Concussion Update 2019

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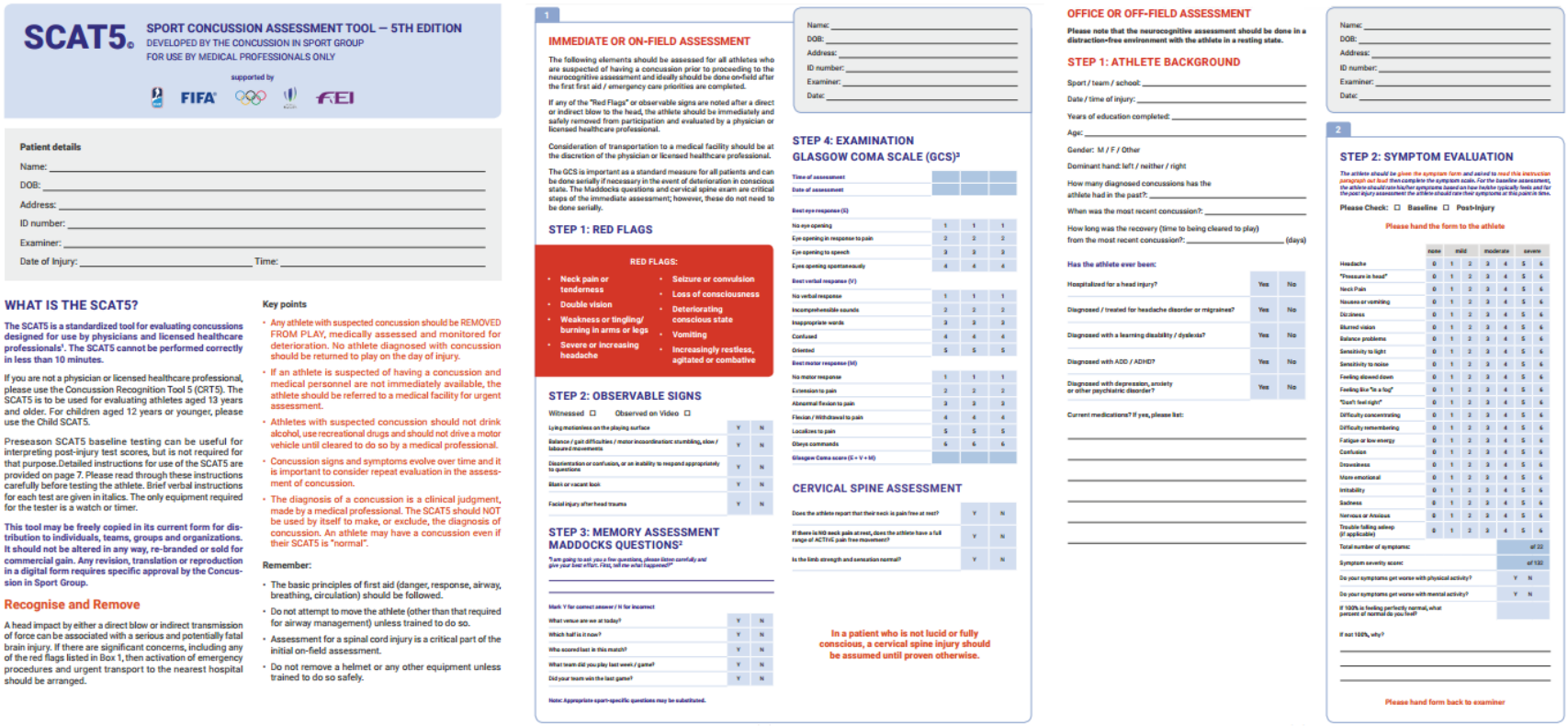
On Field Assessment (SCAT5)



SCAT5. SPORT CONCUSSION ASSESSMENT TOOL – 5TH EDITION
DEVELOPED BY THE CONCUSSION IN SPORT GROUP
FOR USE BY MEDICAL PROFESSIONALS ONLY

supported by

Patient details

Name: _____
DOB: _____
Address: _____
ID number: _____
Examiner: _____
Date of Injury: _____ Time: _____

WHAT IS THE SCAT5?

