Importance of Recognizing a Concussion

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St. Francis HEALTH | SCL Health

FIFA World Cup 2014

- Alvaro Pereira: Uruguay vs. England
  - Unconscious on the field
  - Argued with medical staff
  - Allowed to return to game

- Championship game
  - Christoph Kramer laid on the field for several minutes
  - Played for ~15 minute after injury
  - Had to ask referee if it was the championship game

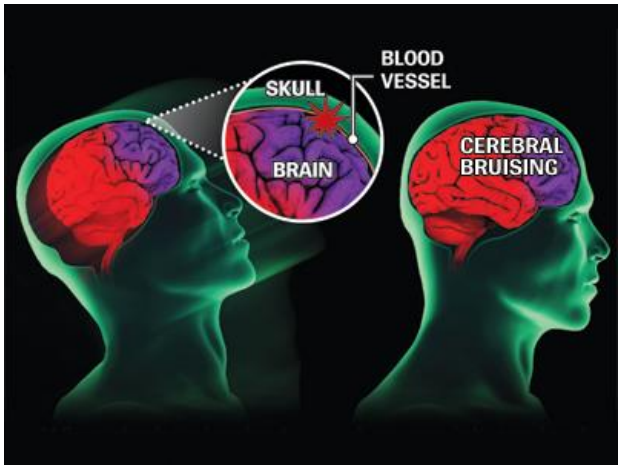
Definition

- AMSSM Position statement (2012):
  - A traumatically induced transient disturbance of the brain function and involves a complex pathophysiological process.
  - **Subset of mild traumatic brain injury (MTBI),** which is generally self-limited and at the less-severe end of the brain injury spectrum.

- Current Concepts in Concussion: Evaluation and Management (AAFP 2012)
  - Disturbance to brain function caused by direct or indirect forces → FUNCTIONAL injury, not structural

Pathophysiology

- Linear and/or rotational forces are transmitted to the brain.
- **No known biomechanical threshold for clinical concussion.**
- “Neurometabolic cascade” underlying the clinical presentation of a concussive injury describes a complex cascade of ionic, metabolic and pathophysiological events that is accompanied by microscopic axonal injury.
- **More pronounced in youth**



Incidence

- Increased annual concussion rates over past decade
  - Better reporting ?
- **Sports concussions: 1.6 – 3.8 million annually**
  - 5-9% of all sports related injuries
- **> 1 million ED visits annually (underreported)**
- 1,700 NFL players, 66,000 collegiate, 1.1 million high school, 250,000 Pop Warner
- **Consistently higher rates in competition than practice**
- At high school and collegiate level: higher incidence of concussions reported in females

Incidence

Table 2 Concussion rates per 1000 athlete exposures

Sport	Powell 1999	Schultz 2004	Hootman 2007	Gessel 2007	Lincoln 2011	Marar 2012
Level	High school	High school	College	High school	High school	High school
Years studied	1995–1997	1996–1999	1988–2004	2005–2006	1997–2008	2008–2010
Baseball	0.05	0.11	0.07	0.05	0.06	0.05
Softball	0.10	0.10	0.14	0.07	0.11	0.16
Boys' basketball	0.11	0.10	0.16	0.07	0.10	0.16
Girls' basketball	0.16	0.17	0.22	0.21	0.16	0.21
Boys' soccer	0.18	0.23	0.28	0.22	0.17	0.19
Girls' soccer	0.23	0.13	0.41	0.36	0.35	0.34
Football	0.59	0.33	0.37	0.47	0.60	0.64
Field hockey	0.09	NR	0.18	NR	0.10	0.22
Volleyball	0.02	NR	0.09	0.05	NR	0.06
Wrestling	0.25	0.09	0.25	0.18	0.17	0.22
Ice hockey			0.41			0.54
Overall		0.17	0.28	0.43	0.24	0.24

NR, not reported.

Football: 0.33 - 0.64
Boy's soccer: 0.17 - 0.28
Girl's soccer: 0.13 - 0.41

AMSSM Position Statement: Concussion in Sport

Signs and Symptoms

- Non-specific:
  - #1: Headache
  - #2: Dizziness
  - **LOC in < 10% of concussions**
  - 59% of college athletes with concussion-like symptoms in the prior year
  - 50-84% of high school athletes report symptoms of concussion at baseline testing.

