CONCUSSION MANAGEMENT

2014

WHAT WE’RE LEARNING

Rick Zappala, ATC
January 12, 2014
Mashantucket, CT
WHY ARE WE HERE?
WHY ARE WE HERE?

- Recent concussion news
- Review concussion guidelines
- State & sports association legislation
- How are we evaluating concussions?
- Some “concussions” are really hard to find
- Return to play
- Return to learn
- Concussion protocols - Do you have one?
- What are some of the things you are doing?
**CONCUSSIONS IN THE NEWS**

* “When I was playing we didn’t know from concussions. We knew smelling salts and that was it. No one talked concussions.* (Joe Namath 9/9/13)

* NFL, players reach whopping $765M settlement in concussion case*  
**CONCUSSIONS IN THE NEWS**

* that high school football players were almost twice as likely to have concussions as their collegiate counterparts. (Nadia Kounang, CNN, 10/31/13)

* Damon Janes, a 16-year-old junior running back for the Brocton (N.Y.) High School varsity football team, died on Monday, 9/16/13 as a result of injuries suffered from a helmet-to-helmet hit. (http://bleacherreport.com/articles/1776791-high-school-football-player-dies-after-helmet-to-helmet-collision)
2013

Dylan Jeffries, Lost Creek WV, 10/13
Chad Stover, Tipton MO, 10/13
Charles Yovella, Hopi HS, AZ, 11/13
WHERE HAVE WE COME FROM?

- Past attitudes
  - Only a “ding”
  - “Bell rung”
- Lack of understanding
  - What is really going on in the brain?
- Rush to RTP
  - Coaches
  - Athletes
  - Parents
“THIS CONCUSSION STUFF IS BS!”

Field hockey official 10/17/13

WHAT????

TABLE 1
Concussion Rates in High School Sports

<table>
<thead>
<tr>
<th>Sport</th>
<th>Injury Rate, per 1000 A/E</th>
</tr>
</thead>
<tbody>
<tr>
<td>Football</td>
<td>0.47–1.03 a,b</td>
</tr>
<tr>
<td>Girls’ soccer</td>
<td>0.36 a</td>
</tr>
<tr>
<td>Boys’ lacrosse</td>
<td>0.28–0.34 c,d</td>
</tr>
<tr>
<td>Boys’ soccer</td>
<td>0.22 a</td>
</tr>
<tr>
<td>Girls’ basketball</td>
<td>0.21 a</td>
</tr>
<tr>
<td>Wrestling</td>
<td>0.18 a</td>
</tr>
<tr>
<td>Girls’ lacrosse</td>
<td>0.10–0.21 c,d</td>
</tr>
<tr>
<td>Softball</td>
<td>0.07 a</td>
</tr>
<tr>
<td>Boys’ basketball</td>
<td>0.07 a</td>
</tr>
<tr>
<td>Boys’ and girls’ volleyball</td>
<td>0.05 a</td>
</tr>
<tr>
<td>Baseball</td>
<td>0.05 a</td>
</tr>
</tbody>
</table>


* How many each year?
* 1.6 to 3.8 million brain injuries each year in US (AAN)
* 300,000 sports related concussions (CDC)
* Majority are adolescent & pediatric (AAP)

(PEDIATRICS Volume 126, Number 3, September 2010)
WHAT IS A CONCUSSION?

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


- A disruption of the normal neurological function of the brain, or
- a brain injury that is caused by a sudden blow to the head or to the body. The blow shakes the brain inside the skull, which temporarily prevents the brain from working normally.

WHAT IS A CONCUSSION?

