

Out & About: Adolescent Sports Injury, Concussion & Office Emergency Simulation

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Concussion with Special Focus on the Pediatric Population



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Sarah R Gibson, MD

- Residency in Boston/Harvard Medical School in Physical Medicine and Rehabilitation – including several months of Neurology at MGH and brain injury rehab
- Fellowship trained in Sports Medicine in Boston/Harvard Medical School – concussion clinic
- Research on sport-related concussion – published in Brain Injury and presented new research findings on recovery from concussion at national medical conferences
- No conflict of interest – do not have any financial association with any of the treatments discussed in this presentation

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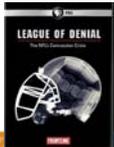
Learning Objectives

1. Identify the immediate and delayed symptoms of concussion or mild traumatic brain injury and recommend appropriate testing or monitoring of the patient.
2. Recognize when a concussion might have caused an intracranial blood clot and recommend additional testing, monitoring, and treatment.
3. Advise parents, athletes and coaches on when an athlete is able to return to play following a concussion.

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Concussion

- Sport-related concussion (SRC) is in the news –
 - Frontline “League of Denial” – investigation of the NFL’s concussion crisis – won a Peabody Award (April 2014)
 - White House – Healthy Kids and Safe Sports Concussion Summit (May 2014)
 - Multiple magazine covers and even a movie
- Parents are getting scared – and have questions...



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Concussion

- One of the most difficult problems faced by health care professionals
- Commonly treated using guidelines built on opinion, experience and very little real science – but this is changing...
- Challenging to diagnose and manage – relies on the individual athlete for symptom reporting
- Diagnosis, grading and management are constantly evolving as more literature becomes available



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Concussion - Definition

- Debate over how to simply define “concussion”
- Concussion = a complex pathophysiological process affecting the brain, induced by traumatic biomechanical forces
- A good “working definition” = a trauma-induced alteration in mental status that may or may not involve loss of consciousness
- Typically results in the rapid onset of short lived impairment of neurologic function that resolves spontaneously
- Most sport-related concussions result in disorientation and only a minority result in loss of consciousness



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Concussion - Mechanism

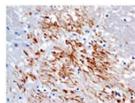
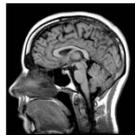
- Concussion usually results from an *acceleration-deceleration* force applied to the moving brain → creates a shearing force
- In animal studies – *rotational* forces lead to more damage than linear forces
- Direct impact to the head is *NOT* required for concussion to occur – a force on another part of the body may be transmitted to the head



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Concussion - Mechanism

- The acute clinical symptoms largely reflect a *functional disturbance* rather than a structural injury
- Typically associated with *normal* structural neuroimaging studies (CT and MRI)
- Much of the injury occurs on a microscopic cellular level – involving neurotransmitters, cellular metabolism and ion flux



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Concussion - Mechanism

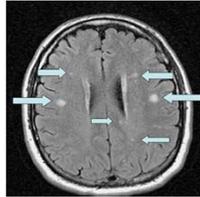


- Diffuse axonal injury (DAI) which refers to widespread lesions in white matter tracts, is one of the major causes of unconsciousness after head trauma
- Due to shear forces – “Jello”
- Stretching injury to the axons, especially at the axonal junctions – seen microscopically but *most* MRI studies are normal

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Concussion

- Special MRI studies – not typical T1 and T2, but DWI (diffusion-weighted imaging) or FLAIR (fluid-attenuated inversion recovery) CAN show DAI
- Severity depends on where lesions are:
 - Cerebral hemispheres
 - Corpus callosum
 - Brain stem



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Concussion

- MRI in general – and especially those with DWI and/or FLAIR are rarely done in sport-related concussion - because they are rarely required...



