


CS8

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The Keys to Concussion Care in 2022

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Concussion definition

- Traumatic brain injury
- Caused by a blow to the head or body
- Characterized by rapid onset neurological impairment that typically are short-lived and resolve spontaneously
- May or may not involve loss of consciousness
- Routine neuroimaging (CT or MRI) if obtained are normal
- Not explained by other medial issues

Herring S et al. Selected issues in sport-related concussion for the team physician: a consensus statement. Br J Sports Med. 2021 Nov;55(22):1251-1261.

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The Keys to Concussion Care in 2022

At the end of this talk you will be able to:

- Explain the utility of baseline testing and VOMS in acute concussion identification
- Describe the NATA recommendations for reducing intentional head-first contact behavior
- Describe a case where subsymptom threshold exercise might help a concussion patient recover.
- Evaluate a student athlete's readiness for return to play
- Explain the risk of repeat concussion for a student athlete

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Health disparities

- Schools with athletic trainer had greater number of athletes diagnosed with concussion compared to schools without one (Kroshus E et al. Disparities in Athletic Trainer Staffing in Secondary School Sport: Implications for Concussion Identification. Clin J Sport Med. 2017 Nov;27(6):542-547, Wallace J et al. Racial Disparities in Concussion Knowledge and Symptom Recognition in American Adolescent Athletes. J Racial Ethn Health Disparities. 2018 Feb;5(1):221-228.)
- Black children significantly less likely than non-Hispanic white children to present to emergency department for concussion (Lyons TW et al. Racial and Ethnic Differences in Emergency Department Utilization and Diagnosis for Sports-Related Head Injuries. Front Neurol. 2019 Jul 2;10:690.)
- Concussed children more likely to receive academic support if they had commercial insurance or parents whose primary language was English (Snedden TR et al. Postconcussion Academic Support in Children Who Attend a Primary Care Provider Follow-up Visit after Presenting to the Emergency Department. J Pediatr. 2019 Jun;209:168-175.)

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Define concussion

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Preseason

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Slide 1

CS8 Notes from PCSM 2021: had 5 min for questions. A little confusing with 6-point symptom scale for SCAT, 2-point rule using 10-pt scale for return. Also a little confusing about when can advance on RTP (with symptoms? without symptoms?) Need to clarify that. consider putting case 3 before case 2, more clear in terms of when somebody stays in cardio vs RTP.

Carlin Senter, 12/13/2021

Your athletic director asks for your advice about whether or not to conduct preseason concussion baseline testing (SCAT3, VOMS, IMPACT). Which of the following is a benefit of these types of baseline testing?

1. Improve our ability to diagnose concussion
2. Reduce the risk of concussion for any athlete that undergoes baseline testing
3. Provide an opportunity to educate athletes and parents/guardians about concussion
4. Predict which athletes are at higher risk for concussion

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How to interpret VOMS

- People without concussion have very few symptoms with VOMS
- Any individual VOMS item with a total symptom score of ≥ 2 increases the probability of being concussed by at least 46%.
- An NPC distance of ≥ 5 cm increases the probability of a concussion by at least 34%.

Mucha, A et al. Am J Sports Med. 2014;42(10):2479-2486.

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Baseline evaluations not as useful as we thought for concussion diagnosis

- Data from NCAA-CARE consortium
- 3958 preseason and 496 acute sport concussion evaluations
 - VOMS, SCAT3, IMPACT baseline and post injury scores
- Results
 - VOMS and symptom severity scores were useful for identifying acute concussion
 - All tools had high within-patient test-retest variability which made these tests have poor reliability
 - Incorporating baseline test scores did not improve concussion identification
- Authors note that baseline testing does offer opportunity for concussion education.

Ferris LM et al. Am J Sports Med. 2022 Mar;50(4):1106-1119.

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The head coach would like to decrease the number of head impacts in the football program. Which of the following would you recommend?