Box 1 Signs and symptoms of a concussion

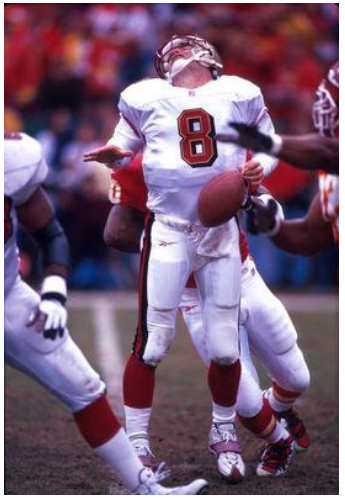
- Physical
  - Headache
  - Nausea
  - Vomiting
  - Balance problems
  - Dizziness
  - Visual problems
  - Fatigue
  - Sensitivity to light
  - Sensitivity to noise
  - Numbness/tingling
  - Dazed
  - Stunned
- Cognitive
  - Feeling mentally 'foggy'
  - Feeling slowed down
  - Difficulty concentrating
  - Difficulty remembering
  - Forgetful of recent information and conversations
  - Confused about recent events
  - Answers questions slowly
  - Repeats questions
- Emotional
  - Irritable
  - Sadness
  - More emotional
  - Nervousness
- Sleep
  - Drowsiness
  - Sleep more than usual
  - Sleep less than usual
  - Difficulty falling asleep

AMSSM Position Statement: Concussion in Sport

Diagnosis

- Diagnosis: Temporal relationship between mechanism of injury and onset of symptoms must be established
- **DOES NOT HAVE TO BE A DIRECT HEAD IMPACT**
- **DO NOT GRADE ANY LONGER**

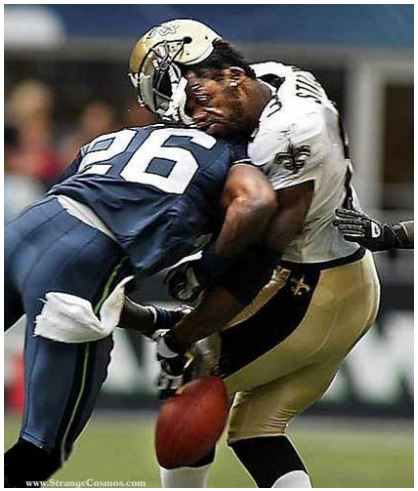
Risk Factors



- Prior history of concussion (2-5.8 fold increase)
  - Severity or duration of symptoms of prior concussion
- Female
  - Tend to have longer duration of symptoms
  - Decreased head-neck mass ?
  - More honest report ?
- Youth
  - Tend to have prolonged recovery and higher rate of catastrophic injury
  - Developing brain ?
- Style of play / position / sport
  - Most common mechanism is player-to-player contact
  - Football:
    - Skill players 3x greater risk than lineman
    - Kickoff 4x greater risk than rushing/passing plays
    - Linebackers with highest rate on defense
  - Soccer:
    - 25.3% of concussions due to illegal activity in a study at the high school level
    - Prospective college level study: No increased risk with heading
  - Hockey:
    - Most common mechanism is checking

Risk Factors

- Genetics:
  - APOE e4, APOE G-219T, tau exon 6
  - Limited studies
- Depression or other mood disorders
  - No evidence that it predisposes to concussion
  - May complicate recovery (new symptom vs. exacerbation of baseline)
- History of ADHD or learning disabilities
  - May complicate recovery (share symptoms: difficulty with memory, attention, concentration)
- Migraines
  - May be a risk factor and may prolong recovery
  - 10% of general population
  - 22% Australian rules football
  - 2.9% NCAA athletes



Management: Initial Presentation

- ABC's
  - First step is to check **A**irway, **B**reathing, **C**irculation
- Cervical spine exam
  - Nexus Protocol (Midline spine tenderness, Focal neurological deficit, Altered level of consciousness, intoxication, distracting injury?)
  - **Football helmet and shoulder pads are a unit, leave both on or take both off.**
  - **Local AMR is spineboarding athletes less now**

Management: Coach /Athletic trainer

- Utilize a standardized approach to reduce degree of subjectivity.
- History
- Cognitive testing
- Neurological testing
- Balance testing (BESS)

Management:

SCAT3™

FIFA · IIHF · IOC · FEI

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.

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[4,5]
Time (best of 4 trials): seconds

