

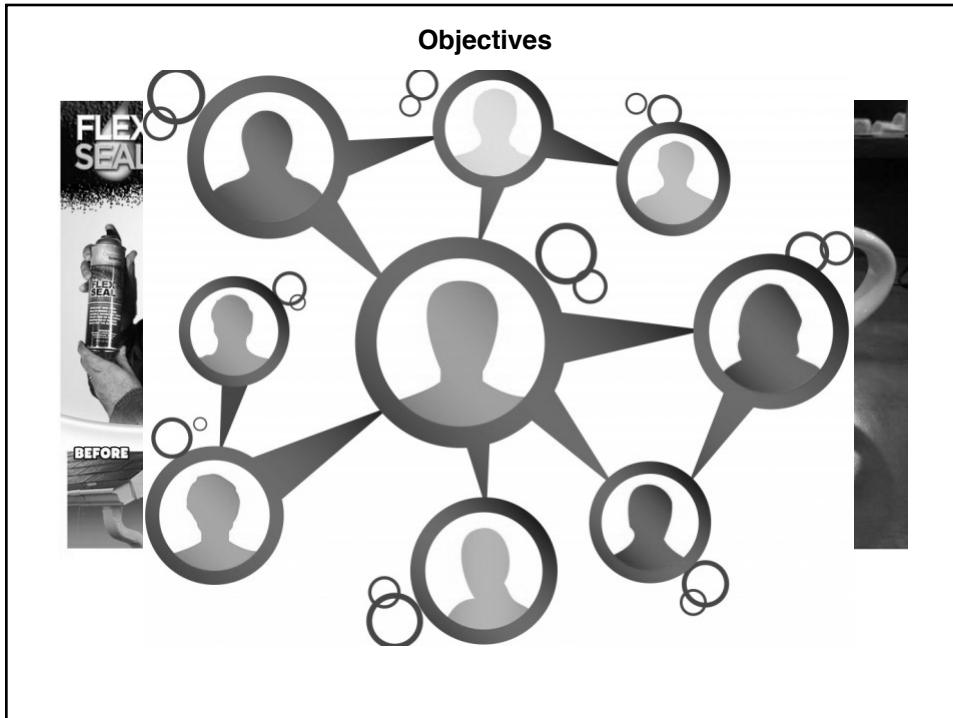
## **It's Enough to Make You Dizzy! Concussion Update 2017**

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Medical Director

### **Disclosures**

**I, Rachel A. Coel, have no relevant financial relationships with the manufacturers(s) of any commercial products(s) and/or provider of commercial services discussed in this CME activity.**

**I do not intend to discuss an unapproved/investigative use of a commercial product/device in my presentation.**



## The “Game Plan”

1. Review presentation of concussion
2. Update on management of concussion
3. Review return-to-play guidelines
4. Discuss injury prevention strategies and equipment
5. My plug for “EARLIER...”

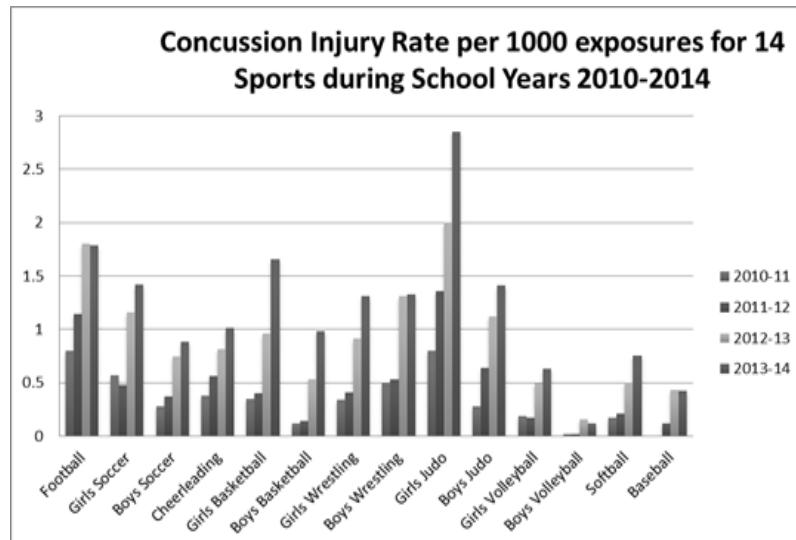


**ImPACT baseline testing for 67 schools  
participating state-wide including private schools**

School Year	# of Baselines	# of Concussions
2010-11	4683	446
2011-12	10,113	895
2012-13	10,496	1140
2013-14	10012	1370
2014-15	9451	1052
2015-16	9066	1092



