free at rest?

If there is NO neck pain at rest, does the athlete have a full range of ACTIVE pain free movement?

Is the limb strength and sensation normal?

Hospitalized for a head injury?	Yes	No
Diagnosed / treated for headache disorder or migraines?	Yes	No
Diagnosed with a learning disability / dyslexia?	Yes	No
Diagnosed with ADD / ADHD?	Yes	No
Diagnosed with depression, anxiety or other psychiatric disorder?	Yes	No

Current medications? If yes, please list:

2

Name: _____
 DOB: _____
 Address: _____
 ID number: _____
 Examiner: _____
 Date: _____

STEP 2:

The athlete should paragraph out loud the athlete should the post injury as

Please Check

Headache

*Pressure in head

Neck Pain

Nausea or vomit

Dizziness

Blurred vision

Balance problem

Sensitivity to light

Sensitivity to noise

Feeling slowed down

Feeling like "in a fog"

"Don't feel right"

Difficulty concentrating

Difficulty remembering

Fatigue or low energy

Confusion

Drowsiness

More emotional

Irritability

Sadness

Nervous or Anxious

Trouble falling asleep (if applicable)

Total number of symptoms

Symptom severity

Do your symptoms

4

STEP 4: NEUROLOGICAL SCREEN

See the instruction sheet (page 7) for details of test administration and scoring of the tests.

Can the patient read aloud (e.g. symptom checklist) and follow instructions without difficulty?	Y	N
Does the patient have a full range of pain-free PASSIVE cervical spine movement?	Y	N
Without moving their head or neck, can the patient look side-to-side and up-and-down without double vision?	Y	N
Can the patient perform the finger nose coordination test normally?	Y	N
Can the patient perform tandem gait normally?	Y	N

BALANCE EXAMINATION

Modified Balance Error Scoring System (mBESS) testing⁵

Which foot was tested (i.e. which is the non-dominant foot) Left Right

Testing surface (hard floor, field, etc.) _____

Footwear (shoes, barefoot, braces, tape, etc.) _____

Condition _____ Errors _____

Double leg stance _____ of 10

Single leg stance (non-dominant foot) _____ of 10

Tandem stance (non-dominant foot at the back) _____ of 10

Total Errors _____ of 30

6

STEP 6: DECISION

Domain	Date & time of assessment:		
Symptom number (of 22)			
Symptom severity score (of 132)			
Orientation (of 5)			
Immediate memory	of 15 of 30	of 15 of 30	of 15 of 30
Concentration (of 5)			
Neuro exam	Normal Abnormal	Normal Abnormal	Normal Abnormal
Balance errors (of 30)			
Delayed Recall	of 5 of 10	of 5 of 10	of 5 of 10

Name: _____
 DOB: _____
 Address: _____
 ID number: _____
 Examiner: _____
 Date: _____

5

STEP 5: DELAYED RECALL:

The delayed recall should be performed after 5 minutes have elapsed since the end of the Immediate Recall section. Score 1 pt. for each correct response.

Do you remember that list of words I read a few times earlier? Tell me as many words from the list as you can remember in any order.

Time Started _____

Please record each word correctly recalled. Total score equals number of words recalled.

Total number of words recalled accurately: _____ of 5 or _____ of 10

Date and time of injury: _____

If the athlete is known to you prior to their injury, are they different from their usual self?

Yes No Unsure Not Applicable

(If different, describe why in the clinical notes section)

Concussion Diagnosed?

Yes No Unsure Not Applicable

If re-testing, has the athlete improved?

Yes No Unsure Not Applicable

I am a physician or licensed healthcare professional and I have personally administered or supervised the administration of this SCAT5.

Signature: _____

Name: _____

Title: _____

Registration number (if applicable): _____

Date: _____

?

- What is the diagnosis?



Case courtesy of A.Prof Frank Gaillard, Radiopaedia.org, rID: 2995



TBI-BH ECHO

Questions?



TBI-BH ECHO

Thank You



TBI-BH ECHO

Resources

- CDC Heads Up
 - <https://www.cdc.gov/headsup/index.html>
- VA/DoD Clinical Practice Guideline
 - Management and Rehabilitation of Post-Acute mTBI
 - <https://www.healthquality.va.gov/guidelines/rehab/mtbi/>
- Ontario Neurotrauma Foundation Guidelines
 - <https://braininjuryguidelines.org/>



Implementation of the 2017 Berlin Consensus Statement

Table 1 Mandatory signs of concussion and appropriate action

Signs	Action
Loss of consciousness	Remove the athlete from the field of play In some codes (eg, AFL, NRL, NFL, WR), the athlete may not return to the game once removed for a mandatory sign (referred to as 'no-go' criteria in the NFL). In other codes, a mandatory sign results in a mandatory assessment conducted in a distraction-free environment to determine whether to allow the player to return to the field of play.
Lying motionless for >5 s*	
Confusion/disorientation	
Amnesia	
Vacant look	
Motor incoordination	
Tonic posturing	
Impact seizure	
Ataxia	

Box 2 Criteria for return to sport after concussion in team collision sport

Athletes who have been diagnosed with concussion, may only return to sport after:

1. Concussion-related *symptom scores, at rest and with match-intensity exercise, have returned to baseline levels.*
2. *Neurological examination* (including balance testing) is normal.
3. *Cognitive testing* (computerised and/or pencil-and-paper) has returned to baseline or age-appropriate norms.

Table 2 Discretionary signs of concussion and appropriate action

Signs	Action
Clutching the head*	Further evaluation is required. The athlete should (1) be removed from the arena, (2) undergo an evaluation in a distraction-free environment and (3) only return to sport if the signs are determined to have been from a cause other than concussion (ie, the diagnosis of concussion is ruled out).
Being slow to get up*	
Suspected facial fracture	
Possible ataxia	
Behaviour change†	
Other clinical suspicion	

Box 3 Six features of successful programmes across team collision sports

1. Providing community resources such as websites, online learning modules and access to concussion recognition tools. Examples include the CDC concussion courses and World Rugby's Player Welfare sites.
2. Training for medical personnel via online modules and courses, posters, booklets and smartphone applications.
3. Training for medical personnel, independent consultants, trainers and spotters through national workshops.
4. Education of match officials.
5. Education of television commentators.
6. Leadership from well-known players involved in public awareness campaigns.