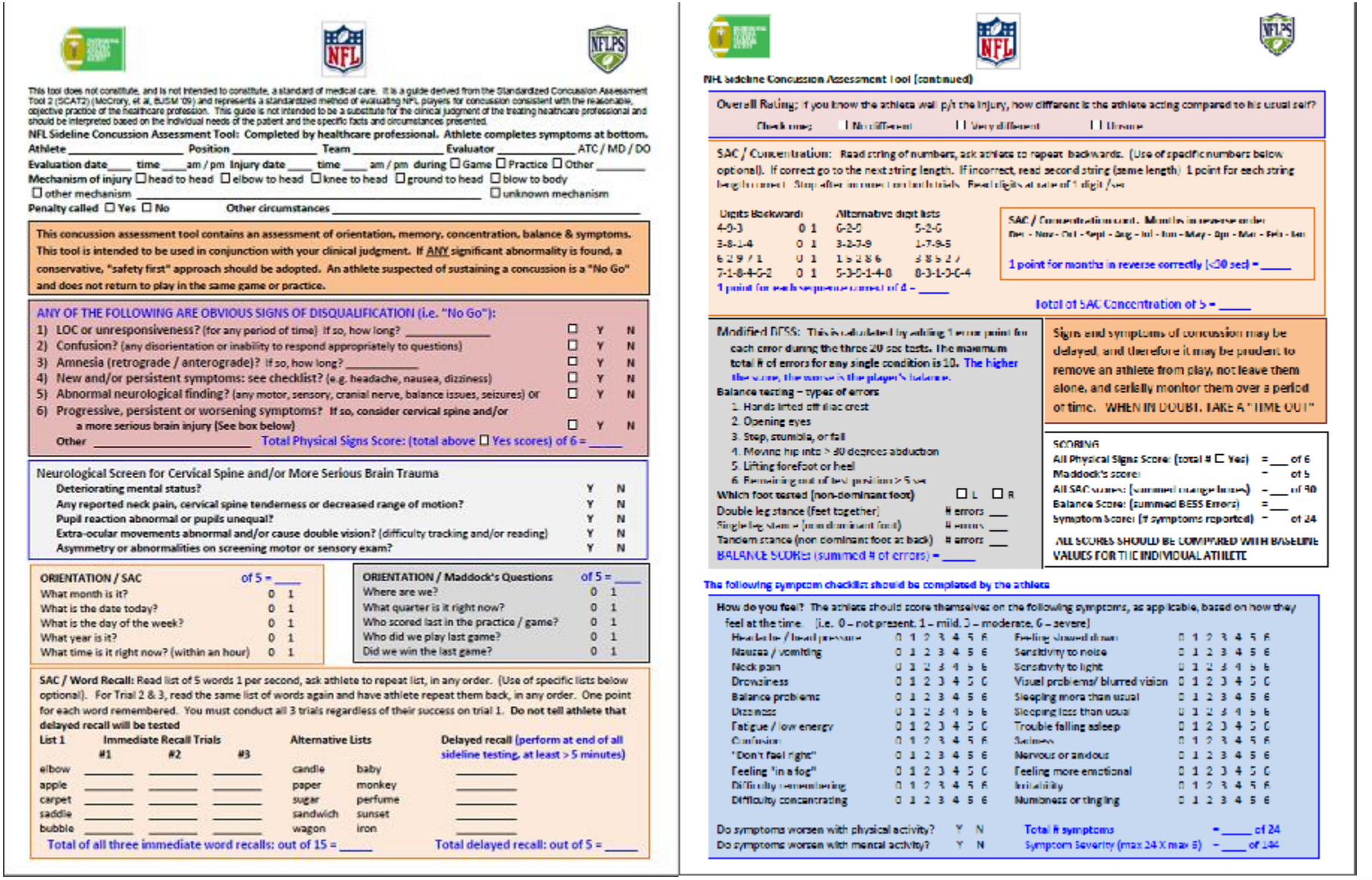
7 Coordination examination

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

8 SAC Delayed Recall[4]

Delayed recall score of 5

Management:



This tool does not constitute, and is not intended to constitute, a standard of medical care. It is a guide derived from the Standardized Concussion Assessment Tool 2 (SCAT2) (McCrory, et al, BJSM '09) and represents a standardized method of evaluating NFL players for concussion consistent with the reasonable, objective practice of the healthcare profession. This guide is not intended to be a substitute for the clinical judgment of the treating healthcare professional and should be interpreted based on the individual needs of the patient and the specific facts and circumstances presented.

NFL Sideline Concussion Assessment Tool: Completed by healthcare professional. Athlete completes symptoms at bottom.

Athlete _____ Position _____ Team _____ Evaluator _____ ATC / MD / DO

Evaluation date ____ time ____ am / pm Injury date ____ time ____ am / pm during ☐ Game ☐ Practice ☐ Other _____

Mechanism of injury ☐ head to head ☐ elbow to head ☐ knee to head ☐ ground to head ☐ blow to body

☐ other mechanism _____ ☐ unknown mechanism

Penalty called ☐ Yes ☐ No Other circumstances _____

This concussion assessment tool contains an assessment of orientation, memory, concentration, balance & symptoms. This tool is intended to be used in conjunction with your clinical judgment. If ANY significant abnormality is found, a conservative, "safety first" approach should be adopted. An athlete suspected of sustaining a concussion is a "No Go" and does not return to play in the same game or practice.

ANY OF THE FOLLOWING ARE OBVIOUS SIGNS OF DISQUALIFICATION (i.e. "No Go"):

1)	LOC or unresponsiveness? (for any period of time) If so, how long? _____	☐ Y	N
2)	Confusion? (any disorientation or inability to respond appropriately to questions)	☐ Y	N
3)	Amnesia (retrograde / anterograde)? If so, how long? _____	☐ Y	N
4)	New and/or persistent symptoms: see checklist? (e.g. headache, nausea, dizziness)	☐ Y	N
5)	Abnormal neurological finding? (any motor, sensory, cranial nerve, balance issues, seizures) or	☐ Y	N
6)	Progressive, persistent or worsening symptoms? If so, consider cervical spine and/or a more serious brain injury (See box below)	☐ Y	N
	Other _____ Total Physical Signs Score: (total above ☐ Yes scores) of 6 = _____		

