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HEALTH SCIENCES CENTER™
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Update in Concussion Management

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What is a concussion?

*Concussion **is a brain injury** and is defined as a complex pathophysiological process affecting the brain, induced by biomechanical forces.*

2012 Zurich Guidelines

Definition – Zurich 2012

- Cause
  - Direct blow to the head, face, neck or elsewhere on the body with an ‘‘impulsive’ force transmitted to the head.
- Rapid onset of short-lived impairment of neurological function that resolves spontaneously.
  - In some cases, symptoms and signs may evolve over a number of minutes to hours.
- Functional disturbance rather than a structural injury
  - No abnormality is usually seen on standard structural neuroimaging studies
  - Though concussion may result in neuropathological changes
- 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.
  - Some cases symptoms may be prolonged.

Why do we care?

Goals today

Concussion History

- Grading scales
  - Colorado
  - Cantu
  - American Academy of Neurology

History

- Consensus Guidelines
  - Vienna (2001)
    - Define concussion
    - Eliminate grading systems
    - Return-to-Play Protocol
  - Prague (2004)
    - Simple vs. Complex
    - Sport Concussion Assessment Tool (SCAT)
  - Zurich (2008)
    - Simple vs. Complex abandoned
    - SCAT-2

Zurich 2012 Guidelines

http://bjsm.bmj.com/content/47/5/250.full

Friday Night

Assessment

- Symptoms
  - Somatic
    - Headache
    - Dizziness
  - Cognitive
    - “In a fog”
  - Emotional
    - Lability

Assessment

- Physical signs
  - LOC
  - Amnesia
- Behavioral change
  - Irritability
- Cognitive impairment
  - Confusion
  - Slowed reaction time
- Sleep disturbance
  - Insomnia

Sideline Evaluation

- Evaluate for c-spine injury
- Remove player from pa
- Use SCAT 3 or other sic
  - Maddock's questions
  - Person/place/time unr
- Serial monitoring of at
  - Appearance of signs/symptoms may be delayed several hours
- No same-day return to play

What venue are we at today?
Which half is it now?
Who scored last in this match?
What team did you play last week / game?
Did your team win the last game?

SCAT3™

Sport Concussion Assessment Tool – 3rd Edition

For use by medical professionals only

Name | Date/Time of Injury: Date of Assessment: | Examiner:

What is the SCAT3?[1]

The SCAT3 is a standardized tool for evaluating injured athletes for concussion and can be used in athletes aged from 13 years and older. It supersedes the original SCAT and the SCAT2 published in 2005 and 2009, respectively[2]. For younger persons, ages 12 and under, please use the Child SCAT3. The SCAT3 is designed for use by medical professionals. If you are not qualified, please use the Sport Concussion Recognition Tool[3]. Preseason baseline testing with the SCAT3 can be helpful for interpreting post-injury test scores.

Specific instructions for use of the SCAT3 are provided on page 3. If you are not familiar with the SCAT3, please read through these instructions carefully. This tool may be freely copied in its current form for distribution to individuals, teams, groups and organizations. Any revision or any reproduction in a digital form requires approval by the Concussion in Sport Group.

NOTE: The diagnosis of a concussion is a clinical judgment, ideally made by a medical professional. The SCAT3 should not be used solely to make, or exclude, the diagnosis of concussion in the absence of clinical judgement. An athlete may have a concussion even if their SCAT3 is "normal".

What is a concussion?

A concussion is a disturbance in brain function caused by a direct or indirect force to the head. It results in a variety of non-specific signs and/or symptoms (some examples listed below) and most often does not involve loss of consciousness. Concussion should be suspected in the presence of **any one or more** of the following:

- Symptoms (e.g., headache), or
- Physical signs (e.g., unsteadiness), or
- Impaired brain function (e.g. confusion) or
- Abnormal behaviour (e.g., change in personality).

SIDELINE ASSESSMENT

Indications for Emergency Management

NOTE: A hit to the head can sometimes be associated with a more serious brain injury. Any of the following warrants consideration of activating emergency procedures and urgent transportation to the nearest hospital:

- Glasgow Coma score less than 15
- Deteriorating mental status
- Potential spinal injury
- Progressive, worsening symptoms or new neurologic signs

Potential signs of concussion?

If any of the following signs are observed after a direct or indirect blow to the head, the athlete should stop participation, be evaluated by a medical professional and **should not be permitted to return to sport the same day** if a concussion is suspected.