**Concussion Injury Rate per 1000 exposures**



## It's not just football...

### Girls Are Often Neglected Victims of Concussions



Suzy Allman for The New York Times

Hannah Stohler, center, a 16-year-old soccer player for Conard High in Connecticut, at a match Sept. 24. She has sustained three concussions.

### Gradual Return to Play Protocol Milestones of Concussion Recovery



so, what's the  
**problem?**

## Average Number of Sport Days Missed

Hawaii Concussion Awareness & Management Program (HCAMP)  
Report from August 1, 2011 to July 31, 2016

Number of Days Missed

Days Missed	MEAN	SD
August 1, 2015 – July 31, 2016 (n=1092)	21.68	19.08
August 1, 2014 – July 31, 2015 (n=1052)	31.68	21.68
August 1, 2013 – July 31, 2014 (n=1370)	26.15	25.17
August 1, 2012 - July 31, 2013(n=1140)	26.2	18.98
August 1, 2011 - July 31, 2012 (n=845)	23.5	16.5



## Relationship Between Time in Each Step

School Year	2010-2012	2013-2014
Onset to Step 1	1.1	1.1
Step 1 to Step 2	3.0	3.0
Step 2 to Step 3 (school/cardio)	9.9	13.7
Step 3 to Step 4	2.0	2.3
Step 4 to Step 5	2.1	2.2
Step 5 to Step 6	2.6	2.8
Step 6 to Step 7	2.7	2.1

**How do we get them moving sooner?**



### What concerns young athletes about concussions?

CJSM study (Stein) of 121 pediatric athlete patients

Worst thing about concussion:

- Symptoms – 58%
- Loss of activity – 56.2%
- Both symptoms and loss of activity – 14%

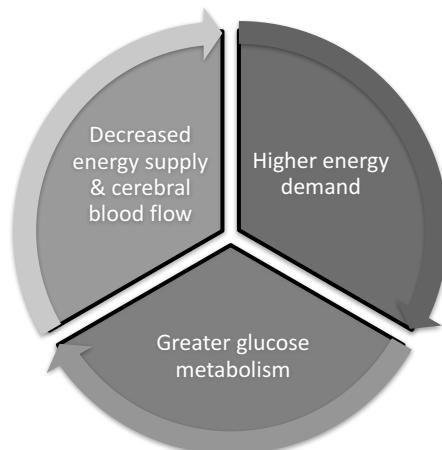
**TABLE 2.** Examples of Patients' Free-Text Responses to the Question, "What Is the Worst Thing for You About Having a Concussion?"

- "Headache, fogginess"
- "Miserable, falling behind in school work, bored, no fun"
- "Having to be on brain rest—it is very boring"
- "Cannot do anything and cannot drive"
- "The worst thing for me is that if I get another one I could potentially not be allowed to play contact sports"
- "I cannot watch television, use my phone, or play sports"
- "Headaches, bright lights, not being able to concentrate, trouble reading"
- "The headaches, not being able to do all of my school work like normal and not being able to play sports"
- "Depression issues, low energy, insomnia, not being able to keep up in school!"
- "Not being able to go to gymnastics or soccer and not being able to be with friends"
- "Feeling tired all the time"
- "I can't play a sport until I am cleared by a doctor. Which can take forever"
- "Not being able to do anything"
- "I get really dizzy a lot"
- "Headaches, not being able to remember things"
- "Feeling like I can think/process something but not being able to do it, painful consistent headaches, and not being able to play soccer"
- "I am not allowed to do the things I love"