Neurological Screen for Cervical Spine and/or More Serious Brain Trauma

Deteriorating mental status?	Y	N
Any reported neck pain, cervical spine tenderness or decreased range of motion?	Y	N
Pupil reaction abnormal or pupils unequal?	Y	N
Extra-ocular movements abnormal and/or cause double vision? (difficulty tracking and/or reading)	Y	N
Asymmetry or abnormalities on screening motor or sensory exam?	Y	N

ORIENTATION / SAC of 5 = ____

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 an hour)	0	1

ORIENTATION / Maddock's Questions of 5 = ____

Where are we?	0	1
What quarter is it right now?	0	1
Who scored last in the practice / game?	0	1
Who did we play last game?	0	1
Did we win the last game?	0	1

SAC / Word Recall: Read list of 5 words 1 per second, ask athlete to repeat list, in any order. (Use of specific lists below optional). For Trial 2 & 3, read the same list of words again and have athlete repeat them back, in any order. One point for each word remembered. You must conduct all 3 trials regardless of their success on trial 1. **Do not tell athlete that delayed recall will be tested**

List 1	Immediate Recall Trials #1	#2	#3	Alternative Lists		Delayed recall (perform at end of all sideline testing, at least > 5 minutes)
elbow	_____	_____	_____	candle	baby	_____
apple	_____	_____	_____	paper	monkey	_____
carpet	_____	_____	_____	sugar	perfume	_____
saddle	_____	_____	_____	sandwich	sunset	_____
bubble	_____	_____	_____	wagon	iron	_____

Total of all three immediate word recalls: out of 15 = _____ Total delayed recall: out of 5 = _____

NHL Sideline Concussion Assessment Tool (continued)

Overall Rating: If you know the athlete well, p/t the injury, how different is the athlete acting compared to his usual self?

Check one: ☐ Not different ☐ Very different ☐ Unsure

SAC / Concentration: Read string of numbers, ask athlete to repeat backwards. (Use of specific numbers below optional). If correct go to the next string length. If incorrect, read second string (same length). 1 point for each string length correct. Stop after incorrect on both trials. Read digits at rate of 1 digit / sec

Digits Backward			Alternative digit lists	
4-9-3	0	1	6-2-5	5-2-6
3-8-1-4	0	1	3-2-7-9	1-7-9-5
6-2-9-7-1	0	1	1-5-2-8-6	2-8-5-2-7
7-1-8-4-6-2	0	1	5-3-9-1-4-8	8-3-1-9-6-4

1 point for each sequence correct of 4 = _____

SAC / Concentration cont. Months in reverse order

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

1 point for months in reverse correctly (<20 sec) = _____

Total of SAC Concentration of 5 = _____

Modified BESS: This is calculated by adding 1 error point for each error during the three 20 sec tests. The maximum total # of errors for any single condition is 10. The higher the score, the worse is the player's balance.

Balance testing – types of errors

1. Hands lifted off iliac crest
2. Opening eyes
3. Step, stumble, or fall
4. Moving hip into > 30 degrees abduction
5. Lifting forefoot or heel
6. Remaining out of test position > 5 sec

Which foot tested (non-dominant foot)	☐ L	☐ R
Double leg stance (feet together)	# errors	___
Single leg stance (non-dominant foot)	# errors	___
Tandem stance (non dominant foot at back)	# errors	___

BALANCE SCORE: (summed # of errors) = _____

Signs and symptoms of concussion may be delayed, and therefore it may be prudent to remove an athlete from play, not leave them alone, and serially monitor them over a period of time. **WHEN IN DOUBT, TAKE A "TIME OUT"**

SCORING

All Physical Signs Score: (total # ☐ Yes)	= ___	of 6
Maddock's score:	=	of 5
All SAC scores: (summed change scores)	= ___	of 30
Balance Score: (summed BESS Errors)	= ___	
Symptom Score: (# symptoms reported)	=	of 24

ALL SCORES SHOULD BE COMPARED WITH BASELINE VALUES FOR THE INDIVIDUAL ATHLETE

The following symptom checklist should be completed by the athlete

How do you feel? The athlete should score themselves on the following symptoms, as applicable, based on how they feel at the time (i.e. 0 – not present, 1 – mild, 3 – moderate, 6 – severe)