The SCAT5 is a standardized tool for evaluating concussions designed for use by physicians and licensed healthcare professionals[1]. The SCAT5 cannot be performed correctly in less than 10 minutes.

If you are not a physician or licensed healthcare professional, please use the Concussion Recognition Tool 5 (CRT5). The SCAT5 is to be used for evaluating athletes aged 13 years and older. For children aged 12 years or younger, please use the Child SCAT5.

Preseason SCAT5 baseline testing can be useful for interpreting post-injury test scores, but is not required for that purpose.Detailed instructions for use of the SCAT5 are provided on page 7. Please read through these instructions carefully before testing the athlete. Brief verbal instructions for each test are given in italics. The only equipment required for the tester is a watch or timer.

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Recognise and Remove

A head impact by either a direct blow or indirect transmission of force can be associated with a serious and potentially fatal brain injury. If there are significant concerns, including any of the red flags listed in Box 1, then activation of emergency procedures and urgent transport to the nearest hospital should be arranged.

Key points

- Any athlete with suspected concussion should be REMOVED FROM PLAY, medically assessed and monitored for deterioration. No athlete diagnosed with concussion should be returned to play on the day of injury.
- If an athlete is suspected of having a concussion and medical personnel are not immediately available, the athlete should be referred to a medical facility for urgent assessment.
- Athletes with suspected concussion should not drink alcohol, use recreational drugs and should not drive a motor vehicle until cleared to do so by a medical professional.
- Concussion signs and symptoms evolve over time and it is important to consider repeat evaluation in the assessment of concussion.
- The diagnosis of a concussion is a clinical judgment, made by a medical professional. The SCAT5 should NOT be used by itself to make, or exclude, the diagnosis of concussion. An athlete may have a concussion even if their SCAT5 is "normal".

Remember:

- The basic principles of first aid (danger, response, airway, breathing, circulation) should be followed.
- Do not attempt to move the athlete (other than that required for airway management) unless trained to do so.
- Assessment for a spinal cord injury is a critical part of the initial on-field assessment.
- Do not remove a helmet or any other equipment unless trained to do so safely.

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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 MADDOCKS QUESTIONS[2]

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

Mark Y for correct answer / N for incorrect

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

Note: Appropriate sport-specific questions may be substituted.

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

STEP 4: EXAMINATION
GLASGOW COMA SCALE (GCS)[3]

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

CERVICAL SPINE ASSESSMENT

Does the athlete report that their neck is pain free at rest?	Y	N
If there is NO neck pain at rest, does the athlete have a full range of ACTIVE pain free movement?	Y	N
Is the limb strength and sensation normal?	Y	N

In a patient who is not lucid or fully conscious, a cervical spine injury should be assumed until proven otherwise.

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:

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:

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

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STEP 2: SYMPTOM EVALUATION

The athlete should be given the symptom form and asked to read this instruction paragraph out loud then complete the symptom scale. For the baseline assessment, the athlete should rate his/her symptoms based on how he/she typically feels and for the post-injury assessment the athlete should rate their symptoms at this point in time.

Please Check: ☐ Baseline ☐ Post-Injury

Please hand the form to the athlete

	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
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
Trouble falling asleep (if applicable)	0	1	2	3	4	5	6
Total number of symptoms:							of 22
Symptom severity score:							of 132
Do your symptoms get worse with physical activity?						Y	N
Do your symptoms get worse with mental activity?						Y	N

If 100% is feeling perfectly normal, what percent of normal do you feel?

If not 100%, why?

Please hand form back to examiner

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http://bjsm.bmj.com/content/51/11/851

Red Flag Symptoms

- Headaches that worsen
- Look very drowsy, can't be awakened
- Can't recognize people or places
- Unusual behavior change
- Seizures
- Repeated vomiting
- Increasing confusion
- Increasing irritability
- Neck pain (depends)
- Slurred speech
- Weakness or numbness in arms or legs
- Loss of consciousness post injury

Evaluation in ED (if needed)

- Evaluation includes history, symptom review, neurological and vision examination, hopefully
- Evaluation might not include imaging
  - Specific criteria exist to decide who needs a CT scan, looking for brain bleed, not concussion
  - MRI is not done with acute concussion, really ever
- Sometimes seen, discharged after observation

And so now they're in the office…

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Is it a Concussion?