* They can range from mild to severe and can disrupt the way your brain normally works.
* They can happen even if you are not “knocked out.”
* Even a “ding” or having your “bell rung” can be serious.
* You can’t see a concussion.
* Signs & symptoms can show up right after the injury, or can take hours, days or weeks to appear.
CONCUSSION vs mTBI

- 4th Consensus statement 2012
  - Often used interchangeably
  - Concussion is a subset of mTBI
  - Concussion used in most documents
  - Let’s call it what it is
INCREASED PUBLIC ATTENTION

* Media coverage
* Legislative efforts
* Rules changes
**STATE LEGISLATION**

- 49 states & Washington DC have concussion legislation
  - [http://www.lawatlas.org/preview?dataset=sc-reboot](http://www.lawatlas.org/preview?dataset=sc-reboot)

- **Common provisions**
  - Educate
  - Recognize
  - Remove
  - Refer to medical care
  - Rest
  - Return after healed

- **NY (2011)**
  - Must be symptom free for at least 24 hours and cleared by a licensed physician.
  - The school’s chief medical officer will make the final decision on return to activity including physical education class and after-school sports.
  - 6 step RTP protocol

- **MA (2010)**
  - The student shall not return to play unless and until the student provides medical clearance and authorization as specified in 105 CMR 201.011.

- **NJ (NJSIAA 2010)**
  - Evaluation by physician or other license health care provider

- **CT (CIAC 2010)**
  - 5 R’s of concussion management
STATE LEGISLATION

* ME
  * No return to play until cleared by licensed neurologist or athletic trainer
* NH
  * RTP with permission of health care provider
* VT
  * Return with clearance from a health care provider
* RI
  * Written authorization by a licensed physician
* PA
  * RTP with clearance by a physician, athletic trainer or neuropsychologist
* DE
  * RTP with medical clearance conforming to association regulation
STATE/LOCAL ASSOCIATIONS

- High school athletic associations
- AT associations
- Official’s associations
LEAGUE POLICIES

NFL (2011)
- Rule changes to reduce hits to the head
- Every team will be required to use the same neurologic test to determine on the field whether an injured player may return to the game.
- "The NFL Sidelines Concussion Exam" is a battery of simple tests evaluating concentration, basic thinking skills and balance. It also includes a questionnaire that asks about concussion symptoms. (Dr. Richard Ellenbogen, MD, 2/25/11)

- NBA
  - New policy that requires players to pass a series of test before returning to play

- NHL
  - any player who exhibits concussion symptoms resulting from a play must be removed from the game and taken to a quiet place in the locker room area for an evaluation by a physician (WTEN.com 3/14/11)
NATIONAL ASSOCIATIONS

- NCAA (2010)
  - Institution must have a concussion management plan
  - A student-athlete who exhibits signs, symptoms or behaviors consistent with a concussion shall be removed from practice or competition and evaluated by an athletics healthcare provider with experience in the evaluation and management of concussions. Student-athletes diagnosed with a concussion shall not return to activity for the remainder of that day.
  - RTP by team physician
  - Student-athletes receive concussion education
  - Sign a statement accepting responsibility to report injuries
  - Football “targeting rule”

- NFHS (01/2011)
  - Follow the “Heads Up” 4-step Action Plan.
    - Remove the athlete from play.
    - Ensure that the athlete is evaluated by an appropriate health-care professional.
    - Inform the athlete’s parents or guardians about the possible concussion and give them information on concussion.
    - Keep the athlete out of play the day of the injury and until an appropriate health-care professional says he or she is symptom-free and gives the okay to return to activity
  - After medical clearance, RTP should follow a step-wise protocol with provisions for delayed RTP based upon return of any signs or symptoms.
Recommendations

1. Any athlete who is suspected to have suffered a concussion should be removed from participation until he or she is evaluated by a physician with training in the evaluation and management of sports concussions.

2. No athlete should be allowed to participate in sports if he or she is still experiencing symptoms from a concussion.

3. Following a concussion, a neurologist or physician with proper training should be consulted prior to clearing the athlete for return to participation.

4. A certified athletic trainer should be present at all sporting events, including practices, where athletes are at risk for concussion.

5. Education efforts should be maximized to improve the understanding of concussion by all athletes, parents, and coaches.

Position Statement History
Approved by the AAN Sports Neurology Section, Practice Committee, and Board of Directors October 2010 (AAN Policy 2010-36).

Updated March 2013 supporting legislation & education
WHAT DOES THIS MEAN TO US ON THE SIDELINES?