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Concussion

- Many studies trying to determine good serum biomarkers specific to brain injury that can be used to evaluate/verify an injury to the brain – similar to how troponins and creatine kinase are used to confirm cardiac muscle injury in an MI
- 4th International Conference on Concussion in Sport – Zurich, 2012
 - “At present, there is no perfect diagnostic test or marker that clinicians can rely on for an immediate diagnosis of concussion... (therefore) it is not possible to rule out concussion when an injury event occurs associated with a transient neurological symptom... (and) a cognitive deficit is not necessary for acute diagnosis as it either may not be present or detected on exam.”
- Basically - treat all suspected concussions as actual concussions because we don't have the ability to "rule them out"



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Concussion – Evolving Knowledge and Recommendations

- “Consensus statement on concussion in sport”
 - 1st - Vienna 2001
 - 2nd - Prague 2004
 - 3rd - Zurich 2008
 - 4th - Zurich 2012
 - 5th - Berlin, Germany Oct 26-27, 2016
- Recommendations by an international group of concussion experts using a formal consensus-based approach
 - Defining 'concussion'
 - Diagnosis: Signs and Symptoms, Neuropsychological Assessment, Imaging
 - Management: Return to Play, Cognitive Rest
 - Modifying factors: LOC, Amnesia, Age
 - Prevention: Equipment, Rule Change, Education



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Concussion – Basics

- Approximately 1.6 - 3.8 million sport-related concussions per year in the USA
- Sports: classic – football, ice hockey, soccer, boxing, rugby etc. BUT also less frequently considered – cheerleading, high jump etc.
- Most SRCs in U.S. occur in football – ~10% of all football injuries are concussions
- The highest incidence rate of SRCs occurs in hockey (12%)
- Most concussions are minor and do not present to medical centers for imaging or other testing
- In fact, most concussions are never evaluated by a physician – coaches and athletic trainers are the only people who evaluate and manage most concussions



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Concussion – Who Is At Risk

- Concussion is 6X more likely to occur in organized sport than in leisure activities
- SRCs are more likely to occur in:
 - games than in practices
 - high school athletes than in college athletes
 - athletes who have already had previous concussions
- Br J Sports Med 2014 – Abrahams et al – systematic review of 86 articles – only 2 factors found to have a high level of certainty for increased risk of SRC: match play and previous concussion
- The risk of repeat concussion is greatest in the first 7-10 days after an acute concussive injury



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Concussion - Recovery

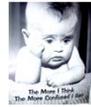
- Most (80-90%) concussions resolve within 7-10 days
- Symptoms may take longer to resolve
 - Patients with a h/o previous concussions
 - LOC > 1 minute
 - Younger patients
 - With prolonged cognitive impairment – by individual reporting and/or formal neuropsychological testing
- Interestingly, LOC < 1 minute, post-traumatic amnesia and even impact seizures have NOT been shown to reliably predict outcome (severity and duration of symptoms)
- "Resolution" as determined by self-reported symptoms, observation by others and neuropsych testing if indicated



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Concussion – Signs and Symptoms

- Loss of Consciousness
- Amnesia, retrograde or anterograde
- Disorientation
- Appearing dazed
- Acting confused
- Forgetting game rules or play assignments
- Inability to recall score or opponent
- Inappropriate emotionality
- Imbalance
- Seizure
- Slow verbal responses
- Personality changes
- **Headache***
- **Dizziness***
- Nausea or vomiting
- Difficulty balancing
- Vision changes
- Photophobia
- Phonophobia
- Feeling "out of it"
- Difficulty concentrating
- Tinnitus
- Drowsiness
- Sadness
- Hallucinations



* Most common



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Concussion

- How do we "measure" symptoms?
- Post concussion symptom score – part of the updated Sport Concussion Assessment Tool (SCAT-3) for those 13 y/o and older
- Total score can range from asymptomatic at 0 up to a maximum of 132 (score 0-6 for 22 different symptoms)
- Child SCAT-3 for those 5-12 y/o is slightly different with separate evaluations by the child and the parent (total score 0-60 for both child and adult – 0-3 for 20 different symptoms for each)
- Can follow scores and symptoms over time
- Subjective reporting by patient – can be a limitation

The SCAT-3 is designed to evaluate how do you feel? You should circle the number that best describes your symptoms based on how you feel today.

