

Using your head:

signs, symptoms and management of
concussion in schools



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Chair: NH Advisory Council on Sports Related
Concussions



Kids get concussions

Whether in organized sports...

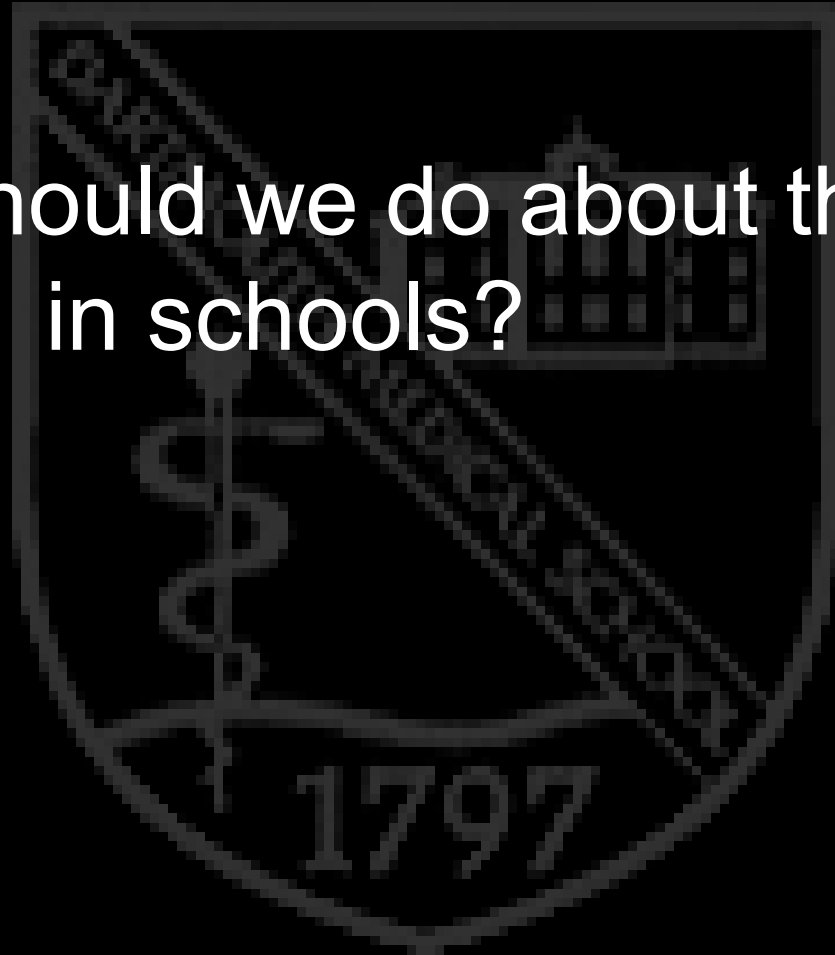


...or not...



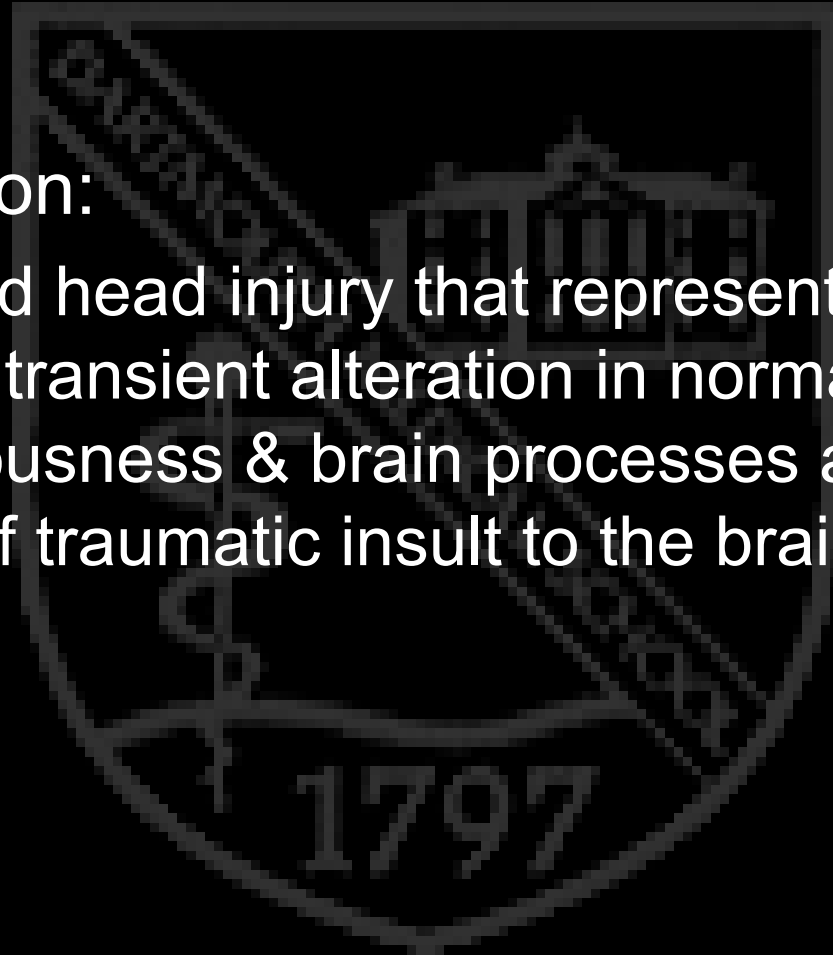
What are concussions?