* Know YOUR state laws
* Know concussion management guidelines
* Be supported by your supervising physician
* Educate administrators, coaches, parents, athletes on the laws & guidelines
* DO NOT return a concussed athlete back to play
* Be confident in your decision – it is the right thing to do
WHAT DO WE DO?

- Recognize if there is a concussion
- Signs & symptoms
- Other possible causes
  - Hypoglycemia
  - Illness
  - Poor conditioning
  - etc
- Don’t be mislead
  - Nobody WANTS it to be a concussion
UNDER TREATMENT VS. OVER TREATMENT

- Need to do what is right for the athlete
- Athletes, parents, coaches concerns
- When in doubt sit them out
USE MULTIPLE EVALUATION TOOLS

- Signs/Observations
- Symptoms
  - Graded Symptom Checklist (GSC)
- Orientation
  - Maddocks Score
  - Time, date, etc
- Memory
  - Word recall
- Concentration
  - Number recall, count back by 7
  - Months in reverse order
- Postural Stability
  - Balance Error Scoring System (BESS)
- Coordination
  - Rhomberg, Stork tests
YOUR EVALUATION TOOLS

- Symptom Checklist (GSC)
- Sideline Assessment of Concussion Exam (SAC)
- BESS
- Sport Concussion Assessment Tool (SCAT3)
- Child SCAT3
- Glasgow Coma Scale
- King-Devick Test
- Neuropsych testing
SYMPTOMS

- Blurred vision
- Dizziness
- Drowsiness/Fatigue
- Feel “in a fog”
- Feel “slowed down”
- Sadness
- Headache
- Ringing in Ears
- Nausea
- Sensitive to Noise
- Sensitive to Light
- Numbness (Any where)
- Vomiting
- Disoriented
- Poor Balance/Coordination
- Weakness (Neck, arm, etc)
- Unable to Concentrate
- Confused or Distracted
- Nervousness
- Irritability/Anger
- Difficulty remembering
# HEAD INJURY GRADED SYMPTOM CHECKLIST

**INDICATE THE SEVERITY OF EACH SYMPTOM USING THE FOLLOWING SCALE**

**GRADING SCALE:**  
0 -NONE 1-TRACE 2-MILD 3-MODERATE 4-SEVERE 5-MOST SEVERE  
(Grading by the patient.)

<table>
<thead>
<tr>
<th>Symptom</th>
<th>At Time Of Injury</th>
<th>Date _________ Min/hrs Post-Injury</th>
<th>Date _________ Min/hrs Post-Injury</th>
<th>Date _________ Min/hrs Post-Injury</th>
<th>Date _________ Min/hrs Post-Injury</th>
<th>Date _________ Min/hrs Post-Injury</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blurred Vision</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dizziness</td>
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<tr>
<td>Drowsiness/Fatigue</td>
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<tr>
<td>Feel &quot;in a fog&quot;</td>
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</tbody>
</table>
SIGNS & OBSERVATIONS

* Look for SIGNS
  * Observable
    * Vacant stare/Glassy eyed
    * Clutching/Holding head
    * Pupil response
    * Not making sense
    * Difficulty speaking
    * Loss of consciousness
    * Posturing

* More Sensitive Indicators
  * Orientation
  * Memory
  * Concentration
  * Balance
LOSS OF CONSCIOUSNESS

LOC IS NOT A GOOD INDICATION OF CONCUSSION SEVERITY
“THE EYES ARE THE WINDOW TO THE SOUL”
Matthew 6, 22-23

* Pupil Response
* Nystagmus
EYE MOVEMENT

Saccades

H-Test
EYE MOVEMENT

Ocular Convergence

Gaze Stability
ORIENTATION EVALUATION

* Orientation (1 point each)
  * Month _______ 0 1
  * Date _________ 0 1
  * Day of Week ___ 0 1
  * Year __________ 0 1
  * Time (within 1 hr) 0 1

* Total Score _______ / 5
* Maddocks Score
  * What venue are we at today?
  * Which half is it now?
  * Who scored last?
  * What team did we play last?
  * Did your team win the last game?
MEMORY EVALUATION