	None	Mild	Severe	Score
Headache	0	1	2	4
"Pressure on head"	0	1	2	4
Nausea or vomiting	0	1	2	4
Blurred vision	0	1	2	4
Double vision	0	1	2	4
Balance problems	0	1	2	4
Sensitivity to light	0	1	2	4
Sensitivity to noise	0	1	2	4
Feeling like "in a fog"	0	1	2	4
"Don't feel right"	0	1	2	4
Difficulty remembering	0	1	2	4
Fatigue or low energy	0	1	2	4
Confusion	0	1	2	4
Dizziness	0	1	2	4
Feeling like you are spinning	0	1	2	4
More emotional than usual	0	1	2	4
Irritability	0	1	2	4
Sadness	0	1	2	4
Sleeping or Anxious	0	1	2	4

Total number of symptoms (Maximum possible 22)

Symptoms SCORE: 22 minus number of symptoms = _____ of 22

Symptoms Severity Score: _____ of all scores. Max possible (20x3)= 60

Do the symptoms get worse with physical activity? 0-3

Do the symptoms get worse with mental activity? 0-3

Overall Rating: 0-6 (0 = no symptoms, 1 = mild, 2 = moderate, 3 = severe, 4 = very severe, 5 = severe, 6 = severe)

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Concussion – Symptoms

- Eisenberg MA, Meehan WP and Mannix – Pediatrics, June 2014 – Duration and course of post-concussive symptoms – a prospective cohort study of 235 ED patients ages 11-22 years evaluated at 1, 2, 4, 6, 8, and 12 weeks or until symptom resolution
 - At presentation: headache, fatigue, dizziness and 'taking longer to think' were the most common symptoms
 - Follow up – a shift in symptoms - sleep disturbance, frustration, forgetfulness and fatigue were most common
 - Irritability and sleep disturbance persisted the longest while nausea, depression, dizziness and double-vision resolved most quickly
 - Conclusion: Physical symptoms (e.g. headache) predominate early, emotional symptoms tend to emerge later and cognitive symptoms may be present throughout
 - At 1 month after injury about 25% still reported headache and 20% still felt fatigue
- Kirkwood et al - Pediatrics, April 2014 – Postconcussive symptom exaggeration after pediatric mild traumatic brain injury – with neuropsych testing (Medical Symptom Validity Test) determined about 12% of children with persistent symptoms may be exaggerating symptoms

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Concussion – Computerized Neuropsychological Screening Tools - ImPACT

- ImPACT – Immediate Post-concussive Assessment and Cognitive Testing
- Developed in the early 1990's primarily for evaluating sport-related concussion
- Some propose it may be more sensitive than traditional neuropsychological testing because of the more precise measurements in response time; however, formal NP testing is more thorough
- 20-minute test that can measure reaction time measured to 1/100th of second – can pick up very subtle changes in function
- Good for all ages down to about 12 y/o
- Measures against normal scores, but best when can be used against patient's baseline – easier to do in athletes at high risk for concussion, but can also follow a patient's score over time to monitor recovery



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Concussion - ImPACT

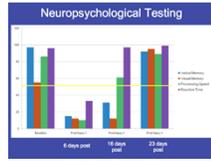
- ImPACT testing – evaluates the following:
 - Attention span
 - Working memory (7 items, 18 seconds – longer with attention and repetition)
 - Sustained and selective attention time
 - Response variability
 - Non-verbal problem solving
 - Reaction time
- One portion of the test – the Impulse Control Composite – can identify irregularities suggestive of misinterpreted directions or a careless response style (i.e. someone who is not giving a full effort during testing)
- Although designed for athletes – follows recovery – helps dictate return to athletics and school – but can be used for all concussions since identifies subtle deficits



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Concussion - ImPACT

- Ideal, but not necessary to have a baseline score – can still measure against “normal” values
- NP assessment should NOT be the sole basis of management decisions, but rather an aid to the clinical decision making process



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Concussion - Management

- No athlete should return to play on the same day that a presumed concussion occurred
- No athlete should return to play until all signs and symptoms have resolved – both at rest and during exercise – and once off any medications that may mask/modify concussion symptoms (e.g. ibuprofen for headaches) – ‘resolution’ often based on:
 - PCSS scores/patient reporting of symptoms
 - ImPACT scores
- No child/adolescent should return to sport or activity until they have returned to a full course load at school successfully
- Recommended management includes:
 - Physical rest
 - Cognitive rest
- The return to play will be gradual, monitored, and conducted in a step-wise fashion



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Concussion – Return to Play

Step Level of activity

1	No activity, complete rest. Once asymptomatic, proceed to level 2.
2	Light aerobic exercise such as walking or stationary cycling, no resistance training.
3	Sport specific exercise - for example, skating in hockey, running in soccer, progressive addition of resistance training at steps 3 or 4.
4	Non-contact training drills.
5	Full contact training after medical clearance.
6	Game play.