And what should we do about them
in schools?



Is a concussion a brain injury?

- ❖ Concussion:
 - ✓ A closed head injury that represents a usually transient alteration in normal consciousness & brain processes as a result of traumatic insult to the brain.



Brain Injury

❖ MILD:

- ✓ LOC < 30 min, PTA < 24hrs, GCS 13-15
- ✓ May be dazed, confused, lethargic initially
- ✓ American Congress of Rehabilitative Medicine definition:
 - traumatic blow to the head resulting in either alteration of level of consciousness (dazed and confused, amnesia for the event) or loss of consciousness less than 30 minutes

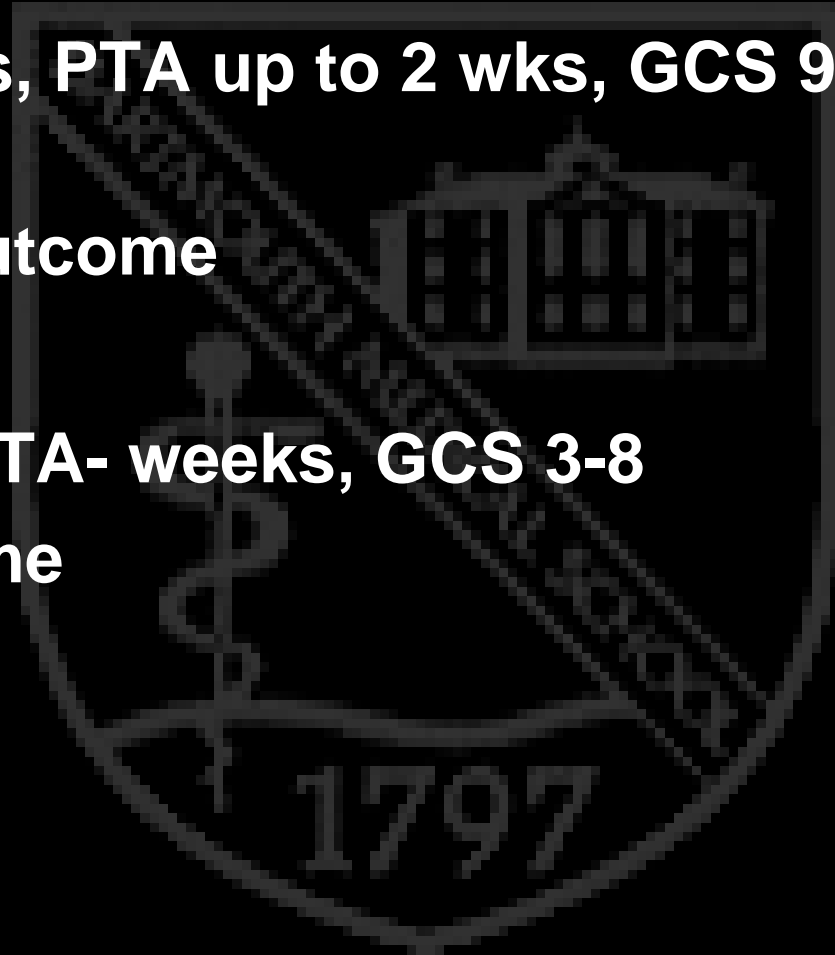
Spectrum of Brain Injury

❖ MODERATE:

- ✓ LOC 1-24 hours, PTA up to 2 wks, GCS 9-12
- ✓ Intermediate outcome

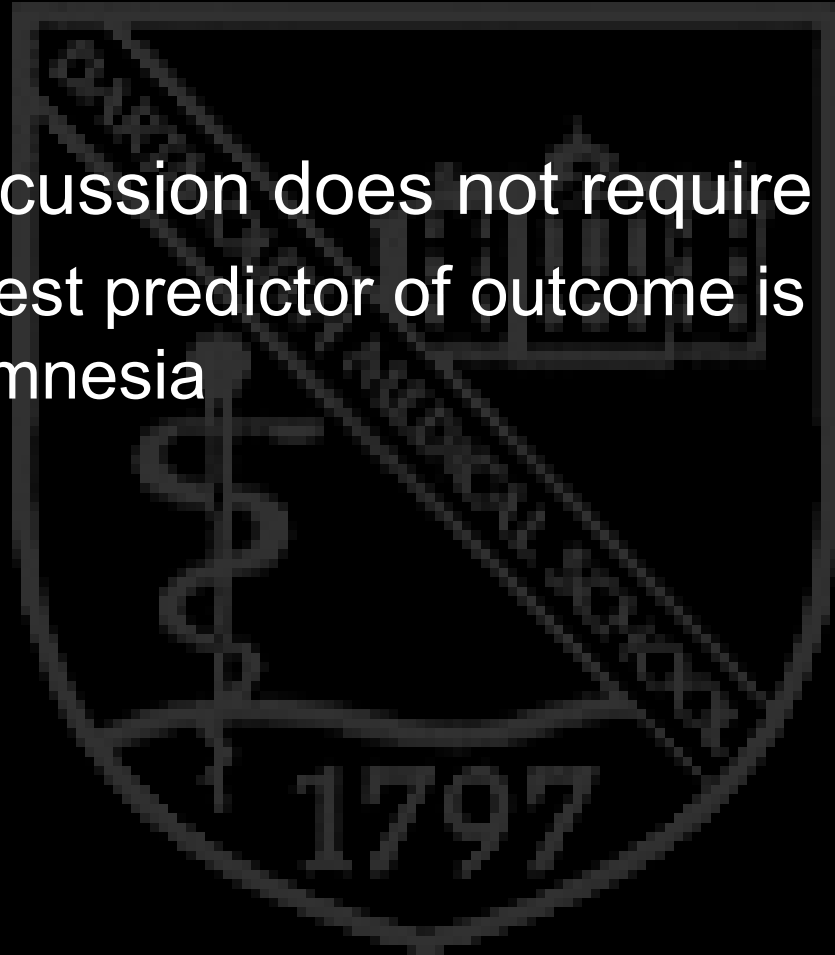
❖ SEVERE:

- ✓ LOC >24 hrs, PTA- weeks, GCS 3-8
- ✓ Poorest outcome



Differences?

- ❖ Concussion does not require LOC
 - ✓ Best predictor of outcome is amnesia
- ❖ ??



Why is it different for kids?

Maturational Change

❖ *Adult*

- ✓ presumed full maturity of brain systems: deficit is commonly expressed as loss of function

❖ *Child* (Taylor & Alden, 1997)

- ✓ brain development proceeds at different rates in different regions of the brain
- ✓ child TBI may have at least 3 general effects:
 - injury to a mature brain system: loss of function
 - injury to a developing system: alteration or delay of function
 - injury to a brain system(s) not yet “on-line”: failure to mature or highly abnormal trajectory

Pediatric Outcomes of mTBI

- ❖ Meta-analytic review of pediatric literature suggested that permanent adverse effects (> 1-3 months) of a single mTBI in any outcome domain are uncommon (Satz & Zaucha, 1998). However....
- ❖ Unresolved issues
 - ✓ Spectrum of severity within the category of mild
 - ✓ More variable outcome in context of learning problems, hyperactivity, abuse
 - ✓ Cumulative effects of multiple injuries
 - ✓ Age at time of injury

HI before age 7

- more severe impairment in attentional processes than later injury
- possibly due to incomplete development of prefrontal cortices at this age



How long does it take?

Most resolve with little intervention (1-2 wks)
Manage by symptoms (more later)



1-2 weeks

3 mo.