* Word Recall (1 pt each)
  * Cat 0 1
  * Florida 0 1
  * School 0 1
  * Ocean 0 1
  * Book 0 1

* Immediate Trials (3)  
Total Score _______ / 15

* Delayed Trial  
Total Score _______ / 5
**CONCENTRATION EVALUATION**

* Concentration Reverse Digits
  * (Go to next string length if correct on first trial. Stop if incorrect on both trials. 1 pt for each string length)

<table>
<thead>
<tr>
<th>String 1</th>
<th>String 2</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 - 4 - 2</td>
<td>6 - 5 - 8</td>
<td>0 1</td>
</tr>
<tr>
<td>6 - 8 - 3 - 1</td>
<td>3 - 4 - 8 - 1</td>
<td>0 1</td>
</tr>
<tr>
<td>4 - 9 - 1 - 5 - 3</td>
<td>6 - 8 - 2 - 5 - 1</td>
<td>0 1</td>
</tr>
<tr>
<td>3 - 7 - 6 - 5 - 1 - 9</td>
<td>9 - 2 - 6 - 5 - 1 - 4</td>
<td>0 1</td>
</tr>
</tbody>
</table>

* Months in reverse order (1 pt for entire sequence)

* **Concentration Total Score** _________ / 5

* Others: Count backward from 100 by 7s, Days of the week backwards, etc
**Balance Error Scoring System**

- Record the number of errors for each 20 Second Stance

**Recordable Errors**

- Hands lifted off iliac crests
- Opening of eyes
- Step, stumble or fall
- Moving into > 30° hip flex or Abd
- Remaining out of test position for > 5 sec
B.E.S.S.
<table>
<thead>
<tr>
<th>SURFACE/STANCE</th>
<th>DATE</th>
<th>DATE</th>
<th>DATE</th>
<th>DATE</th>
<th>DATE</th>
<th>DATE</th>
</tr>
</thead>
<tbody>
<tr>
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<td></td>
</tr>
<tr>
<td>FIRM/DOUBLE LEG</td>
<td></td>
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<tr>
<td>FIRM/TANDEM</td>
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<tr>
<td>FIRM/SINGLE LEG</td>
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<td>FOAM/DOUBLE LEG</td>
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<tr>
<td>FOAM/TANDEM</td>
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<tr>
<td>FOAM/SINGLE LEG</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>TOTAL SCORE</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
BALANCE ASSESSMENT

* Commercial assessment & training
* Vestibular training

http://www.4securehealth.com/
COORDINATION

* Rhomberg Test
* Stork Test
* Heel to toe walk
POSTURAL CHANGES/PROVOCATIVE ACTIVITY

- Light exercise
  - Sit up, push up, squats
- Postural change
- Running
GLASGOW COMA SCALE

The test measures the motor response, verbal response and eye opening response with the following values:

The final score is determined by adding the values of I+II+III

**I. Motor Response**
- 6 - Obeys commands fully
- 5 - Localizes to noxious stimuli
- 4 - Withdraws from noxious stimuli
- 3 - Abnormal flexion, i.e. decorticate posturing
- 2 - Extensor response, i.e. decerebrate posturing
- 1 - No response

**II. Verbal Response**
- 5 - Alert and Oriented
- 4 - Confused, yet coherent, speech
- 3 - Inappropriate words and jumbled phrases consisting of words
- 2 - Incomprehensible sounds
- 1 - No sounds

**III. Eye Opening**
- 4 - Spontaneous eye opening
- 3 - Eyes open to speech
- 2 - Eyes open to pain
- 1 - No eye opening
CONCUSSION ASSESSMENT TOOLS

- SCAT 3
- SCAT 3 CHILD
- CRT (Concussion Recognition Tool)
- Readily available
## Acute Concussion Evaluation (ACE)

**Physician/Clinician Office Version**

Gerard Gioia, PhD¹ & Micky Collins, PhD²  
¹Children's National Medical Center  
²University of Pittsburgh Medical Center