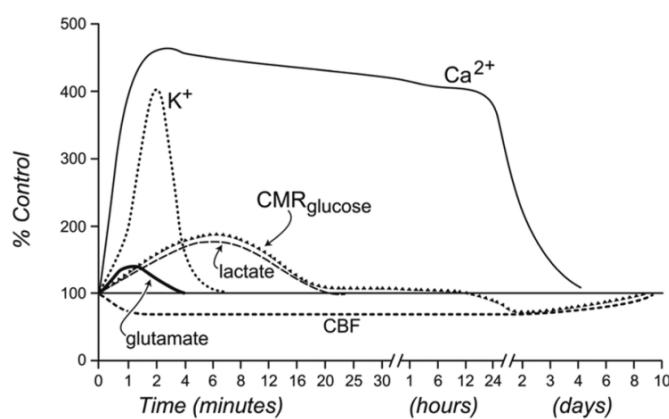
## What happens in a concussion?

## Metabolic Mismatch

BRAIN = ENERGY CRISIS

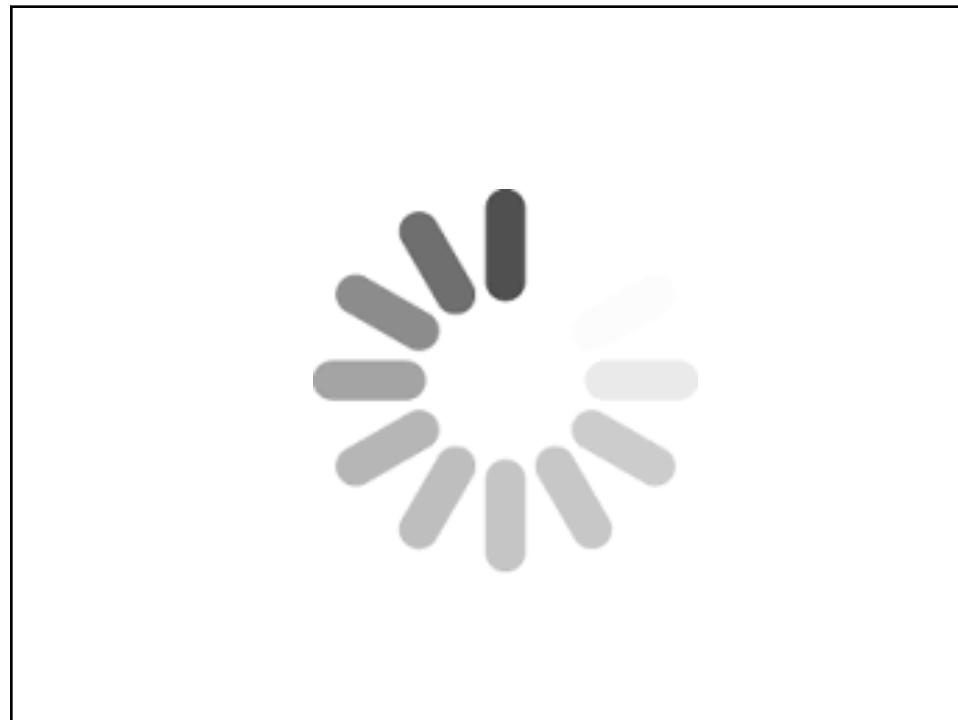
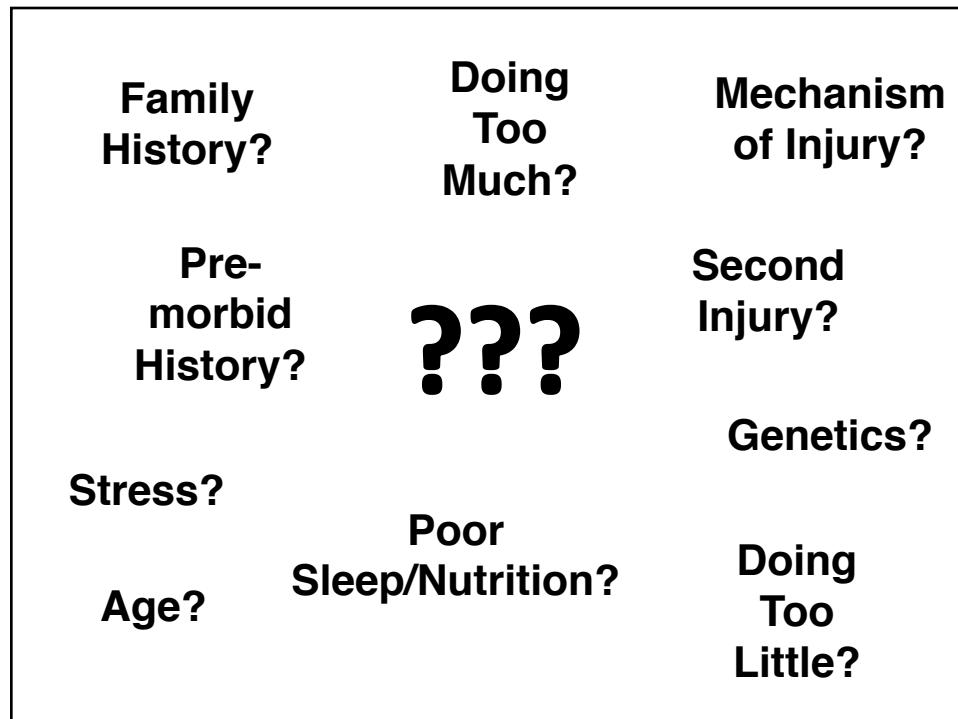