9-12 mo.
(full NP)

(Concussion screening?)

mTBI in Schools

- ❖ mTBI is often unrecognized
 - ✓ “dings’
 - ✓ Concussions
- ❖ May not “happen” at school – but impacts work
- ❖ Effects may not show up for 24-36 hours
- ❖ Less is known about concussions in children under 11
 - ✓ Less school-sponsored organized athletics

Identification

- ❖ No good tests for younger children
 - ✓ Need to confirm incident
 - ✓ Can go to a neuropsychologist
 - ✓ No treatment
 - What does “rest” mean
 - Physical, mental
- ❖ What are the effects?

Symptoms

Physical		Thinking	Emotional	Sleep
Headaches	Sensitivity to light	Feeling mentally foggy	Irritability	Drowsiness
Nausea	Sensitivity to noise	Problems concentrating	Sadness	Sleeping more than usual
Fatigue	Numbness/Tingling	Problems remembering	Feeling more emotional	Sleeping less than usual
Visual problems	Vomiting	Feeling more slowed down	Nervousness	Trouble falling asleep
Balance Problems	Dizziness			



The SCAT Card
(Sport Concussion Assessment Tool)
Medical Evaluation

Name: _____ Date _____

Sport/Team: _____ Mouth guard? Y N

1) SIGNS

Was there loss of consciousness or unresponsiveness? Y N
Was there seizure or convulsive activity? Y N
Was there a balance problem / unsteadiness? Y N

2) MEMORY

Modified Maddocks questions (check correct)

At what venue are we? __; Which half is it? __; Who scored last? __

What team did we play last? __; Did we win last game? __?

3) SYMPTOM SCORE

Total number of positive symptoms (from reverse side of the card) = _____

4) COGNITIVE ASSESSMENT

5 word recall		Immediate	Delayed
		(after concentration tasks)	
		(Examples)	
Word 1 _____	cat	___	___
Word 2 _____	pen	___	___
Word 3 _____	shoe	___	___
Word 4 _____	book	___	___
Word 5 _____	car	___	___

Months in reverse order:

Jun-May-Apr-Mar-Feb-Jan-Dec-Nov-Oct-Sep-Aug-Jul (circle incorrect)
or

Digits backwards (check correct)

5-2-8	3-9-1	_____
6-2-9-4	4-3-7-1	_____
8-3-2-7-9	1-4-9-3-6	_____
7-3-9-1-4-2	5-1-8-4-6-8	_____

Ask delayed 5-word recall now

5) NEUROLOGIC SCREENING

	<u>Pass</u>	<u>Fail</u>
Speech	___	___
Eye Motion and Pupils	___	___
Pronator Drift	___	___
Gait Assessment	___	___

Any neurologic screening abnormality necessitates formal neurologic or hospital assessment

6) RETURN TO PLAY

Athletes should not be returned to play the same day of injury.

When returning athletes to play, they should follow a stepwise symptom-limited program, with stages of progression. For example:

1. rest until asymptomatic (physical and mental rest)
2. light aerobic exercise (e.g. stationary cycle)
3. sport-specific exercise
4. non-contact training drills (start light resistance training)
5. full contact training after medical clearance
6. return to competition (game play)

There should be approximately 24 hours (or longer) for each stage and the athlete should return to stage 1 if symptoms recur.

Resistance training should only be added in the later stages.

Medical clearance should be given before return to play.

**Sport Concussion
Assessment Tool
available through CDC**

LATER SIGNS OF CONCUSSION: Post-Concussion Syndrome

- ❖ Decreased Processing Speed
- ❖ Short-Term Memory Impairment
- ❖ Concentration Deficit
- ❖ Irritability/Depression
- ❖ Fatigue/Sleep Disturbance
- ❖ General Feeling of “Fogginess”
- ❖ Academic Difficulties



What are the effects?

- ❖ Processing speed is typically the most common finding
 - ✓ PS is a part of the attention system
 - ✓ Not just slow, but can be inefficient
 - ✓ Fast but inaccurate on testing.
- ❖ Exacerbation of pre-morbid characteristics
 - ✓ Psychiatric problems
 - ✓ “personality”



Predicting Behavioral Effects

- in general, several factors:
 - age,
 - severity,
 - site of lesion,
 - premorbid personality.



What to look for



ATTENTION: Is the student ...