- 4 ways to assess:
  - Symptoms
  - Balance testing
  - Visual testing
  - Cognitive testing

- Note that we have NO imaging test or blood test that definitively diagnoses concussion

What's Useful?

- Vestibulo-ocular screening exam (A)
- Neck eval (B)
- Balance testing (B)
- Screening for prior (A) or current psych issues (B)

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Sports Health. 2016 May/Jun;8(3):260-269. doi: 10.1177/1941738116641394.

What's not so Useful?

- Cranial nerves (C)
- Reflexes (C)
- Strength testing (C)
- Funduscopic exam (C)
- Visual acuity (C)

So… This is not your usual neuro exam

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Concussion History

- Usual HPI – how, when, where, mechanism, field evaluation, ED?, progress since
- Previous concussions – when, how, how long to recover
- Pre-existing psych issues – ANXIETY, depression, ADD
- Current sport, where in season, next sport

Symptoms

- Taken from SCAT-5
- Helps to decide on early treatment (light, noise sensitivity for example)
- Can be useful to track symptoms (or might not)

Symptoms, self rate 0-6

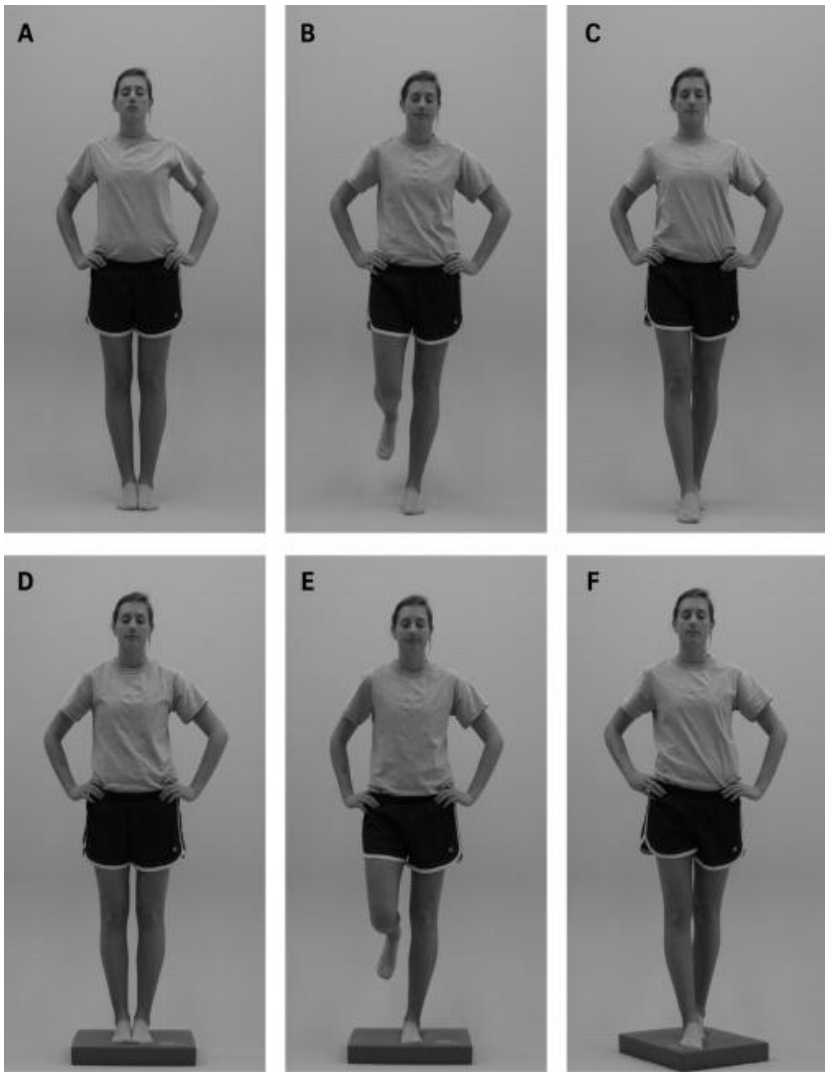
- Headache
- "Pressure in head
- Neck Pain
- Nausea or vomiting
- Dizziness
- Blurred Vision
- Balance problems
- Sensitivity to light
- Sensitivity to noise
- Feeling slowed down
- Feeling in a "fog”
- "Don’t feel right“
- Difficulty concentrating
- Difficulty remembering
- Fatigue or low energy
- Confusion
- Drowsiness
- Trouble falling asleep
- More emotional
- Irritability
- Sadness
- Nervous or anxious