1. Teach weekly tackling/blocking drills without helmets and shoulder pads.
2. Implement the use of mouth guards with embedded head impact sensors
3. Group players of similar sizes for tackling drills
4. Disqualify athletes with a past history of concussion

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Vestibular/Ocular-Motor Screening (VOMS)

Consider adding to SCAT for increased diagnostic accuracy

**See handouts in syllabus

Vestibular/Ocular-Motor Screening (VOMS) for Concussion						
Vestibular/Ocular Motor Test:	Not Tested	Headache 0-10	Dizziness 0-10	Nausea 0-10	Fogginess 0-10	Comments
BASELINE SYMPTOMS:	N/A					
Smooth Pursuits						
Saccades – Horizontal						
Saccades – Vertical						
Convergence (Near Point)						(Near Point in cm): Measure 1: _____ Measure 2: _____ Measure 3: _____
VOR – Horizontal						
VOR – Vertical						
Visual Motion Sensitivity Test						

Mucha, A et al. Am J Sports Med. 2014;42(10):2479-2486.

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Helmetless-tackling drills reduce head impact exposure

- 115 high school football players over 2 seasons
 - 1 group weekly tackling/blocking drills without helmets and pads
 - 1 group trained as normal w/same frequency and duration
 - All wore head impact sensors during games
- Helmetless group had fewer head impacts during games at week 4 and week 7 during both seasons
 - These differences disappeared at end of season

Swartz EE et al. J Sci Med Sport. 2019 Oct;22(10):1102-1107.

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NATA position statement: Reducing Intentional Head-First Contact Behavior

- Head-first contact behavior: player initiates contact with head (regardless of what part of head, regardless of action they are doing – tackling, blocking, carrying the ball)
- Head-first contact increases risk for severe head + neck injuries. Concern re: accumulated impacts and long-term risk of neuropsychological problems
- Recommendations (14) should be responsibility of athletic trainer and their multidisciplinary team of stake holders

Swartz EE et al. J Athl Train. 2022 Feb 1;57(2):113-124.



Recs: Rules and Regulations

1. Because full-contact practices increase the opportunities for head-first behavior, regulate the time devoted to such sessions each week to ensure sufficient focus on age-appropriate instruction, maintenance, and mastery of proper tackling and blocking skills.
2. Eliminate or modify football drills that do not reinforce proper and safe tackling and blocking behaviors or techniques.
3. Consistently enforce the penalties or fines (or both) for head-first contact behavior, spearing, or targeting at all levels of play for all player positions.

Swartz EE et al. J Athl Train. 2022 Feb 1;57(2):113-124.



Recs: Education + Administration

1. Develop + require education for players, coaches and officials on the dangers of head-first contact in football and the risks for head and neck injury
2. Communicate with parents + guardians to describe the strategies used to reduce head-first contact behavior and its potentially risky outcomes.
3. Encourage coaches, strength and conditioning specialists, administrators, ATs, team physicians, and athletics or league directors to meet regularly and work together to discuss, implement, and review strategies that reduce head-first contact behavior by football players.

Swartz EE et al. J Athl Train. 2022 Feb 1;57(2):113-124.



Recs: Technology and Scientific Research

1. Recognize that helmet and after-market companies that produce helmet add-on products may overstate injury-prevention benefits, leading to risk-taking behavior.
2. Consider using validated head-impact monitoring systems or video capture (or both) as a complementary tool for identifying and correcting head-first contact behavior.
3. Educate athletes on the influence of protective equipment and techniques related to avoiding head contact.
4. Engage all stakeholders in the generation of high-level scientific research to test and validate strategies, techniques, or technologies proposed to support the reduction of head-impact exposure in football.

Swartz EE et al. J Athl Train. 2022 Feb 1;57(2):113-124.



Recs: Skill Development + Behavior Modification

1. Introduce evidence-based, progressive techniques for avoiding head-first contact behavior during ball carrying, tackling, and blocking before the first exposure to tackle football (ie, first-time participants, preseason).
2. Teach until mastery is achieved and reinforce the maintenance of appropriate tackling and blocking skills that explicitly deter head-first contact behavior in football at all levels of play.

Swartz EE et al. J Athl Train. 2022 Feb 1;57(2):113-124.