- ❖ • Able to concentrate for brief periods?
- ❖ • Able to concentrate for longer periods?
- ❖ • Able to 'hold onto' and mentally manipulate information?
- ❖ • Able to concentrate on more than one task at a time?
- ❖ • Able to concentrate better on written, compared to orally presented, information?
- ❖ • Accurate when carrying out complex tasks?

INFORMATION PROCESSING

SPEED: Is the student ...

- ❖ • Accurate but slow in tasks?
- ❖ • Accurate in tasks, when time limits are ignored?
- ❖ • Penalized on timed tasks due to slowness?
- ❖ • Slow to respond verbally to questions or directions?

MEMORY:

- Can the student retain new information – from one day to the next?
- Does providing a context improve learning?
- Are verbal and visual memory skills equally proficient?
- Does repetition of information increase learning?
- Does the student attempt to ‘chunk’ or organize similar information to aid recall?
- Is more information recalled via recognition or through spontaneous recall?

EXECUTIVE FUNCTIONING:

Can the student...

- Think independently?
- Prioritize the steps in completing a task?
- Follow through to complete a task logically?
- Use problem-solving strategies?
- Organize a task if given structure?
- Benefit from feedback from others, using feedback to improve performance on tasks?
- Shift from one task to another?

How Long Does It Take The Athlete to Recover?

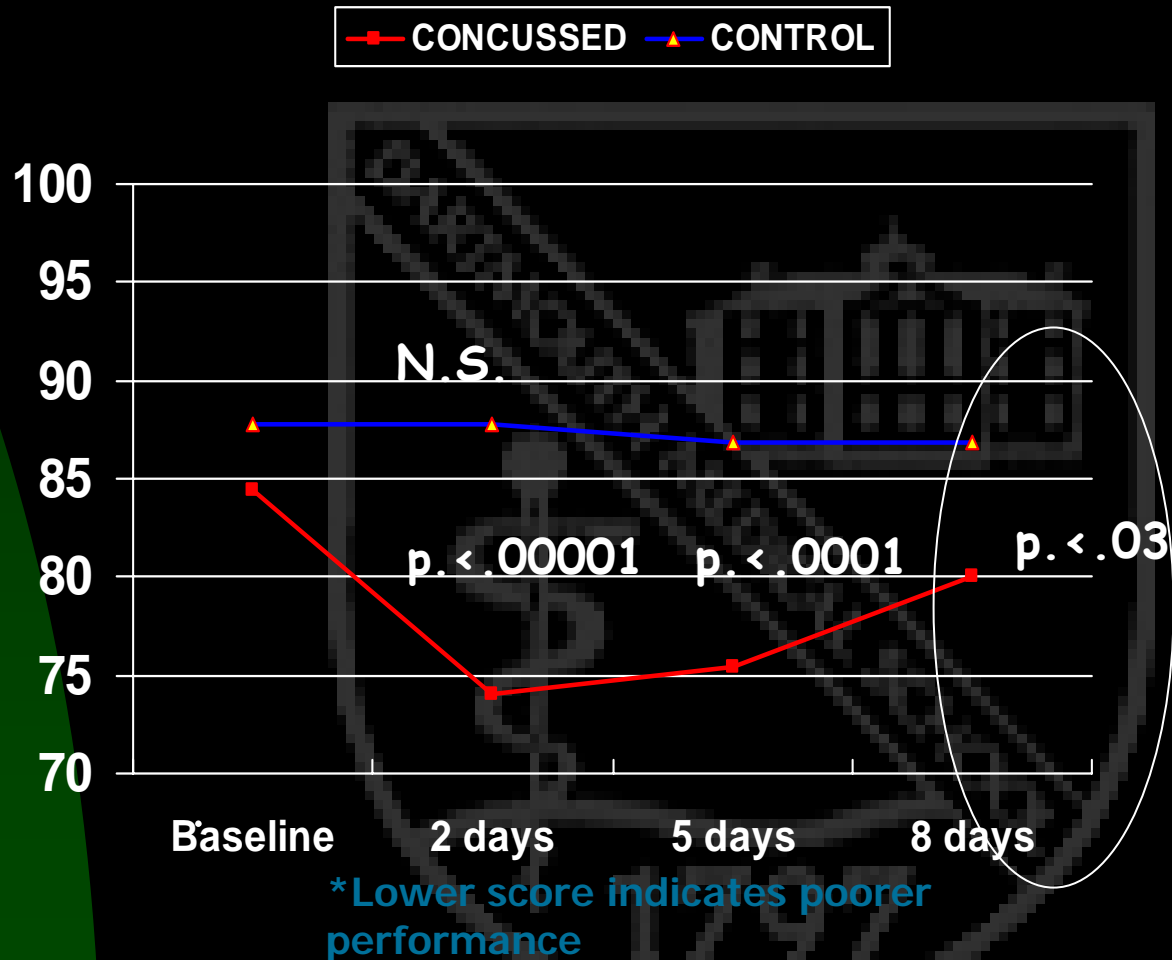
- ❖ Lovell, Collins, Maroon, Cantu & Powell (2002)
 - ✓ N = 210 athletes suffered concussion in 01-02 season
 - Males = 172, Females = 38
 - 143 high school, 41 college, 26 others
 - Evaluated at 2, 5, & 8 days post-injury
 - Compared with 50 HS & college controls