Balance Testing

BESS (Balance Error Scoring System)

Subjective depending on scorer

20 secs each position, count errors (up to 10) per position



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BESS Scoring

- Normal score for age 5-7 is 23 +/- 8
- Normal score for age 8-10 is 18 +/- 8
- Normal score for age 11-14 is 16 +/- 7
- Normal score for age 15-20 is 12 +/- 7
- Normal score for age 20-55 is 10 +/- 5

- OK to also do mBESS (modified BESS, no foam block)

Tandem Gait Testing

- Ability to walk heel to toe in a straight line 3 meters
- Timed, rather than counting errors, but they have to correct errors, which affects time
- Compare to norms or their baseline
- May be more user friendly than BESS
  - Less inter-rater reliability concerns

Eye Testing – VOMS (Vestibular/ Ocular Motor Screen)

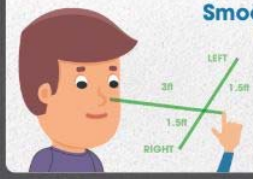
- Smooth pursuits and saccades - horizontal and vertical
  - Looking for inability to track, symptoms, nystagmus
- Accommodation/ Near point convergence
  - Normal should be ~ 6 inches from face
- Reasonably reliable, and hard to fake
- May predict what they'll have trouble with

Mucha et al AJSM 2014

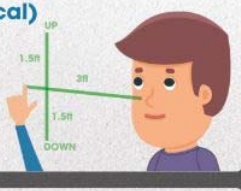
Vestibular/Ocular-Motor Screening
(VOMS)

Smooth Pursuits (Horizontal & Vertical)

Tests ability to follow a slowly moving target



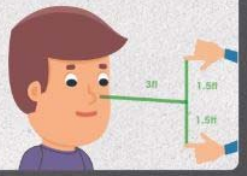
Both patient and clinician are seated
Patient follows finger with eyes
Do NOT move head, just eyes
2 reps at rate of 2 sec / rep
Rate symptoms (0-10)
Complete for both horizontal & vertical



Saccades (Horizontal & Vertical)

Tests ability of eyes to move quickly between targets

Both patient and clinician are seated
Clinician holds fingers 3' apart
Patient initally looks L-R
Do NOT move head, just eyes
10 reps as quickly as possible
Rate symptoms (0-10)
Repeat with patient looking Up-Down



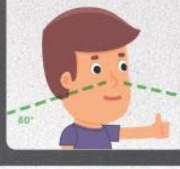
Convergence

Measures ability to view a near target without double vision

Patient holds target with 14-point font "X" at arms length
Patient brings target toward eyes focusing on the "X"
Stop when they see double
Clinician measures distance from tip of nose to target (cm)
Repeat 3x; record all 3
Rate symptoms (0-10)

Visual Motion Sensitivity

Tests visual motion sensitivity & ability to inhibit vestibular induced eye movements using vision



Patient holds arm outstretched in front with thumbs up
Turn body as a unit to L-R 80 deg from midline focusing on thumb
Use metronome 50 bpm
Repeat 5 revolutions
Rate symptoms (0-10)

Vestibular-Ocular Reflex (Horizontal & Vertical)

Assess ability to stabilize vision as head moves

Clinician holds target 3' from patient's eye level
Patient initially turns head L-R 10x
Keep eyes focused on target
Use metronome 180 bpm
Wait 10 seconds
Rate symptoms (0-10)
Repeat with patient looking Up-Down

Visit natafoundation.org/for-the-profession for more info including the NATA Foundation e-article on VOMS

1. Collins MW, Kontos AP, Reynolds E, et al. A comprehensive, targeted approach to the clinical care of athletes following sport-related concussion. *Knee Surg Sports Traumatol Arthrosc.* 2014;22:235-246.
2. Khan S, Chang R. Anatomy of the vestibular system: a review. *NeuroRehabilitation.* 2013;32;437-443.
3. Kontos AP, Sufrinko A, Elbin RJ, Puskar A, Collins MW. Reliability and associated risk factors for performance on the vestibular/ocular motor screening (VOMS) tool in healthy collegiate athletes. *Am J Sports Med.* 2016:44:1400-1406.
4. Mucha A, Collins MW, et al. A brief vestibular/ocular motor screening (VOMS) assessment to evaluate concussions: preliminary findings. *Am J Sports Med.* 2014;42:2479-2486.