- Should be totally asymptomatic for at least 24 hours before resuming any physical activity
- Some athletes may proceed through each step in a day, others may take several days or longer for each step
- If symptoms return – drop down to previous level until asymptomatic for at least 24 hours before trying to proceed again
- The younger the patient, the more conservative the approach to return to play should be

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Concussion – Cognitive Rest

- Cognitive rest – may include – reading, computer work, texting, crossword puzzles/sudoku, video games etc.
- This may require complete absence from school or limited time reading, on the computer and performing calculations
- Indicated when symptoms either inhibit the ability to attend class and complete school work and/or when these activities exacerbate post-concussion symptoms



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Concussion

- Does cognitive rest help speed recovery from symptomatic concussion?
- Unclear – research is ongoing...however it does appear that high levels of cognitive activity may prolong recovery, but complete cognitive rest may not be necessary or even recommended



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Concussion – Cognitive Rest

- Brown NJ et al. Effect of cognitive activity level on duration of post-concussion symptoms. Pediatrics. Feb. 2014.
- 335 patients, mean age 15 years (8-23), mean duration of symptoms was 43 days
- Evaluated level of cognitive activity on a cognitive activity scale
 - “Full cognitive activity” – no restrictions
 - “Significant cognitive activity” – reading less, doing less homework
 - “Moderate cognitive activity” – reading less than 10 pages/day, less than 20 text messages/day and less than 1 hour (combined) of homework, online activity and video games
 - “Minimal cognitive activity” – no reading or homework and less than 5 texts/day
 - “Complete cognitive rest” – no reading, texts, online activity, videogames etc. Watching TV or listening to music was permitted.
- Conclusion: increased cognitive activity IS associated with longer recovery from concussion – those in the highest quartile of cognitive activity took statistically longer to recover than those in the first to third quartiles (based on a cognitive activity scale)
- While limiting cognitive activity may allow for faster recovery complete abstinence from cognitive activity may be unnecessary

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Concussion – Cognitive Rest



- Thomas et al – Benefits of strict rest after acute concussion: a randomized controlled trial. Pediatrics, Feb. 2015.
- 88 patients aged 11-22 years who presented to a pediatric ED within 24 hours of concussion were randomized to strict rest for 5 days or “usual care” (1-2 days of rest followed by stepwise return to activity)
- Conclusion – not only was there no added benefit from recommending strict rest, but the intervention group reported MORE symptoms AND SLOWER symptom resolution

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Concussion - Management

- Although most concussions resolve in 7-10 days, there are cases (10-15%) where the patient has a prolonged recovery
- Issues with prolonged recovery in the pediatric population include:
 - Dealing with symptoms themselves
 - Missing school
 - Declining grades
 - Not able to participate in physical activity
- These can lead to depression and alienation from their social groups

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Concussion

- Obviously, chronic HA and limitations in function are significant issues after concussion
- What can be done to speed recovery?
- No medication or other intervention has been proven to speed recovery from concussion, but mismanagement can lead to prolonged recovery
- Think of concussion as analogous to a bruise...it just takes time to heal...



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Concussion

- Some activities that appear to prolong recovery –
 - Poor sleep hygiene
 - Premature return to strenuous physical activity
 - Overuse of pain medications – even acetaminophen, NSAIDs → rebound HAs
 - Dehydration
 - Cognitive or emotional stress
- In general however, reassurance, a period of rest if indicated, followed by a gradual return to full activities (or modified activities if significant deficits found on neuropsych and/or performance testing)



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Concussion – Sleep Difficulties

- Kostyun et al. Am J Sports Med, March 2015 – Sleep disturbance and neurocognitive function during the recovery from a sport-related concussion in adolescents.
- 545 patients evaluated with ImPACT were stratified into groups based on self-reported sleep duration and post-concussion sleep disturbance symptoms (sleeping more/less than normal and difficulty falling asleep)
- Sleep was classified as short (<7 hours), intermediate (7-9 hours) and long (>9 hours)
- Found that PCSS was higher in those who reported < 7 hours of sleep and “disrupted sleep” while ImPACT scores were lower in those reporting >9 hours of sleep and “sleeping more than normal”
- Conclusion:
 - those sleeping less and/or with disrupted sleep are more likely to experience more post-concussion symptoms
 - those sleeping more than normal may still be recovering from concussion (worse ImPACT scores)