Any loss of consciousness?	Y N
"If so, how long?"	
Balance or motor incoordination (stumbles, slow/laboured movements, etc.)?	Y N
Disorientation or confusion (inability to respond appropriately to questions)?	Y N
Loss of memory:	Y N
"If so, how long?"	
"Before or after the injury?"	
Blank or vacant look:	Y N
Visible facial injury in combination with any of the above:	Y N

1 Glasgow coma scale (GCS)

Best eye response (E)	
No eye opening	1
Eye opening in response to pain	2
Eye opening to speech	3
Eyes opening spontaneously	4
Best verbal response (V)	
No verbal response	1
Incomprehensible sounds	2
Inappropriate words	3
Confused	4
Oriented	5
Best motor response (M)	
No motor response	1
Extension to pain	2
Abnormal flexion to pain	3
Flexion/Withdrawal to pain	4
Localizes to pain	5
Obeys commands	6
Glasgow Coma score (E + V + M)	of 15

GCS should be recorded for all athletes in case of subsequent deterioration.

2 Maddocks Score[3]

"I am going to ask you a few questions, please listen carefully and give your best effort."

Modified Maddocks questions (1 point for each correct answer)

What venue are we at today?	0	1
Which half is it now?	0	1
Who scored last in this match?	0	1
What team did you play last week/game?	0	1
Did your team win the last game?	0	1
Maddocks score		of 5

Maddocks score is validated for sideline diagnosis of concussion only and is not used for serial testing.

Notes: Mechanism of Injury ("tell me what happened"?):

Any athlete with a suspected concussion should be REMOVED FROM PLAY, medically assessed, monitored for deterioration (i.e., should not be left alone) and should not drive a motor vehicle until cleared to do so by a medical professional. No athlete diagnosed with concussion should be returned to sports participation on the day of injury.

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BACKGROUND

Name: | Date:
Examiner:
Sport/team/school: | Date/time of injury:
Age: | Gender: M F
Years of education completed:
Dominant hand: right left neither
How many concussions do you think you have had in the past?
When was the most recent concussion?
How long was your recovery from the most recent concussion?
Have you ever been hospitalized or had medical imaging done for a head injury? Y N
Have you ever been diagnosed with headaches or migraines? Y N
Do you have a learning disability, dyslexia, ADD/ADHD? Y N
Have you ever been diagnosed with depression, anxiety or other psychiatric disorder? Y N
Has anyone in your family ever been diagnosed with any of these problems? Y N
Are you on any medications? If yes, please list: Y N

SCAT3 to be done in resting state. Best done 10 or more minutes post exercise.

SYMPTOM EVALUATION

3 How do you feel?

"You should score yourself on the following symptoms, based on how you feel now".

	none	mild		moderate			severe
Headache	0	1	2	3	4	5	6
"Pressure in head"	0	1	2	3	4	5	6
Neck Pain	0	1	2	3	4	5	6
Nausea or vomiting	0	1	2	3	4	5	6
Dizziness	0	1	2	3	4	5	6
Blurred vision	0	1	2	3	4	5	6
Balance problems	0	1	2	3	4	5	6
Sensitivity to light	0	1	2	3	4	5	6
Sensitivity to noise	0	1	2	3	4	5	6
Feeling slowed down	0	1	2	3	4	5	6
Feeling like "in a fog"	0	1	2	3	4	5	6
"Don't feel right"	0	1	2	3	4	5	6
Difficulty concentrating	0	1	2	3	4	5	6
Difficulty remembering	0	1	2	3	4	5	6
Fatigue or low energy	0	1	2	3	4	5	6
Confusion	0	1	2	3	4	5	6
Drowsiness	0	1	2	3	4	5	6
Trouble falling asleep	0	1	2	3	4	5	6
More emotional	0	1	2	3	4	5	6
Irritability	0	1	2	3	4	5	6
Sadness	0	1	2	3	4	5	6
Nervous or Anxious	0	1	2	3	4	5	6

Total number of symptoms (Maximum possible 22)
Symptom severity score (Maximum possible 132)

Do the symptoms get worse with physical activity? Y N
Do the symptoms get worse with mental activity? Y N

self rated | self rated and clinician monitored
clinician interview | self rated with parent input

Overall rating: If you know the athlete well prior to the injury, how different is the athlete acting compared to his/her usual self?
Please circle one response:

no different | very different | unsure | N/A

Scoring on the SCAT3 should not be used as a stand-alone method to diagnose concussion, measure recovery or make decisions about an athlete's readiness to return to competition after concussion. Since signs and symptoms may evolve over time, it is important to consider repeat evaluation in the acute assessment of concussion.