In season

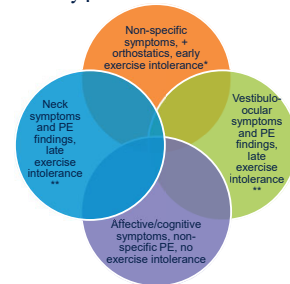


Case

- 21 y/o college soccer player with history of 2 prior concussions.
- 3rd concussion occurred 4 weeks ago in game. Elbowed in head while going up for header.
- Presents with headache, fatigue, cognitive fogginess
- No significant symptom exacerbation with school, manages by taking breaks
- Unable to progress her exercise due to symptom exacerbation with cardio
- Normal vitals, neck and neuro exams, VOMS

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6/19/2

Concussion subtypes



*Early exercise intolerance: < 70% of age-predicted max heart rate
 **Late exercise intolerance: beyond 70% age-predicted max heart rate

Haider MN et al. Practical Management: Brief Physical Examination for Sport-Related Concussion in the Outpatient Setting. Clin J Sport Med. 2020 Sep;30(5):513-517.

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You refer the patient to a physician trained in concussion management and expect they will recommend which of the following?

- Rest from school and exercise until symptoms resolve
- Continue school with adjustments, rest from exercise until symptoms resolve
- Continue school with adjustments, design subsymptom threshold exercise program
- Continue school with adjustments, progress to sport-specific exercise

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Personalized treatment plan

Acutely concussed patient

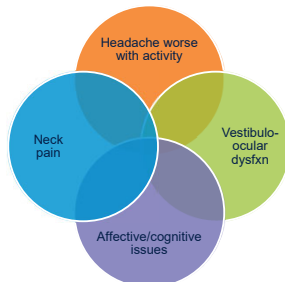
- Patients with symptoms > 2 weeks significantly more likely to have returned to sport by 8 weeks if they received individualized tailored multimodal treatment program
 - Physical therapy
 - Neck
 - Vestibuloocular
 - Subthreshold aerobic exercise
 - Significant small to moderate effect on improving symptom scores
 - Doesn't reduce days to symptom recovery

Reid SA et al. Do physical interventions improve outcomes following concussion: a systematic review and meta-analysis? Br J Sports Med. 2021 Sep 30;bjspports-2020-103470.

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My approach in clinic

- Is this a concussion?
- Subtype



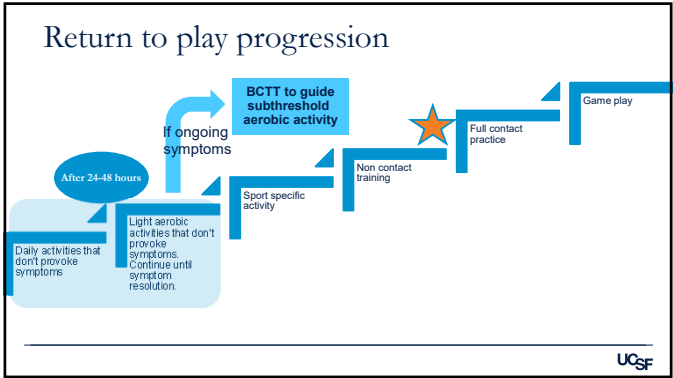
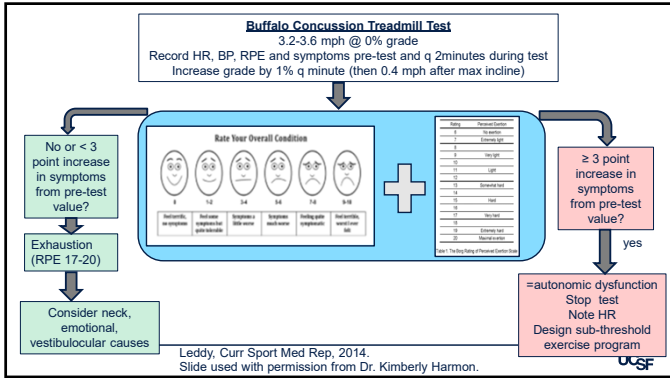
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How might exercise help treat concussion?