## Timeline for Cellular Correction

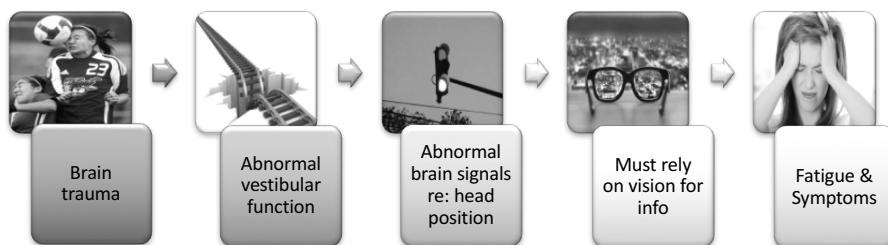


7 – 10 DAYS

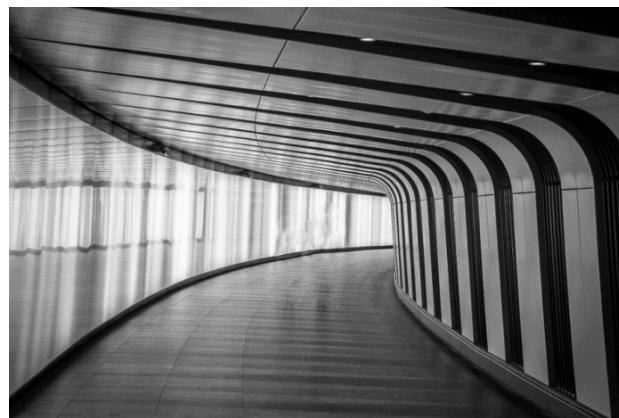
Giza CC, Hovda DA. Ionic and metabolic consequences of concussion. In: Cantu RC, Cantu RI. *Neurologic Athletic and Spine Injuries*. St Louis, MO: WB Saunders Co; 2000:80–100.



## Concussion & the Vestibular System



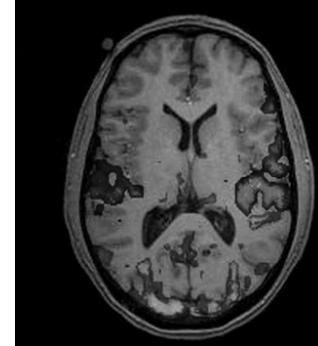
**This is vestibular dysfunction!**



## What do I dream about?



Breathalyzer



## Where are we currently?

- History & Symptom Checklists
- Physical Exam
- Balance Testing
- Imaging
- Computerized neurocognitive testing
- Neuropsychological testing
- Physical therapy
- Vision therapy
- Medication
- Coping