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Concussion – Sleep Difficulties



- McClure et al. Am J Sports Med, Feb. 2014 – retrospectively reviewed ImPACT scores of 3686 nonconcussed athletes (3305 high school and 381 college) – found that those with <7 hours of sleep the night before the test performed more poorly on ImPACT
- Sufrinko et al. Am J Sports Med, April 2015 – cohort study of 348 adolescent and adult athletes with a SRC – found that those with preinjury sleep difficulties performed more poorly on ImPACT testing and also reported more post-concussion symptoms

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Concussion – Cervicovestibular Rehabilitation

- Schneider et al – Br J Sports Med, Sept. 2014 – randomized controlled trial with 31 patients (age 12-30 yrs) who reported persistent dizziness, neck pain and/or headaches after SRC
 - All had weekly PT (postural education, ROM, etc.) until medically cleared for return to activity - half randomized to also have cervical and vestibular rehabilitation as part of PT
 - Primary outcome was medical clearance for return to sport – determined by a sports medicine doctor blinded to their treatment groups
 - 73% of those who received cervicovestibular rehab were cleared to RTP within 8 weeks versus only 7% of those in the control group
 - Those in the treatment group were almost 4x more likely to RTP within 8 weeks
 - Conclusion: athletes with SRC who have prolonged (>7-10 days) recovery with symptoms including dizziness, neck pain and/or headaches RTP faster with cervicovestibular PT treatment
- Issues – often hard to find cervicovestibular treatment for non-pro/collegiate athletes and known benefit has only been proven to be beneficial in a small proportion of those with SRCs

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Concussion – Special Considerations



- **Chronic traumatic encephalopathy (CTE)** – Alzheimer-like symptoms – major focus on retired NFL players (Junior Seau – suicide at 43 y/o in 2012 – CTE confirmed at NIH in Jan. 2013)
- The number and severity of SRCs that are more likely to lead to long-term effects have not been elucidated
- Concensus Statement - Zurich 2012 –
 - a cause and effect relationship has not as yet been demonstrated between CTE and concussion or exposure to contact sports
 - the extent to which age-related changes, psychiatric or mental health illness, alcohol/drug use or co-existing medical or dementing illnesses contribute to this process is largely unaccounted for in the published literature

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Concussion – Special Considerations

- **Second Impact Syndrome** – the reason why there are strict RTP recommendations
- Vary rare but often fatal or at least severely disabling, so taken seriously
- Occurs when someone who is still symptomatic from a concussion sustains a second concussion. The second concussion that leads to SIS may be very mild and may occur anywhere from minutes to weeks after the initial concussion
- Mechanism believed to be related to the brain's inability to properly regulate cerebral blood flow after the 1st concussion → 2nd impact leads to massive cerebral edema often causing herniation
- Estimated that anywhere from 1.5 to 6 people per year in the US die annually from SIS
- Disproportionately affects teenagers - all documented cases occurred in people younger than 20 except in boxing



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Concussion - Research

- Maugans TA – Pediatrics, 2012
 - 12 children, age 11-15 with SRC with age and gender matched controls
 - IMPACT MRI, proton magnetic resonance spectroscopy and phase contrast angiography
 - No structural abnormality on MRI
 - No decrease in N-acetyl aspartate
 - No increase in lactic acid
 - Statistically significant alterations in CBF were seen in those with a SRC – with a reduction in CBF predominating
 - Improvement toward control values occurred in only:
 - 27% at 14 days
 - 64% at 30 days → 36% still with altered CBF!



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Concussion – Special Considerations

- Not only are younger individuals at much higher risk for second impact syndrome, they have also been found to take longer to recover from concussion
- A more conservative RTP approach is recommended for younger concussed patients
- Research supports this – Howell et al. Am J Sports Medicine, March 2015 – evaluated 19 young adults (20.3 +/- 2.4 yrs) and 19 adolescents (15.1 +/- 1.1 yrs) within 72 hours after concussion with whole-body motion gait analysis with concurrent cognitive task – results: adolescents have more gait balance deficits for at least two months after concussion than matched controls/young adults