ImPACT MEMORY COMPOSITE

Control vs. Concussed Athletes

Significant difference between groups out to at least 8 days post-injury

N=410



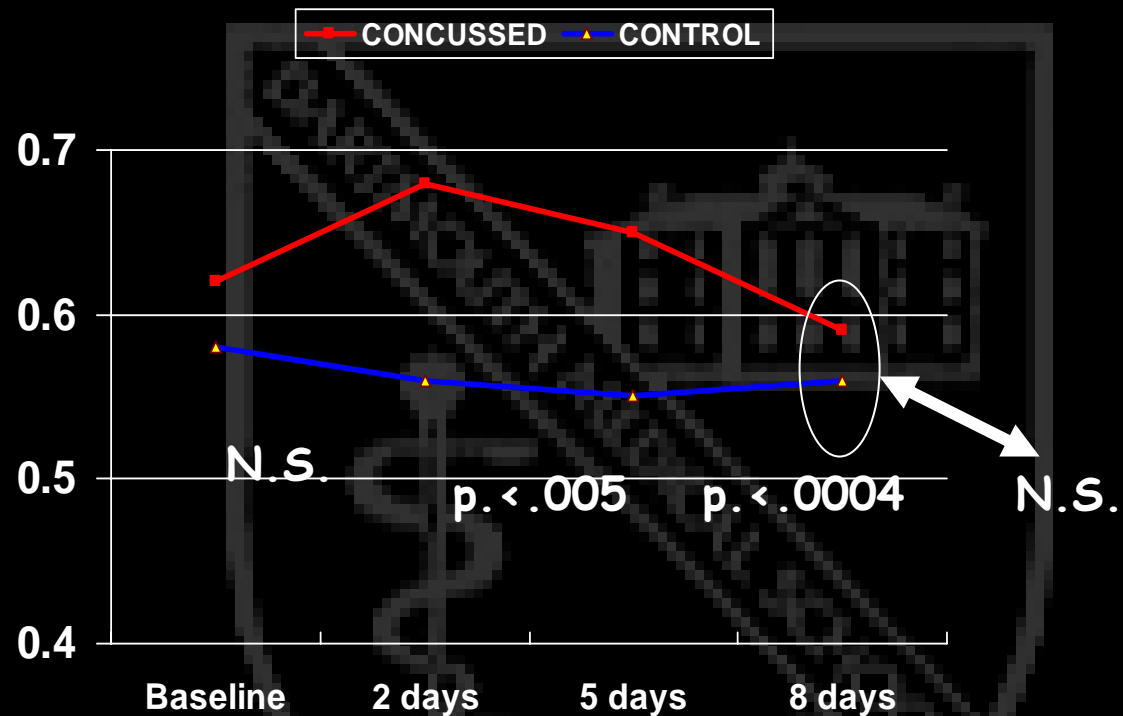
Collins MW, Lovell MR, Maroon et al. Medicine and Science in Sports Exercise, 34:5;2002