## Computerized Neurocognitive Testing (ie. ImPACT)

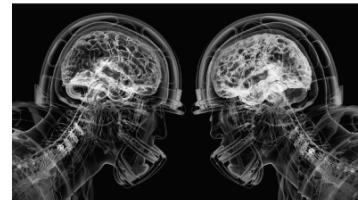
- First used in 1982
- Attempts to measure attention, memory, problem solving, and reaction time
- Baseline? Who? How often?  
False sense of security?
- Validity?
- Not formally recommended
- Comprehensive plan required
- Neuropsychologist evaluation is preferable

### Concussion test may not be panacea

ImPACT sells tests and training to thousands, but some question program's validity

By Peter Keating | ESPN The Magazine

Updated: August 26, 2012, 11:21 AM ET



Aryati Christie Design; iStockphoto Imagery; Purdue Biostatistics Group / Purdue University



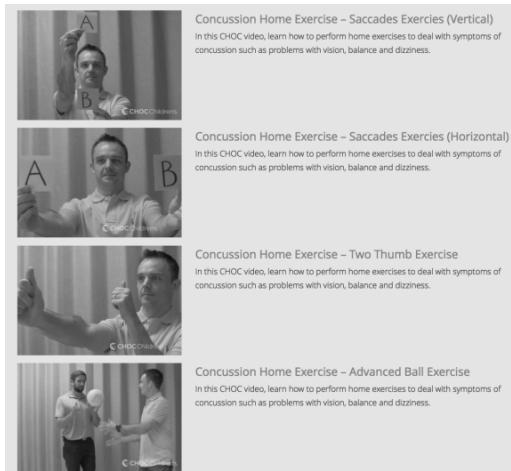
## Treatment Options

- Physical Rest
- Cognitive Rest
- Vestibular therapy
- Cervical physical therapy
- Vision therapy
- Medication
- Exercise
- Coping / Psychology / Cognitive Behavioral Therapy
- Reassurance

## My Current Approach...

- Close observation first 24-72 hrs!
- Limited medications (no defined role)
- Emphasize nutrition/stress/sleep hygiene
- Some cognitive and physical rest: decrease electronics, music, physical activity, and cognitive stress
- Return to school within 48-72 hours
- Return to symptom-limited light exercise within 3-5 days
- Exertional stress testing to determine tolerance
- Review expectations and return-to-play guidelines!
- Must return to school fully prior to returning to sports!

## Vestibular Therapy



From Children's Hospital of Orange County website

## What happened to...



### Cocoon vs. Light Activity

- Prolonged rest and inactivity do not speed recovery time.
  - *Kids who returned to light activity (rest only 1-2 days) felt better faster than kids who underwent prolonged rest (5 days of strict rest).*
  - *Kids who rested longer had more severe symptoms and had longer lasting symptoms than the active kids.*

Henneke et al. (2015) Benefits of Strict Rest After Acute Concussion: A Randomized Controlled Trial. *Pediatrics*. Vol 135, No 2.



PM R 8 (2016) S91-S100

CrossMark

**Advanced Sports Medicine Concepts and Controversies**

**The Role of Controlled Exercise in Concussion Management**

John Leddy, MD, Andrea Hinds, PhD, Dan Sirica, BS, Barry Willer, PhD

www.pmrjournal.org

## Earlier Return to NON-CONTACT Exertion

- Earlier return to exertion (noncontact exercise and school) did not worsen symptoms or prolong healing time.
  - It is safe to try gradually increasing light activity.
- Concussion patients treated with cardio exertion returned to full work/activity more often than those treated with rest.
- Missing school for prolonged periods may worsen symptoms.
  - Stress, anxiety
  - Depression, sadness, isolation
  - Feeling overwhelmed, unfocused, frustrated

Leddy et al. (2015) AMSSM Annual Meeting, Hollywood, FL. Baker et al. Rehabilitation Research and Practice. (2012)