NATA RESEARCH & EDUCATION FOUNDATION

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Accommodation

- Also called convergence
- Keep focused on object as it gets closer
- Watch for convergence (cross eyed)
- Subject will report double image as eyes lose ability to converge, examiner may see that too

- If far from face, patient will have complaints of double vision when trying to focus on tasks

- Smooth Pursuits
  - Smoothly(!) move object (finger) in front of face, ask subject to track with eyes only
  - Watch for nystagmus, inability to track, sx of dizziness, making faces, withdrawal, request to stop, etc
- Saccades
  - Subject looks as quickly as reasonable between 2 fixed objects
  - Watch for same findings

Visual Testing Correlates

- Horizontal – trouble with reading
- Vertical – trouble with taking notes in class
- Accommodation – focal length, blurriness (reading glasses???)

VOR (Vestibulo-Ocular Reflex)

- Ability of eyes to remain fixed on object while head moves
- Eyes must move opposite to direction of head in order to keep object in focus

- Used both as a physical exam and rehab tool

VOR How-to

- Snellen eye chart
  - Should lose no more than 3 lines while turning head at 1 back and forth per second
- Focus on fixed object (pen, thumb) while turning head
  - Should not be symptomatic

Visual Motor Screen

- Focus on fixed object while pivoting
- Makes background blurred
- Hardest to do and good for rehab

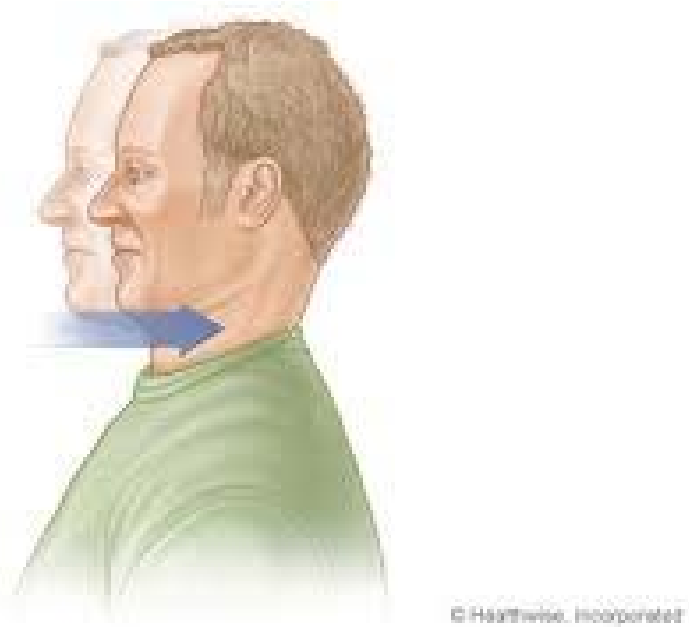
Instructional Videos

- https://www.youtube.com/watch?v=S66o9ODhmIk
- https://www.youtube.com/watch?v=LyxcLTSsF_w&t=1s
- https://www.youtube.com/watch?v=XlA_wJAMBmg

What about the Neck?

- Many concussions also involved a neck injury
  - Typically not enough to require imaging
- Can be a cause for persistent headaches
  - If headache is the only remaining symptom, it could be neck related and not concussion
- Range of motion, posterior glide, palpation

Posterior Glide Neck Stretch



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Cognitive Testing

- ImPACT is a purchased tool, not “the” concussion test, in conjunction with other eval
  - Baseline testing helpful but not always available
  - Effort dependent
  - Can be useful for deciding on return to play
- Anxiety can affect test
- For many, school or work ability may be good enough

What about Imaging?

