Concussion Management
Making a difference on the Sidelines

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Author of
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Concussion

Traumatic brain injury with an alteration of brain function, typically back to normal within days to weeks. 90% recover within 10 days (slightly longer in children).

Can occur from direct impact, or rotation, or whiplash to head.

Multiple signs and symptoms with biochemical but no structural changes.
Concussion Symptoms

Can have any one of these

**Headache**

**Light or sound sensitivity**

**Difficulty concentrating**

**Feeling “foggy” or confused**

**Nausea or vomiting**

**Trouble sleeping**

**Loss of consciousness**

**Balance trouble or dizziness**

CDC.gov
The Stats

- Risk of recurrent concussion when still healing from first - 4X more likely to get a second concussion
  most risk in the first 10 days after first concussion

- 90% of concussions have NO loss of consciousness

- CT, MRI, and EEG can diagnose concussion 0% of the time!

- Symptoms, signs, and the history can diagnose concussion most of the time!
Risk

- Females more than males

- Child/adolescent more than adult

- Highest in Football and Lacrosse for boys, soccer for girls

- Lowest in Baseball, Volleyball, Gymnastics

AAN, 2013
Incidence of concussion in high school sport

Incidence rate of .24 per 1000 boys in high school sport

Football accounted for about half

Girl’s soccer was second

Girls had roughly twice the concussion risk of boys

- Trends in concussion incidence in high school sports: a prospective 11-year study.
Epidemiology of concussions among United States high school athletes in 20 sports.


- Football made up 47%
- Girl’s soccer 8.2%
- Boy’s wrestling 5.8%
- Girl’s basketball 5.5%

- Concussion made up 22% of all injuries for ice hockey (about 10% higher than other sports)

- Head to head caused 70%
- Head to ground caused 17%

- 55% of athletes returned to play in 1-3 weeks
- 23% of athletes returned to play in less than a week
# Concussion - the High Risk Sports

<table>
<thead>
<tr>
<th>Sports</th>
<th>College %</th>
<th>Injury rate per 1000 athletes</th>
<th>High School</th>
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<tbody>
<tr>
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<td>18.3</td>
<td>.91</td>
<td></td>
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<td>Ice Hockey Men</td>
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<td>.41</td>
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<tr>
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<td>.37</td>
<td>1.55</td>
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<td>.25</td>
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<tr>
<td>Soccer Women</td>
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<tr>
<td>Basketball Men</td>
<td>3.2</td>
<td>.16</td>
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<tr>
<td>Gymnastics W</td>
<td>2.3</td>
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</tbody>
</table>

Hootman, 2007, AAN 2013

- 30% sports related
- 69% had head imaging
- 28% were discharged with follow up recommended
- 69% male
Sideline Management

All SUSPECTED concussions should be removed from play for at least 24 hours and only returned when considered safe by a concussion trained health care provider

- AAN 2013 and KS/MO state law

- **Obvious signs are “easy” to see:**
  - Loss of consciousness
  - Seizure
  - Decreasing mental status

- **Subtle signs can still result in serious bad outcomes**
  - Running the wrong play, running back to the wrong sidelines
  - Acting not quite right
  - Rubbing head or helmet or taking helmet off
  - Slow to return to huddle or sidelines
  - Staying down after a tackle longer than usual
One Protocol to Consider Using
First Responder

- Remove from play
- If neck injury- keep on ground and wait for transport
- If loss of consciousness- check airway
- Don’t remove helmet until neck is cleared
- No return until cleared by health care professional and step wise return to play
- If decreasing mental status then immediate evaluation otherwise evaluation in 48-72 hours
What about testing on the sidelines if first responder is medically trained

- Pupil response and eye movement testing
- Cranial nerve exam
- Balance testing, disdiadochokinesia and convergence testing
- Questioning athlete and mental status
- SAC, SCAT II and III and others

- If you do, it’s not for return to play but rather to make decisions if getting worse or stable
When to consider a CT or emergent evaluation