## Normal Time to Recovery

Children/Adolescents: 4 Weeks

Adults: 10-14 days

31

***Not all symptoms are concussion!***

**Sports must wake up about depression**

By Reid Forgrave FoxSports



## Speaking of Depression...

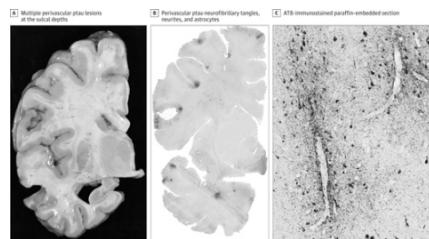
### Mom Suing Pop Warner Wants to Stop Pre-Teen Tackle Football

Study: Former NFL Players Who Played Tackle Football Before Age 12 at Increased Risk of Memory and Thinking Problems Later



## CTE

- Postmortem finding of increased tau deposition
- Also found in other conditions
- Not always correlated with symptoms
- Cause & Effect???
- Relationship overstated? Or just not well understood?
- Mostly still unknown...



## What is risk of problems later in life?

- Study evaluated football players from 1956-1970
  - 296 football athletes, 190 other athletes
  - Compared to varsity swimmers, wrestlers and basketball players
- Head injury more likely reported in football
- *No increased risk in football players of neurodegenerative diseases and specifically dementia, Parkinsonism, and ALS*

Janssen PH, Mayo Clin Proc, 2017

## It's Not Just the Brain We Should Be Worrying About...

### Concussion Increases Odds of Sustaining a Lower Extremity Musculoskeletal Injury After Return to Play Among Collegiate Athletes

M. Alison Brooks, MD, MPH\*, †,‡, Kaitlin Peterson, BS§, Kevin Biese, BS||,

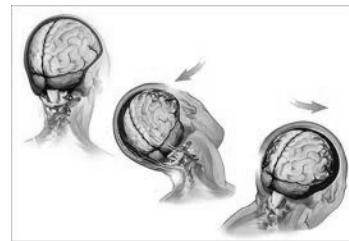
**In 90 days following  
concussion: 2.5x  
increased risk of lower  
extremity MSK injury**

## Can We Prevent Concussion?

37

**There is no concussion-proof helmet or head gear...**

Helmets and head gear DO reduce the risk of skull fractures, severe head injury, eye injuries.



*They DO NOT reduce the risk of concussion!*

## Head Gear in Soccer

- Insufficient evidence that current headgear prevents head injury
- May increase how aggressively athletes play?



Niedfeldt MW. Head Injuries, Heading,  
and the Use of Headgear in Soccer.  
CSMR 2011;10(6): 324-29

## Gear should fit & be worn properly





### 3<sup>rd</sup> Party Add-Ons Don't Work

#### Guardian Caps



#### Unequal Technologies



## What about mouthguards???

Proven protection against dental and orofacial injury



*Mouth guards DO NOT reduce risk of concussion*

## These don't prevent concussion!





## Change the Sport?

- U11: no heading
- U12 & U13: max 30 minutes heading training/week  
(max 15-20 hits/player)



**Changing the Sport**

---

Trying to Reduce Head Injuries, Youth Football Limits Practices

i.e.

NF

ESPN.C



PM ET

A team at a Pop Warner game in 2009. More than 285,000 children, ages 5 to 15, compete in Pop Warner leagues.

By ANAHAD O'CONNOR  
Published: June 13, 2012 | 79 Comments

**AAP Policy Statement**

American Academy  
of Pediatrics



DEDICATED TO THE HEALTH OF ALL CHILDREN™

**Tackling in Youth Football**

COUNCIL ON SPORTS MEDICINE AND FITNESS

## Pre-participation Exams

- Concussion history: #, length of symptoms
- Baseline SCAT5?
- Baseline symptom checklist?
- Computerized neurocognitive baseline?

34. Have you ever had a head injury or concussion?
35. Have you ever had a hit or blow to the head that caused confusion, prolonged headache, or memory problems?
36. Do you have a history of seizure disorder?
37. Do you have headaches with exercise?
38. Have you ever had numbness, tingling, or weakness in your arms or legs after being hit or falling?
39. Have you ever been unable to move your arms or legs after being hit or falling?