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Concussion - Prevention

- Prevention of SRC is very difficult – helmets have, at best, a limited effect
- Helmets are certainly recommended and are very useful in preventing skull fractures and facial injuries, but may also lead to *risk compensation* – where the use of protective equipment results in more dangerous playing techniques that can cause a paradoxical increase in injury
- Mouth guards useful for preventing dental and orofacial injury
- McGuire et al., Am J Sports Med, Oct., 2014 – prospective study of over 2000 high school football players – no difference of incidence of SRC between different brands of helmets or age and recondition of helmets. Additionally, the rate of SRC was HIGHER in players with a custom mouth guard compared to a generic mouth guard
- Strengthening the neck muscles MAY reduce the risk of concussion; however, most SRCs occur when the athlete does not anticipate the impact/injury – recently supported by Eckner et al, Am J Sports Medicine, March 2014 which noted neck strength and impact anticipation are 2 potentially modifiable risk factors for concussion



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Concussion - Prevention

- Rule changes and Education of players and coaches
- Eliminating body checking from Pee Wee ice hockey (11-12 y/o) and fair play rules were effective in injury prevention
- Pop Warner football –
 - No full speed head-on blocking or tackling drills in which the players line up more than 3 yards apart are permitted
 - No intentional head to head contact
 - The amount of contact at each practice will be reduced to a maximum of 1/3 of practice time
- Education – often limited and transient benefit
 - Cusimano et al. Br J Sports Med, Jan. 2014 – 267 minor league hockey players educational video improved players' concussion knowledge and behavior, but by 2 months there was no significant difference between video and no-video groups
 - Rivara et al. Am J Sports Med, May 2014 – educating coaches for 778 high school football and girls soccer athletes (identical rate of concussion for each sport) did NOT result in a higher awareness of concussion in the athletes by the coaches – 69% of concussed athletes reported playing with symptoms and 40% reported their coach was not aware of their concussion



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Concussion – Take Home Points

- You do NOT have to have direct impact to the head to sustain a concussion
- You do NOT have to have loss of consciousness to sustain a concussion
- NEVER return a concussed individual to physical activity while they are still symptomatic
- NEVER return an athlete to physical activity within 24 hours of a concussion – even if they are asymptomatic (must be asymptomatic for at least 24 hours before returning to physical activity – recommended graduated approach)
- The younger the patient, the more conservative the RTP approach should be
- School-aged patients should “return to learn” (tolerate a full school load while maintaining their typical grades) before they begin a graduated return to physical activity protocol

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Concussion Case

- 15 y/o female flyer on the cheerleading squad who fell and hit her head on the floor during a recent practice
- No loss of consciousness but felt “light-headed” and as though her balance was off, so sat out the rest of practice
- Mild headache that evening which continues to persist, although it's decreased from a 4/10 to a 2/10

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Concussion Case

- Has stayed home from school which helps (3 days total so far), but says headaches worsen when she tries to do homework
- Tried to take her dog for a jog, but felt light-headed again and had to stop
- Denies any history of previous concussion
- PMH: none, including no h/o headaches
- PSH: none
- Allergies: NKDA

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Concussion Case

- PCSS (0-132) = 11
 - Headache – 2
 - Pressure in head – 1
 - Feeling in a fog – 2
 - Difficulty concentrating – 2
 - Dizziness – 1
 - Fatigue or low energy – 1
 - “don't feel right” – 2
- Symptoms get worse with mental and physical activity

The PCSS (0-132) Evaluation

How do you feel? You should only proceed if the following symptoms, based on how you feel now:

Symptom	None	Mild	Severe
Headache	0	1	2
Pressure in head	0	1	2
Feeling in a fog	0	1	2
Difficulty concentrating	0	1	2
Dizziness	0	1	2
Fatigue or low energy	0	1	2
“Don't feel right”	0	1	2
Balance problems	0	1	2
Nausea or vomit	0	1	2
Blurred vision	0	1	2
Double vision	0	1	2
Slurred speech	0	1	2
Weakness	0	1	2
Stomach pain	0	1	2
Diarrhea	0	1	2
Constipation	0	1	2
Excessive sweating	0	1	2
Excessive yawning	0	1	2
Excessive tearing	0	1	2
Excessive salivation	0	1	2
Excessive urination	0	1	2
Excessive defecation	0	1	2
Excessive sweating	0	1	2
Excessive yawning	0	1	2
Excessive tearing	0	1	2
Excessive salivation	0	1	2
Excessive urination	0	1	2
Excessive defecation	0	1	2