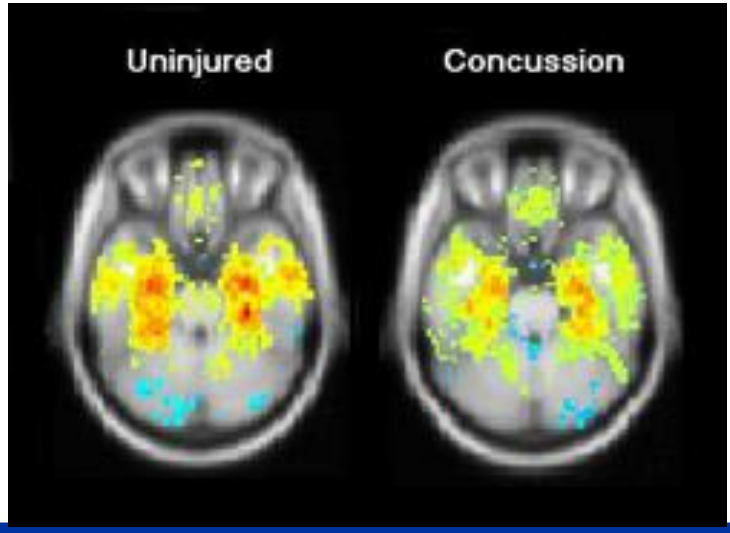
Headache / head pressure	0	1	2	3	4	5	6	Feeling slowed down	0	1	2	3	4	5	6
Nausea / vomiting	0	1	2	3	4	5	6	Sensitivity to noise	0	1	2	3	4	5	6
Neck pain	0	1	2	3	4	5	6	Sensitivity to light	0	1	2	3	4	5	6
Drowsiness	0	1	2	3	4	5	6	Visual problems/ blurred vision	0	1	2	3	4	5	6
Balance problems	0	1	2	3	4	5	6	Sleeping more than usual	0	1	2	3	4	5	6
Dizziness	0	1	2	3	4	5	6	Sleeping less than usual	0	1	2	3	4	5	6
Fatigue / low energy	0	1	2	3	4	5	6	Trouble falling asleep	0	1	2	3	4	5	6
Confusion	0	1	2	3	4	5	6	Sadness	0	1	2	3	4	5	6
"Don't feel right"	0	1	2	3	4	5	6	Nervous or anxious	0	1	2	3	4	5	6
Feeling "in a fog"	0	1	2	3	4	5	6	Feeling more emotional	0	1	2	3	4	5	6
Difficulty remembering	0	1	2	3	4	5	6	Irritability	0	1	2	3	4	5	6
Difficulty concentrating	0	1	2	3	4	5	6	Numbness or tingling	0	1	2	3	4	5	6

Do symptoms worsen with physical activity? Y N Total # symptoms = _____ of 24

Do symptoms worsen with mental activity? Y N Symptom Severity (max 24 X max 6) = ____ of 144

Management: Neuroimaging

- Vast majority of athletes with sports-related concussions do NOT require neuroimaging
  - CT and MRI will be normal
- CT: if concern for fracture or intracranial bleed
- MRI: if concern for underlying pathology or persistent symptoms (headache or seizure activity)
  - IE: AV malformation, Chiari malformation
- Functional MRI: abnormal patterns of activation have been noted in concussions
  - **Does not change management**



Management: Neurophysiological testing

- Written: neurophysiologist (time consuming but can assess more domains)
- Computerized (ie: ImPACT, Concussion Vital Signs (CVS), XLNTbrain Sport, Computerized Cognitive Assessment Tool (CCAT), Concussion Resolution Index (CRI)): easier to administer, cheaper

- Has NOT been validated as a diagnostic tool, but has the ability to show cognitive deficits longer than athletes are symptomatic
  - No universally agreed upon recommendations for testing, current recommendations are based on expert opinions

ImPACT testing

- **I**mmediate **P**ost-**C**oncussion **A**ssessment and **C**ognitive **T**esting
- Impact: 20 min computer test measuring verbal and visual memory, processing speed, reaction time, and impulse control.
- Theory: have baseline test for healthy athlete to compare cognitive fxn after injury
- > 7,000 Pro teams, colleges, high schools
  - NFL, MLB, MLS, NHL
  - Cooperate partners (Dick's, Wells Fargo, Overland Park Regional)

- ***St. Francis Health DOES offer (see next slide)***
- ***Washburn University, USD 501 HS, and Seaman HS uses ImPACT to tests student athletes for baseline and post-injury***
- ***Washburn Rural HS uses CVS***

- **It is a tool in the toolbox, use it to assist, not make the decision.**

Concussion Management
for Sports Injuries

Baseline Testing: $40
Post-Concussion Test: $50

Ages Starting at 10 years old
Tests performed every 2 years throughout sport performance.
Credentialed Sports Medicine Physician on staff.

Call to schedule an appointment
785.228.1700

St. Francis HEALTH | SCL Health

Sports Medicine Center

801 SW Fairlawn Topeka, KS 66606 | 785.228.1700

ImPACT®

We proudly use ImPACT, The most scientifically validated computerized concussion evaluation system. leading concussion management standards, providing the highest standards of care and safe return to play.