ImPACT REACTION TIME COMPOSITE

Control vs. Concussed Athletes

Significant difference between groups out to 5 days post-injury

N=410



*Higher score indicates poorer performance

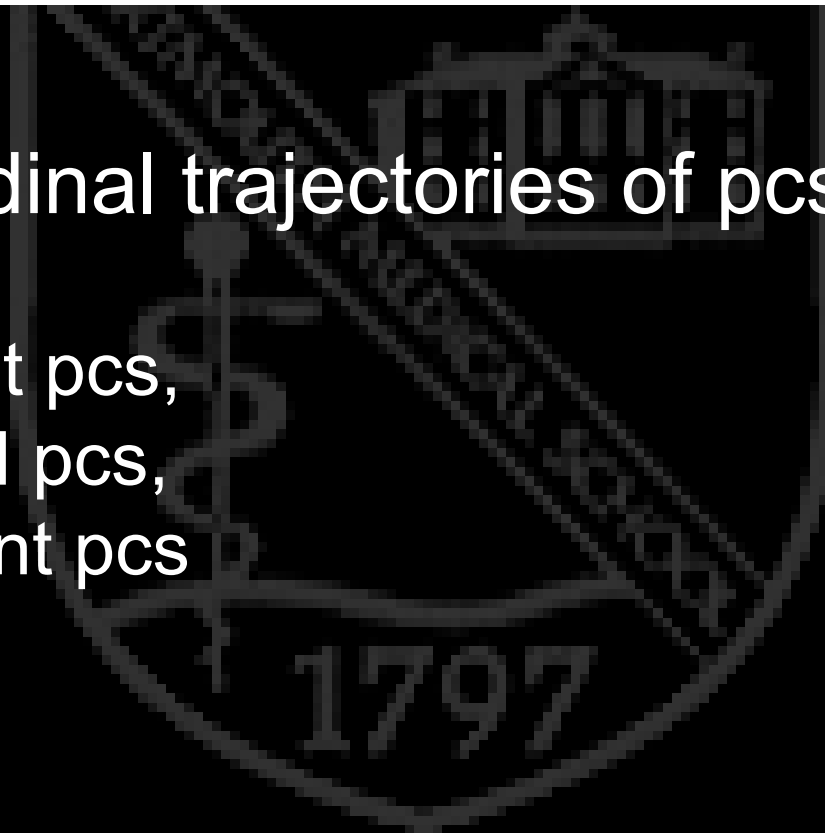
Lovell MR, Collins MW, Maroon et al. Medicine and Science in Sports Exercise, 34:5;2002

Longitudinal Trajectories of Postconcussive Symptoms in Children With Mild Traumatic Brain Injuries and Their Relationship to Acute Clinical Status

Keith Owen Yeates, PhD^{a,b}, H. Gerry Taylor, PhD^{c,d}, Jerome Rusin, MD^e, Barbara Bangert, MD^f, Ann Dietrich, MD^{a,g}, Kathryn Nuss, MD^{a,g}, Martha Wright, MD^{c,d}, Daniel S. Nagin, PhD^h, Bobby L. Jones, PhD^h