Total number of symptoms (Maximum possible: 32)

Symptoms Score: 11

24-hour symptom resolution: 0/24

Resolves quickly: None

Time to all return: None possible (24hr-132)

Do the symptoms get worse with physical activity? 0/0

Do the symptoms get worse with mental activity? 0/0

Overall rating: 0/0

If you have any other symptoms not listed here, please list them in the adjacent column (maximum of 10 other symptoms):

Other symptoms: None

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Concussion Case

- Neurologically intact on physical exam
- Is this a concussion? Yes – no LOC but hit her head and symptomatic
- What is the plan?
- Cognitive rest – continue – she has missed 3 days of school already, is still symptomatic and school work worsens her symptoms, BUT make sure she is not texting friends, typing emails, on Facebook etc.
- Physical rest – continue - she should not return to physical activity until she has been completely asymptomatic for at least 24 hours at rest
- She could attempt to do some homework – typically recommend trying to keep up with classes where each lecture builds on the next – math, physics, chemistry etc., but ONLY as tolerated (and this is currently worsening symptoms)
- Small doses of Tylenol or NSAIDs as needed if the headache is problematic
- Follow up in one week

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Concussion Case

- One week later:
- She reports to be feeling much better and has been able to keep up with her math and science class homework
- Her PCSS has decreased from 11 to 3 (1 for each of headache, feeling in a fog and low energy)
- She has not required any tylenol or NSAIDs for 4 days
- She has been able to slowly walk her dog around the block without symptoms

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Concussion Case

- Plan at this point?
- Cognitive rest – she has been able to tolerate some homework so she should gradually return to full course load as tolerated – may start with half-days at school if necessary, but no gym class. May also have special accommodations if needed: longer time for tests, being excused from non-critical work or projects etc.
- Physical rest – continue because although PCSS has improved, she still has not been totally asymptomatic for at least 24 hours
- BUT she has been able to walk her dog around the block without experiencing symptoms...
- That is fine – it means that she will hopefully be able to tolerate returning to school where she'll be walking from class to class, but does not mean that she should increase her physical activity at this time

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Concussion Case

- She follows up with you again in another week and reports to have attended 2 half days of class without symptoms, and then was able to return to her full course load without any recurrence of symptoms
- PCSS – has decreased from 3 to 1 (irritability which she claims is because she is frustrated that she's not seeing her cheerleading friends)
- She has not had any headaches or any other of her previous post-concussion symptoms for 5 days
- Her school grades have fallen a bit, but she attributes this to having missed so many classes and briefly falling behind

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Concussion Case

- Plan at this point?
- Cognitive rest? No – at this point she is back at school full time without any symptoms – she should not have any restrictions and hopefully her grades will come up again once she has fully caught up with her classes
- Physical rest? No – her "irritability" seems to be more of a statement of annoyance about missing cheerleading practice and was not a symptom previously. Her previous post-concussion symptoms resolved 5 days ago, so she may begin a graduated approach to return to physical activity

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Concussion Case

- She returns again in another week in great spirits
- She denies any post-concussion symptoms since her last appointment and was able to return to full cheerleading without any symptoms
- PCSS today is 0
- Her grades have started to improve again
- At this point – she can be released from treatment and follow up as needed
- If only all concussion cases were this straight forward... When the recovery is complicated or prolonged or if the patient has neurologic findings on exam – it is wise to refer to a specialist, unless you feel very comfortable with concussion management

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Some Questions Parents May Ask...

- Should I let my children play football?
 - In most cases there is no right or wrong answer – it is a personal choice
 - History of difficulty with previous concussions or TBI, then probably wise to avoid it
 - Brown NJ et al. Pediatrics. 2014. – sports played by those in the study? Ice hockey (21.8%), football (20.6%), basketball (14.9%), soccer (13.4%), lacrosse (6%), skiing/snowboarding (5.4%), baseball (1.8%), wrestling (1.8%), cheerleading (1.5%) – less than 1% - field hockey, rugby, bicycling, dancing, horse-back riding, track and field, softball, volleyball, diving, gymnastics, sailing, swimming, crew, squash, dodge ball, ultimate frisbee, broom ball, skateboarding and "in gym class"

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THE END



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Office Emergency Simulation

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