St. Francis

Management: Medications

- No convincing evidence that any particular medication is effective in treating the acute symptoms of sports concussion
- In acute setting (0-10 hr post injury), avoid any drugs that could alter mental status
- Caution with anti-nausea and anti-depressants
  - Can effect CNS
- **Avoid Ibuprofen (Advil, Motrin) or Aleve (Naproxen) and Aspirin → risk for intracranial hemorrhage**
- **Tylenoal (Acetaminophen) only**
- Recommend dim, quiet environment
  - **Limit reading and screen time**
- Good sleep hygiene -> Allow athlete to sleep, no longer need to wake up every 30 minutes

Management:

- **No specific treatment except relative physical AND cognitive rest**
- Natural history: symptoms present immediately, usually last > 72 hrs, most resolve spontaneously within 7-10 days
  - But 3-4 weeks is still considered NORMAL
- Predicting recovery time:
  - Dizziness at time of injury found to be greatest predictor in high school football players for a recovery > 21 days
  - Athletes with more symptoms in cognitive or migraine symptoms often required more recovery time
- Worsening symptoms could indicate intracranial pathology and warrants advanced imaging

Management: Return to Activities

- Return to school PRIOR to return to sport
- No standardized guidelines for returning athlete to school
  - May use ACE form -> *Currently working with local school districts to have a unified Topeka Metro form*
- May require academic accommodations initially
  - Reduced workload
  - Extended test-taking time
  - Shortened school day
- American Medical Associate (AMA) passed policy in June 2015:
  - Recommends requiring young athletes who are suspected of having a concussion to be quickly removed from a game, the group said in a statement, and allowed to return only with a physician's written consent.

ACE Form

Name _____ ☐M ☐F Birthdate _____ Date of Injury _____
Sport/Team/School _____ Phone _____
Primary Care Physician _____ Phone _____
Concussion Management Team Leader _____ Phone _____

Return to Learn
Classroom Rx 3
KSCP Kansas Sports Concussion Partnership
www.KansasConcussion.org

When can the student-athlete return to school? It will depend on the individual.
Every student's injury and recovery is unique and requires careful observation from parents and doctors. Promote recovery and prevent ongoing symptoms by following a Return to Learn plan like the one below. *The physician will customize a plan to allow recovery at student's own pace.*

Schools should identify a team leader to work with each student-athlete who sustained a concussion to facilitate a safe return to learn. This identified team leader should establish a communication system between the physician, athletic trainer, school administrators, teachers, coaches, school nurse, school counselor, parent/guardian and any other members.

☐ **STUDENT MAY NOT ATTEND SCHOOL AT THIS TIME.** Student may not attend class and should not work on homework assignments, reading projects, etc. This includes no extracurricular activities, such as all athletic activity, weightlifting, gym class, band, music, debate, etc. Continue to limit at-home activities that can worsen symptoms, such as loud music, television, computer screen time, texting, etc.

☐ **PARTIAL SCHEDULE & ACCOMMODATIONS.** Student may attend school with a partial class schedule. Work with the student to help determine the most appropriate schedule. Classes should be prioritized and not worsen symptoms. Special accommodations may be required to limit symptoms (e.g. longer time period to take exams, postponing research papers, quiet studying in the library, etc.) Homework should be limited during this time. Participation in all athletic activity, weightlifting, gym class, and extracurricular activities is still fully restricted.

☐ **FULL SCHEDULE & ACCOMMODATIONS.** Student may participate in a normal classroom schedule, but will still require some accommodations, depending on their current symptoms. Continue to work with the student to identify any specific classroom activities that could be worsening symptoms. Student may be able to participate in band and music class if this does not worsen concussions symptoms. All athletic activity, weightlifting and gym class is still not allowed, but the student can start to participate in non-athletic extracurricular activities as tolerated.

Classroom options while student has not achieved 100% cognitive recovery could include:

- Offer a tutor, reader, or a note taker to assist with performance in the classroom.
- Give an extended period of time to complete quizzes, tests, papers, etc.
- Allow classroom attendance but postpone tests, quizzes, papers, etc. until cognitive function has improved.
- Offer accommodations to minimize noisy/stimulating environments or allow them preferential seating in the classroom

Gradually increase school participation and independence as tolerated by the student. Goal is to achieve full return to school without accommodations.

Do NOT allow student to participate in the following:
- ☐ PE class
- ☐ Weightlifting
- ☐ Band or Music
- ☐ Wood shop or Metal shop
- ☐ Debate and Forensics
- ☐ Homework
- ☐ Exams or Quizzes
- ☐ Research Papers
- ☐ Computer Use
- ☐ Videos or Movies
- ☐ Other: _____

Please accommodate the student in the classroom by:
- ☐ Extending test time
- ☐ Allowing quiet work time (in library, for example)
- ☐ Creating a planner with assignments, due dates, etc.
- ☐ Providing a tutor
- ☐ Creating an individualized learning plan
- ☐ Other: _____

☐ **NORMAL CLASSROOM.** Student is **NOT** allowed to participate in any physical activity, such as weights, jogging, drills, practice or games. The athlete is **NOT** cleared to start "Warm-up to Play" but may fully participate in normal classroom activities. Work with the student to ensure a classroom "catch-up" plan is in place, if necessary.

Once participation in the classroom is normal and all concussion symptoms have resolved, physician should use the **Warm-up to Play Release Form 4** *if authorization for Warm-up to Play can be safely started. Once the Warm-up to Play progression is fully completed without return of symptoms, the student will be cleared for all athletic activity, weightlifting and gym class without restrictions.*

Concussion symptoms may develop within days after a head injury. The patient should continue to be observed for any new symptoms.