## Educate, educate, educate...

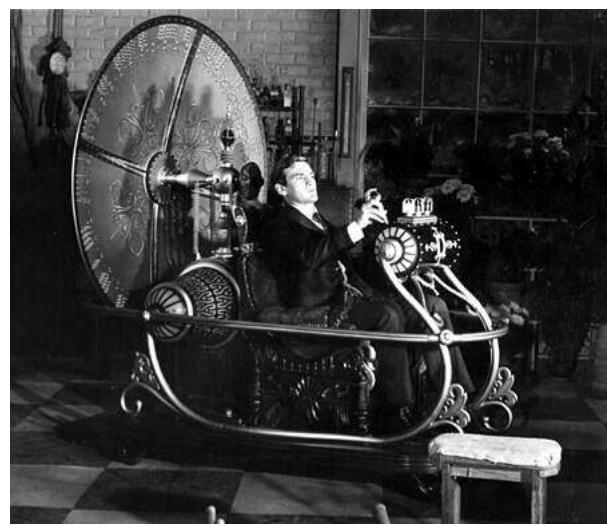
**U.S. athletes still reluctant to admit head injuries: report**

BY SUSAN HEAVY  
WASHINGTON | Thu Oct 31, 2013 10:26am EDT  
0 COMMENTS | [Tweet](#) 25 | [Share](#) 5 | [Share this](#) 8 | [Email](#) | [Print](#)



1 OF 7 Seventeen year-old Hannah Steenhuisen watches her high school's girls soccer team prepare for a game against Bishop Feehan in Attleboro, Massachusetts October 25, 2013.  
CREDIT: REUTERS/BRIAN SNYDER

## The Case of Judo Jane



### 1. Initiate medical care in the first few days



**Optimal Recovery begins at time of injury!**

**High school athletes who continued to play  
with concussion symptoms**

**= 8.8x more likely to have protracted recovery  
> 21 days**

**College athletes**

**= ~5 more days to recover than those removed  
from play right away**

Elbin RJ, Pediatrics. Asken BM, J Athl Train.

## Point of Entry

- Primary care
- Emergency Department
  - From 2001 to 2009 increased 100,000 visits/yr
- Sports Medicine
- Neurology
- Physical Medicine & Rehabilitation
- Neurosurgery

Original Investigation  
Point of Health Care Entry for Youth With Concussion  
Within a Large Pediatric Care Network

Kristy B. Arbogast, PhD; Allison E. Curry, PhD; Melissa R. Pfeffer, MPH; Mark R. Zonfrillo, MD, MSCE; Juliet Haarauer-Krupa, PhD; Matthew J. Breiding, PhD; Victor G. Coronado, MD, MPH; Christina L. Master, MD



## 2. Earlier referral to appropriate sub-specialists



## 3. Earlier collaboration with school



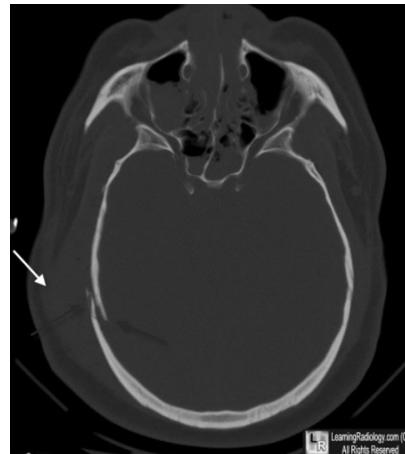
#### 4. Earlier return to routines



#### 5. Earlier lifestyle interventions



## 6. Earlier care coordination of co-morbidities and RTP planning



## Summary

Earlier referral to concussion specialist may:

- Reduce post-concussive sequelae
- Reduce time to return to play
- May facilitate earlier return to school
- Improve patient's mood
- Improve coordination between providers



## Resources

CDC Head's Up Campaign

<http://www.cdc.gov/concussion/headsup>

National Federation of State High Schools

<http://nfhslearn.com/>

STOP Sports Injuries campaign

<http://www.STOPSportsInjuries.org>



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Medical Director



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## THANK YOU!

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