COGNITIVE & PHYSICAL EVALUATION

4 Cognitive assessment

Standardized Assessment of Concussion (SAC)[4]

Orientation (1 point for each correct answer)

What month is it?	0	1
What is the date today?	0	1
What is the day of the week?	0	1
What year is it?	0	1
What time is it right now? (within 1 hour)	0	1
Orientation score		of 5

Immediate memory

List	Trial 1	Trial 2	Trial 3	Alternative word list		
elbow	0 1	0 1	0 1	candle	baby	finger
apple	0 1	0 1	0 1	paper	monkey	penny
carpet	0 1	0 1	0 1	sugar	perfume	blanket
saddle	0 1	0 1	0 1	sandwich	sunset	lemon
bubble	0 1	0 1	0 1	wagon	iron	insect
Total						

Immediate memory score total of 15

Concentration: Digits Backward

List	Trial 1	Alternative digit list		
4-9-3	0 1	6-2-9	5-2-6	4-1-5
3-8-1-4	0 1	3-2-7-9	1-7-9-5	4-9-6-8
6-2-9-7-1	0 1	1-5-2-8-6	3-8-5-2-7	6-1-8-4-3
7-1-8-4-6-2	0 1	5-3-9-1-4-8	8-3-1-9-6-4	7-2-4-8-5-6
Total of 4				

Concentration: Month in Reverse Order (1 pt. for entire sequence correct)

Dec-Nov-Oct-Sept-Aug-Jul-Jun-May-Apr-Mar-Feb-Jan 0 1

Concentration score of 5

5 Neck Examination:

Range of motion | Tenderness | Upper and lower limb sensation & strength
Findings:

6 Balance examination

Do one or both of the following tests.
Footwear (shoes, barefoot, braces, tape, etc.)

Modified Balance Error Scoring System (BESS) testing[5]
Which foot was tested (i.e. which is the **non-dominant** foot) Left Right
Testing surface (hard floor, field, etc.)

Condition

Double leg stance:	Errors
Single leg stance (non-dominant foot):	Errors
Tandem stance (non-dominant foot at back):	Errors

And / Or

Tandem gait[6,7]
Time (best of 4 trials): seconds

7 Coordination examination

Upper limb coordination
Which arm was tested: Left Right
Coordination score of 1

8 SAC Delayed Recall[4]

Delayed recall score of 5

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

Further Care

- Evaluation in ER or physician's office
  - (Natasha's Law – H.B. 2038)
  - Detailed neurologic exam
    - Cranial nerves
    - Cerebellar function
  - Mental status

Further Evaluation

- Cognitive function
  - Serial 7s
- Gait
- Balance
  - Romberg
  - Tandem Gait

Imaging?

- Typically normal in concussion
  - Functional injury
- Indicated for:
  - Focal neurologic deficits
  - Prolonged cognitive disturbance
  - Worsening symptoms

Neuropsychiatric Testing

The application of neuropsychological (NP) testing in concussion has been shown to be of clinical value and contributes significant information in concussion evaluation.

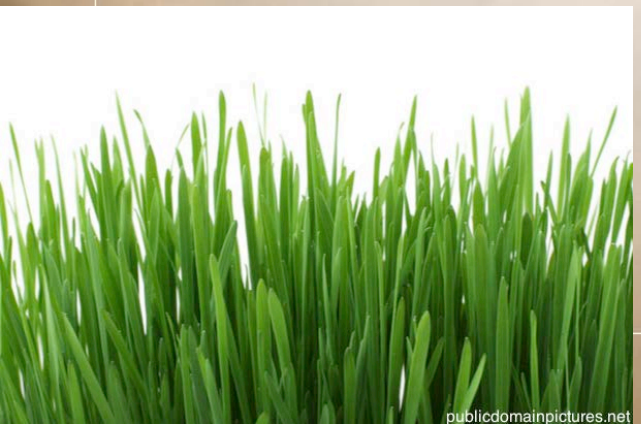
-Zurich 2012 Guidelines

Management

- Step 1
  - No activity until completely asymptomatic

Rest Rest Rest

(yes, this also means school)



Management

- Each step 24 hours apart
- If asymptomatic → progress to next step
- If symptoms develop
  - Rest 24 hours
  - Repeat the last asymptomatic step

Table 1 Graduated return to play protocol

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

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