<table>
<thead>
<tr>
<th>A. Injury Characteristics</th>
<th>Date/Time of Injury</th>
<th>Reporter: Patient Parent Spouse Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Injury Description</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1a. Is there evidence of a forcible blow to the head (direct or indirect)?</td>
<td>Yes No Unknown</td>
<td></td>
</tr>
<tr>
<td>1b. Is there evidence of intracranial injury or skull fracture?</td>
<td>Yes No Unknown</td>
<td></td>
</tr>
<tr>
<td>1c. Location of Impact:</td>
<td>Frontal Lft Temporal Rt Temporal Lft Parietal Rt Parietal Occipital Neck Indirect Force</td>
<td></td>
</tr>
<tr>
<td>2. Cause:</td>
<td>MVC Pedestrian-MVC Fall Assault Sports (specify) Other</td>
<td></td>
</tr>
<tr>
<td>3. Amnesia Before (Retrograde)</td>
<td>Are there any events just BEFORE the injury that you/ person has no memory of (even brief)?</td>
<td>Yes No Duration</td>
</tr>
<tr>
<td>4. Amnesia After (Anterograde)</td>
<td>Are there any events just AFTER the injury that you/ person has no memory of (even brief)?</td>
<td>Yes No Duration</td>
</tr>
<tr>
<td>5. Loss of Consciousness:</td>
<td>Did you/ person lose consciousness?</td>
<td>Yes No</td>
</tr>
<tr>
<td>6. EARLY SIGNS: Appears dazed or stunned Is confused about events Answers questions slowly Repeats Questions Forgetful (recent info)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Seizures: Were seizures observed?</td>
<td>No Yes</td>
<td></td>
</tr>
</tbody>
</table>

### B. Symptom Check List*

Since the injury, has the person experienced *any* of these symptoms *any more than usual* today or in the past day?  
Indicate presence of each symptom (0=No, 1=Yes).  

*Lovell & Collins, 1998 JHTR*
King Devick Test: There's No Such Thing As A Tough Brain

* Quick, Simple, Accurate
* King-Devick Test is an objective rapid sideline screening test for concussions that can be administered by coaches, athletic trainers, medical professionals and parents in minutes.
* King-Devick Test is an accurate and reliable method for identifying athletes with head trauma and has particular relevance to contact sports such as football, hockey, soccer, basketball and all activities.
* Baseline testing
* [http://kingdevicktest.com/](http://kingdevicktest.com/)
CONCUSSIONS

- Evaluate for neck/facial injuries
  - Often overlooked
WHAT TO DO

ANY SIGNS OR SYMPTOMS – NO RETURN TO PLAY

Send to Emergency Room if:

- Any loss of consciousness
- Any amnesia
- Any vomiting
- Any unusual behaviors
- If there is blood or fluid draining from nose, ears, etc
- If signs / symptoms get worse
NEUROPSYCH EVALUATION

* Baseline test
* Post concussion test
* Can be a valuable tool
* Not intended for sideline testing
NEUROPSYCH TESTING
What it is and what it isn’t

* It is a tool to help determine recovery
* It is a tool to help manage concussions
* It is a tool to help communicate post-concussion status to coaches, parents, medical providers
* It does not diagnosis a concussion
* It is NOT a substitute for medical evaluation / treatment
SOME CONCUSSIONS ARE TOUGH TO RECOGNIZE

- What about the athlete who bumped their head & only has a headache and “saw stars” when they hit it?
- Or who flat out lies to you about symptoms?
  - Knowledge / Behaviors
  - How do you treat them in the heat of competition?
  - What’s your protocol?
WHAT DO YOU DO?

* Must recognize when a concussion occurs
  * May have to develop “quick check” strategies.
* Need to use multiple evaluation tools
* Remove the athlete with concussion symptoms or signs
* Develop a method to communicate your findings to other health care providers
* Educate your athletes, coaches, parents and administrators
WHAT DO YOU TELL YOUR ATHLETES & PARENTS?