- **Loss of consciousness** (especially if above 1 minute)
- Recurrent vomiting
- Decreasing mental status
- Abnormal cranial nerve exam
- Obvious skull fracture, neck injury, or trauma
What to do after diagnosed

- Rest from school, video, TV, Phone
- Tylenol if needed rather than ibuprofen
- Slow return to school

Staged Return to Activity

Stage 1: 10 minutes of activity  
Check for symptoms
Stage 2: 30 minutes of activity  
Increase HR
Stage 3: 1 hour non contact, resistance  
Movement
Stage 4: Practice without contact  
Coordination
Stage 5: Full contact practice  
Confidence, skill

A safe return is based on symptoms, balance, cognitive tests - no one test is absolute

Occasionally needs vestibular therapy, special medications, psychologist, physical therapy, and rarely a diagnostic test such as an MRI, especially consider if over 10 days of symptoms in adults, possibly longer in children.
What not to do after diagnosed

• Rush back to school or sport (even if elite athlete)

• Allow to return to sport the same day or if still having symptoms

• Allow to drive home after suspected concussion

• Narcotics for headache (in most cases)

• CT every concussion

• Base return to school or sports on one test, yet if you did the best would be no symptoms with return of normal personality, attention, and sleep

• Ignore more subtle symptoms such as concentration difficulty, trouble falling asleep, not acting quite right
The dangers

• ACUTE
  • Second impact syndrome
  • Chronic headache or concentration difficulty

• CHRONIC
  • CTE (Tau) and Dementia Pugilistica
  • Behavioral changes resulting in difficulty with career, family, life
Equipment and testing

• **Helmets (+)**
  - Examining concussion rates and return to play in high school football players wearing newer helmet technology: a three-year prospective cohort study.
    - *Neurosurgery*. 2006; 58(2):275-86; discussion 275-86 (ISSN: 1524-4040)
  - Change in size and impact performance of football helmets from the 1970s to 2010.

• **Soccer Head Bands(NS) and Mouthguards (+/-)**
  - Demystifying preventive equipment in the competitive athlete.
  - Incidence of cerebral concussions associated with type of mouthguard used in college football.
    - *Dent Traumatol*. 2004; 20(3):143-9 (ISSN: 1600-4469)

• **Computer chips in helmets (NS)**

• **Baseline & post concussion computer neuropsych tests**
  - Sensitivity and specificity of the ImPACT Test Battery for concussion in athletes.
    - *Arch Clin Neuropsychol*. 2006; 21(1):91-9 (ISSN: 0887-6177)
  - Sensitivity and Specificity of the Online Version of ImPACT in High School and Collegiate Athletes.
  - Post-exertion neurocognitive test failure among student-athletes following concussion.
    - *Brain Inj*. 2013; 27(1):103-13 (ISSN: 1362-301X)

• **The future (Being researched)**
  - Blood testing, MRI spectroscopy, PET, EEG, ERP
Athlete Advocacy

- Health care providers
- CDC and National Institutes of Excellence
- Legislators and State Agencies
- Coaches and officials
- Teachers and Schools
- Parents and spectators
- Team mates
- Scientists and Researchers
- The Media
- Pro Athletes/NFL
What will make a difference

• Rules that are protective
• Officials that are alert
• Coaches that respect the diagnosis
• Athletes that are looking out for each other
• Parents that are educated and an advocate for their child athlete
Concussion Management Teams

- Training in the diagnosis and treatment
  - thus more likely to be updated on the most current management guidelines
- Research and development
- Patient numbers
  - thus may be able to detect subtle signs of worsening or improvement
- Using the newest tests and access to National Centers of Excellence such as Pittsburg

Included on the team:

- Concussion trained doctor
- Vestibular therapist
- Vision therapist
- Psychologist/Neuro psychologist
- Neurologist
- Physical therapist
- Neurosurgeon
- Research/Scientists
- Athletic trainer
- Pain team/PMR
- Concussion trained nurse
- Educator for return to school
Resources

• http://www.kumed.com/medical-services/concussion-management

• www.cdc.gov/concussioninyouthsports/

• www.kansasconcussion.org

• www.cdc.gov/concussion/

Thank you!