- Exercise intolerance post concussion appears to reflect impaired autonomic function
- Exercise improves autonomic nervous system function
- Aerobic exercise patients recovered significantly faster than stretching patients (13 days vs 17 days, P = 0.009)
- The intervention was safe – there were no adverse events from subsymptom threshold aerobic exercise when prescribed within 1 week of injury

Leddy JJ et al. Early Subthreshold Aerobic Exercise for Sport-Related Concussion: A Randomized Clinical Trial. JAMA Pediatr. 2019 Feb 4.

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BCTT Instruction Manual
<https://ubortho.com/wp-content/uploads/2020/10/Buffalo-Concussion-Treadmill-Test-Manual.pdf>

VISUAL ANALOGUE SCALE (VAS)

Rate Your Overall Condition
Choose a number from 0 to 10 and describe your condition.

0: No symptoms
1: Mild symptoms but not bothersome
2: Mild symptoms
3: Moderate symptoms
4: Moderate symptoms
5: Moderate symptoms
6: Moderate symptoms
7: Moderate symptoms
8: Moderate symptoms
9: Moderate symptoms
10: Worst ever felt

Rating of Perceived Exertion / The Borg Scale

Green	6	Very light
Green	7	Extremely light
Green	8	Minimal
Yellow	9	Very light
Yellow	10	Can just start to hear your breathing
Yellow	11	Conversation is easy and you can run like the Victor a while
Orange	12	Light
Orange	13	Somewhat hard
Orange	14	You can keep your breathing but you're not struggling
Red	15	You can talk but not in full sentences
Red	16	Hard
Red	17	Very hard - Starting to get uncomfortable
Red	18	You can no longer talk because of your breathing
Red	19	Extremely hard - Your body is screaming at you
Red	20	Maximal

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Recovery

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Using the Buffalo concussion treadmill test to design subthreshold aerobic program

- BCTT: Check RPE every minute, BP and HR every 2 minutes
- BCTT: Stop at report of exacerbation of concussion symptoms (≥ 3 points)
- Ex Rx
 - Frequency: Once/day
 - Intensity: 80% of max HR achieved during treadmill test
 - Timing: same duration achieved during treadmill test
 - Type: aerobic
 - Stop early if symptom exacerbation.

Leddy JJ et al. A preliminary study of subsymptom threshold exercise training for refractory post-concussion syndrome. Clin J Sport Med. 2010 Jan;20(1):21-7.

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Your 14 y/o student athlete has successfully completed the noncontact RTP protocol. What else should you do prior to full contact clearance?

- Confirm that the athlete uses a helmet proven to reduce risk of future concussion.
- Confirm that the athlete is taking omega-3 supplements in order to reduce the risk of future concussion.
- Evaluate the athlete's degree of fear, anxiety and pressure with respect to returning to play.
- Evaluate the athlete's family history of dementia and other neurological problems.

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Psychological readiness for RTP

- Which psychosocial factors are associated with RTP in athletes with concussion?
 - 14 studies met inclusion criteria
 - 2098 athletes (85% male) from US and Canada, adolescent-college age
- Results: Fear, anxiety and pressure are experienced by some athletes at the time that they are cleared to RTP
- Take home: Consider incorporating evaluation (and treatment) of psychological readiness into RTP

van Ierssel J et al. J Sport Health Sci. 2022 Jan 10:S2095-2546(22)00015-1. UCSF

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Your 16 y/o patient has recovered from concussion. She and her parents would like to know what her risk of repeat concussion is if she returns to sport.

Compared to her teammate with no history of concussion, her risk of concussion is:

- A. 2x higher
- B. 4x higher
- C. 6x higher
- D. 10x higher

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Thank you!

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What is the risk of concussion in children with previous history of concussion?

- 7 studies included
- 23,411 children aged 5-18 yrs, majority male
- Results
 - Risk of concussion was more than 3x greater in children with history of concussion compared to those without history of concussion (RR = 3.64)
- Take home: Discuss concussion history and increased risk of concussion when counseling athletes and families on RTP

van Ierssel J et al. Br J Sports Med. 2021 Jun;55(12):663-669.

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