* What a concussion is... a brain injury
* What signs & symptoms should they look for
* When should they go to the hospital ER or MD
* How they should take care of themselves
* What the RTP protocol will be
* What are the risks of returning before they are healed
* When your protocol provides for their return to sports
* Have a take home concussion care sheet
WHAT DO YOU TELL YOUR ATHLETES & PARENTS?

- You DO NOT need to be “knocked out” to have a concussion
- A concussion CANNOT be diagnosed by a CT scan, MRI or other imaging technology
Concussions may be cumulative & may have long term effects
Younger athletes take longer to recover & are more susceptible to 2nd impact syndrome
Girls seem to have more concussions than boys
Girls seem to take longer to recover than boys
Importance of Proper Care
  No return to activity until symptom free
  Graded return to activity
EXTENDED SYMPTOMS

- 10 – 20% of concussions take longer than 7-10 days to resolve
  - “Post Concussion Syndrome”
- May be very frustrating to all
- Sleep disorders
- Noise or light sensitivity
- Dizziness
- Headache
- Difficulty concentrating
- Effects on school or work
- Evaluation
- Rehab activities?
- Medication
RETURN TO PLAY

* Must be symptom free
* Must have zero signs
* Must be cleared by a physician
* Graded RTP protocol
  * Progressively increase exercise levels
  * 6 step/day process
**Physical Activity Protocol**

NYS Guidelines

- **Phase 1**: low impact, non-strenuous, light aerobic activity such as walking or riding a stationary bike. If tolerated without return of symptoms over a 24 hour period proceed to;

- **Phase 2**: higher impact, higher exertion, and moderate aerobic activity such as running or jumping rope. No resistance training. If tolerated without return of symptoms over a 24 hour period proceed to;

- **Phase 3**: Sport specific non-contact activity. Low resistance weight training with a spotter. If tolerated without return of symptoms over a 24 hour period proceed to;

- **Phase 4**: Sport specific activity, non-contact drills. Higher resistance weight training with a spotter. If tolerated without return of symptoms over a 24 hour period proceed to;

- **Phase 5**: Full contact training drills and intense aerobic activity. If tolerated without return of symptoms over a 24 hour period proceed to;

- **Phase 6**: Return to full activities without restrictions.

**Progressive Physical Activity Program**

NFHS Guidelines

- **Step 1**: Light aerobic exercise- 5 to 10 minutes on an exercise bike or light jog; no weight lifting, resistance training, or any other exercises.

- **Step 2**: Moderate aerobic exercise- 15 to 20 minutes of running at moderate intensity in the gym or on the field without a helmet or other equipment.

- **Step 3**: Non-contact training drills in full uniform. May begin weight lifting, resistance training, and other exercises.

- **Step 4**: Full contact practice or training.

- **Step 5**: Full game play.
RETURN TO PLAY

* Locust Valley School District RTP
* Port Washington SD RTP
What about....? 

- School work
- Reading
- Watching TV
- Using a computer
- Texting
RETURN TO LEARN

- New emphasis
- Difficulty returning to school/work
- Extended symptoms
- Class difficulties
- Reading/Homework
- Test/Quizzes
RETURN TO LEARN

- RTL Strategies
- RTL team
  - Family team
  - Medical team
  - Academic team
  - Physical activity team
- Educational plan
  - IEP – for chronic conditions
  - 504 – for accommodations for temporary conditions

REAP Concussion Management Program
WHAT ARE THE RISKS?

* Second Impact Syndrome
  * Athletes who return to sports too early – while the brain is still healing – are at a greater risk for a more severe second concussion.
  * Second, or later, concussions can cause death or serious brain damage that may last a lifetime.

* Post Concussion Syndrome
  * May last months
Can you share with us how you manage your concussions?
RESOURCES

* http://www.cdc.gov/TraumaticBrainInjury
* http://www.momsteam.com/health-safety
* http://www.lawatlas.org/preview?dataset=sc-reboot
* http://bjsm.bmj.com/content/47/5/250.full
* http://www.rockymountainhospitalforchildren.com/sports-medicine/concussion-management/
* www.NATA.org
* Your state associations
THANK YOU