- Most concussions never need imaging
  - Imaging is looking for brain bleed not concussion
- Decision tool –PECARN criteria
  - https://www.mdcalc.com/pecarn-pediatric-head-injury-trauma-algorithm
- Choosing Wisely Campaign (MRI)
  - http://consumerhealthchoices.org/wp-content/uploads/2015/01/ChoosingWiselyBrainScanAMSSM-ER.pdf

Criteria for CT in Concussion

- GCS < 15 at 2 hours post-injury
- Suspected open or depressed skull fracture
- Any sign of basilar skull fracture (hemotympanum, raccoon eyes, cerebrospinal fluid oto-/rhinorrhea, Battle's sign)
- >= 2 episodes of vomiting
- Age >65
- Retrograde Amnesia to the Event >= 30 minutes
- "Dangerous Mechanism" (struck by vehicle, ejected from vehicle, Fall from > 3 feet or > 5 stairs.)

Take Home Points on Imaging

- Just because you had a normal CT scan does NOT mean it's NOT a concussion
- Because you did not need a CT scan does NOT mean it's NOT a concussion
- Because they're not getting better is NOT a reason to get MRI (do with focal neuro findings only)
- There is no imaging test to diagnose a concussion

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Expected Concussion Recovery

- 10-14 days
  - Bell shaped curve
  - Individualize, don’t sit everyone out for set amount of time
  - Don’t try to predict at onset
- Worse in those reporting “fogginess” as immediate symptom, amnesia
- Worse in younger kids

Treating a Concussion

- After 24 hrs, OTC analgesics are OK
- Meds to aid sleep
  - Diphenhydramine to start, or melatonin
  - Amitriptyline
- Referral to balance/ vestibular specialist in PT
- Other meds used rarely
  - Amantadine
  - Stimulants?

What if they're not getting better?

- Quality of sleep (and quantity)
- Work station/ computer set-up
  - Dim screen, biggest screen possible
  - Light similar to area lighting
- Balance/ visual challenges – PT referral
- ANXIETY
- Too much too soon? Too hard/ other stimuli?
  - Heart rate threshold?

Return to Learn

- “brain rest” now limited to 2 days
- Start with “presenteeism”
- Gradually increase time in class, visual complexity
- Extra time for assignments
- Hold out from most difficult testing, standardized tests

Troubleshooting Symptoms

- Hat, sunglasses, earplugs
- Sleep aids/ sleep hygiene
- Tylenol, NSAIDs
- Psych referral
- Reading glasses(?)
- Vestibular PT referral

Vestibular PT

- VOMS as treatment
- Balance exercises
- Increase complexity of visual tasks
- Increase exercise/ dual task

Return to Play

- Gradual, over minimum of 5 days/ steps
- Progressive heart rate, visual challenges
- If one day increases symptoms, may not move on to the next day, but not back to beginning
- Could take longer than 5 days
  - http://www.cdc.gov/headsup/providers/return_to_activities.html

What's New in Return to Play?

- May start exercising before symptoms are gone (not return to play, but return to exercise)
- Can be as soon as 48 hours post concussion
- Exercise OK if symptoms "not worse"
- Parents do not need to worry about their concussed child being active when able