Medical Professional Signature: _____ Date _____
Scheduled Follow-up Date _____
Notes: _____

7/2013

Name _____ ☐M ☐F Birthdate _____ Date of Injury _____
Sport/Team/School _____ Phone _____
Primary Care Physician _____ Phone _____
Concussion Management Team Leader _____ Phone _____

Warm-up to Play
Release Form 4
KSCP Kansas Sports Concussion Partnership
www.KansasConcussion.org

An athlete's return to his/her sport will be a step-by-step process. Once the athlete has no symptoms or signs of concussion and is doing well in school and daily activities, a physician (MD/DO) will sign this form allowing the athlete to start the progression back to play. This will be monitored by a coach, athletic trainer or designated school official.

Athlete should spend a minimum of 30 minutes on each step. Athlete must wait 24 hours before progressing to the next step and remain completely symptom-free. STOP IMMEDIATELY if there is any return of signs/symptoms and report this right away. Go back to rest for the day, refrain from activities including bike riding, skateboarding, playful wrestling, etc. The following day — only if symptom free— athlete may repeat step that was previously symptom-free and resume progression. If symptoms persist or worsen for more than a day, please notify the physician.

☐ **Physician Release to Start Warm-up to Play. Proceed to Step 1.**

This patient has had an injury to the head. Patient may "Return to Play" after normal classroom full participation is achieved and successfully completing Steps 1 through 4 of the "Warm-up to Play" below. Symptoms of concussion may develop within days after a head injury. Patient should continue to be observed for any new symptoms.

Physician Signature _____ Date _____

Step 1. Light aerobic exercise, including walking or riding an exercise bike. No weightlifting. *(increase heart rate)*

☐ Step 1 completed successfully. Athlete reports no return of symptoms after 24 hours. Okay to proceed to Step 2.
Coach/Athletic Trainer _____ Date _____
Notes: _____

Step 2. Running in a gym or on the field. No helmet or equipment should be used. *(add movement)*

☐ Step 2 completed successfully. Athlete reports no return of symptoms after 24 hours. Okay to proceed to Step 3.
Coach/Athletic Trainer _____ Date _____
Notes: _____

Step 3. Non-contact training drills and full equipment. Start light resistance training or light weight training. *(add coordination and cognitive load)*

☐ Step 3 completed successfully. Athlete reports no return of symptoms after 24 hours. Okay to proceed to Step 4.
Coach/Athletic Trainer _____ Date _____
Notes: _____

Step 4. Full contact training under the supervision of the coach/athletic trainer. *(restore confidence and assess functional skills)*

☐ Step 4 completed successfully. Athlete reports no return of symptoms after 24 hours. Okay to "Return to Play."
Coach/Athletic Trainer _____ Date _____
Notes: _____

Return to Play

Student may fully Return to Play if all the above steps were successfully completed without return of any symptoms. This includes full participation in live competition or practice. Symptoms of concussion may develop within days after a head injury. Patient should continue to be observed for any new symptoms.

7/2013

Return to Play

Return to Play Progression

Baseline (Step 0): As the baseline step of the Return to Play Progression, the athlete needs to have completed physical and cognitive rest and not be experiencing concussion symptoms for a minimum of 24 hours. *Keep in mind, the younger the athlete, the more conservative the treatment.*

Step 1: Light Aerobic Exercise

The Goal: only to increase an athlete's heart rate.

The Time: 5 to 10 minutes.

The Activities: exercise bike, walking, or light jogging.

Absolutely no weight lifting, jumping or hard running.

Step 2: Moderate Exercise

The Goal: limited body and head movement.

The Time: Reduced from typical routine

The Activities: moderate jogging, brief running, moderate-intensity stationary biking, and moderate-intensity weightlifting

Step 3: Non-contact Exercise

The Goal: more intense but non-contact

The Time: Close to Typical Routine

The Activities: running, high-intensity stationary biking, the player's regular weightlifting routine, and non-contact sport-specific drills. This stage may add some cognitive component to practice in addition to the aerobic and movement components introduced in Steps 1 and 2.

Step 4: Practice

The Goal: Reintegrate in full contact practice.

Step 5: Play

The Goal: Return to competition

Premature Return to Play

- May predispose athlete to a subsequent concussion with prolonged recovery
  - Decreased cognitive ability and reaction time when recovering
- **Second Impact Syndrome (SIS)**
  - Second injury prior to the first healed
  - More common in boxers or athletes < 18 y/o
  - Loss of auto-regulation of brain's blood supply, leading to vascular engorgement, increased intracranial pressure, brain herniation → coma or death
  - **Mortality rate ~50%**
  - **Morbidity / disability rate ~100%**
  - 35 cases of suspected SIS from 1980-1993 in American football players

Post-concussion Syndrome

- Defined as symptoms and signs of concussion that persist for weeks to months
- Difficult to define where concussion ends and post-concussion syndrome begins
- Foundation of management is TIME → slow recovery process, often frustrated due to limitations in daily life (school, work, sports)
- Ideally managed by a team of providers who work with concussion on regular basis

Long Term Sequelae

- Increasing concern and coverage regarding Chronic Traumatic Encephalopathy (CTE)
- CTE is NOT a continuation of post-concussion syndrome or symptoms from an acute concussion, but rather develops decades after exposure.
- Neurodegenerative disease associated with repetitive brain trauma.
- Diagnosed post-mortem due to accumulation of Tau protein in specific areas of the brain.
- Not all former athletes diagnosed with CTE had reports of prior concussion.
  - Does sub-concussive blows contribute to development of disease ?