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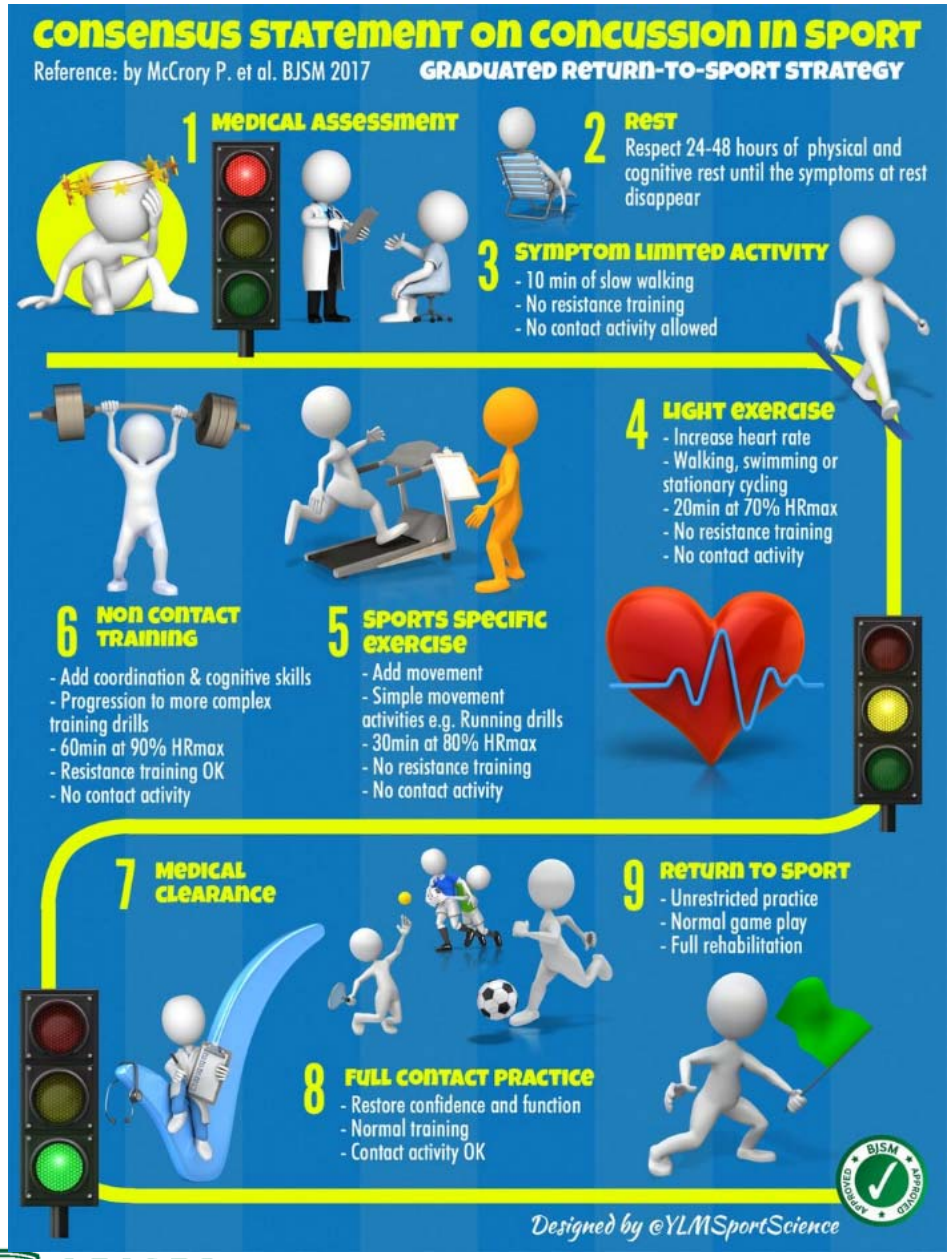
What's not new in return to play?

- Must be back in school full time before considering full return to contact sport

- No return same season for second concussion this season (maybe no return next season too)



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Resources

- http://www.cdc.gov/concussion/headsup/
- https://jamanetwork.com/journals/jamapediatrics/fullarticle/2698456
- https://www.youtube.com/watch?v=zCCD52Pty4A

(put “concussion 101” in your search engine)

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Chronic Traumatic Encephalopathy

- Lots of press coverage – suicides, depression in NFL, Parkinson's in boxers, feature film
- Alzheimer's like brain plaques and tangles

- So everybody's worried
  - Should Dartmouth eliminate football?
  - Will my kid get Alzheimer's? Be suicidal/ homicidal?

CTE is a POSTMORTEM Diagnosis

- Unable to diagnose in living
- Donated brains are a small subset of deceased pro athletes, not representative
- Pro sports retirees are actually healthier than age matched peers
- We treat kids far differently than pro athletes were treated (or not) in the past

End of Season/ End of Year

- Easier decision to make, easier to handle emotionally
- Not a retirement, just a break
- Usually made due to second concussion this season, or within a couple of months
- Some athletes participate in practices, not games, avoiding contact

End of Career Criteria

1. number of concussions
2. mechanism of injury
3. length of time to recover
4. proximity of concussions

- Note that none of this is scientific, absolute or evidence based

In The Bleachers

"You took a hard blow to the head. I'll tell coach you're OK to go back in the game if you can answer these three simple questions correctly."

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