Disqualification from Sports

- No evidence-based guidelines for disqualifying or retiring from sport after concussion
- No agreed upon absolute number of concussion prior to disqualification
- Discuss each case with athlete and family
  - Risks: multiple concussions, abnormality on neuroimaging, persistent diminished academic or workplace performance, persistent post-concussive symptoms, prolonged recovery courses

Prevention

RIDDELL 360 HELMET

$309.99 - $389.99

RIDDELL REVOLUTION SPEED HELMET

$209.99 - $274.99

RIDDELL REVOLUTION SPEED CLASSIC HELMET

$169.99 - $274.99

RIDDELL REVOLUTION HELMET VARSITY

$209.99

RIDDELL REVOLUTION EDGE YOUTH HELMET

$119.99

RIDDELL REVOLUTION ATTACK YOUTH HELMET

$99.99

RIDDELL REVOLUTION ATTACK YOUTH HELMET

$104.99

Prevention

- **No evidence that protective gear prevents concussions.**
  - They reduce the risk of skull and dental fractures.
  - **Proper fitment is more important than style**
- In 2009, Washington state enacted the Zackery Lystedt Law – required education for coaches, athletes, and parents

Reduces Impact

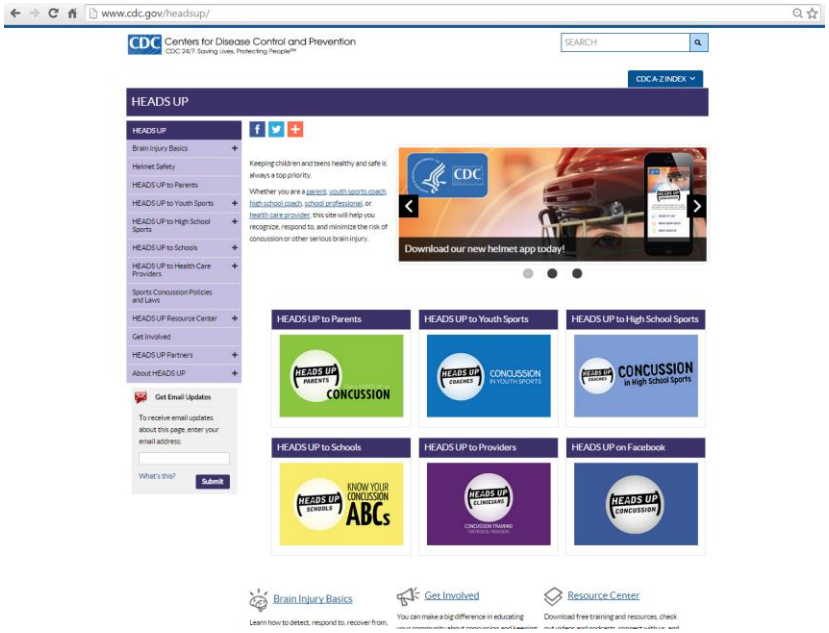
When the jaw suffers an impact, energy can be transmitted to the head, which can cause concussion. US Performance Mouthguards have been shown to reduce the G-Force impact of blows the jaw by up to 20%.

Prevention

- Impossible to prevent all sports-related concussions
- **Education is key**
- **Attitude shift is essential**
  - Players, coaches, officials, administrators, parents, fans
- Modification of rules
  - NFL banning spear tackling in 1976
  - Hockey banning checking from behind
    - Checking prohibited in leagues < 13-15 y/o
  - Soccer limited ‘elbow to head’ contact

CDC Concussion

http://www.kansasconcussion.org/



Referral

- Peter Loo, MD
- Sports Medicine Clinic at St. Francis Health Brewster Place
- 1101 SW 29th St.
- 785-379-4600

- **Staff at my clinic has been instructed that these student athletes are to be scheduled within 24-48 business hours to be seen**

Summary

- Concussions do not require a direct blow to the head
- Pull athlete out of activity for the day if any concern (state law)
- CT scans will be normal for concussions
- Cautious when starting medications post-injury
  - Avoid Ibuprofen and Aleve
  - Tylenol only for pain
- Allow to rest from both physical and mental activities
- Return to school before Return to play (RTP)
- RTP progression
- Education is key

Questions

- Thank you to SportZone

References

- http://www.amssm.org/Content/pdf%20files/2012_ConcussionPositionStmt.pdf
- http://www.aafp.org/afp/2012/0115/p123.html
- http://www.cdc.gov/headsup/
- http://bjsm.bmj.com/content/47/5/250.full.pdf+html
- http://www.kansasconcussion.org/