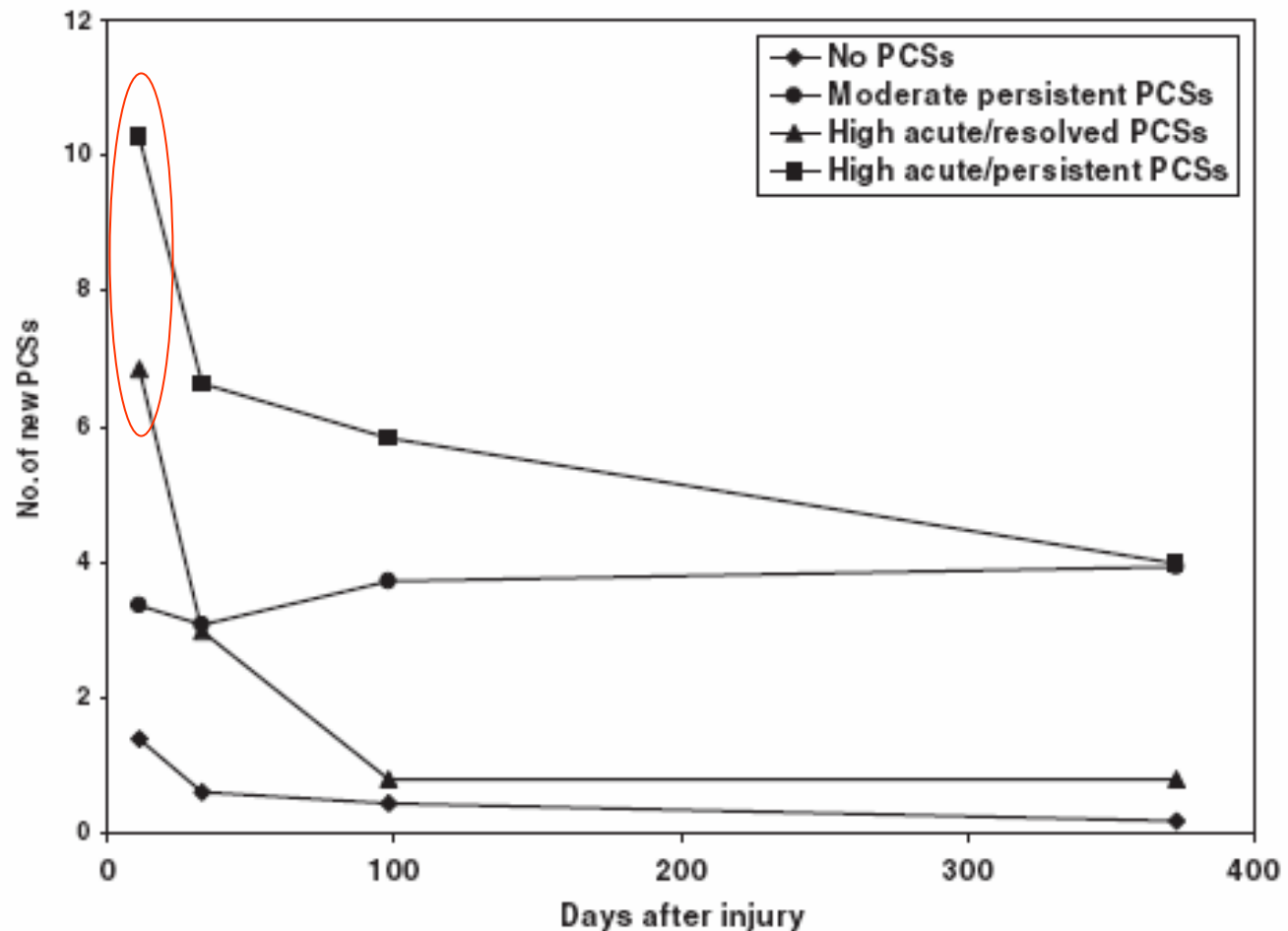
identified 4 longitudinal trajectories of pcs

1. no pcs,
2. moderate persistent pcs,
3. high acute/resolved pcs,
4. high acute/persistent pcs



PCS trajectories

The 2 trajectories with high acute levels of pcs were especially likely among children whose acute clinical presentation reflected more severe injury.



Recovery

- ❖ In athletics, once athletes symptoms and cognition return to their own baseline-
- ❖ Undergo a series of increasingly challenging physical exertion tests
 - ✓ (step-wise exertion protocol)
 - ✓ If symptoms emerge, wait a day and go back a step
- ❖ No analog for mental exertion

What to do?

- ❖ Students who appear to have changes in cognition, mood, personality can be queried;
 - ✓ “rest” and reduced exertional demand are first step
 - ✓ Rule-outs of other causes is obviously important
- ❖ If suspected PCS worsen or continue more than 2 weeks – refer to PCP and/or clinic.
- ❖ Advocate for accommodations
 - ✓ Concern over false-positive identification??
- ❖ If injury is more than 9 months out, refer for NP testing

Continued monitoring

(who and how?)

- ❖ 24 - 72 hr
- ❖ 5 - 7 days
- ❖ 10 - 14 days
- ❖ 1 mo.
- ❖ 3, 6, 9, 12 mo.

How to treat?

'Temporary' accommodations

- ❖ Kids with mTBI may need (relatively) short-term accommodations
- ❖ Staff can advocate (see ACE Care Plan)
 - ✓ Nurse
 - ✓ Counselor?
 - ✓ Psychologist?
- ❖ NAACSC working on a systematic process for identifying within the school system, tracking & monitoring
 - ✓ Who, what, when

ACE School Care Plan

ACUTE CONCUSSION EVALUATION (ACE)

CARE PLAN

Gerard Gioia, PhD¹ & Micky Collins, PhD²

¹Children's National Medical Center
²University of Pittsburgh Medical Center

Patient Name: _____
 DOB: _____ Age: _____
 Date: _____ ID/MR# _____
 Date of Injury: _____

You have been diagnosed with a concussion (also known as a mild traumatic brain injury). This personal plan is based on your symptoms and is designed to help speed your recovery. Your careful attention to it can also prevent further injury.

Rest is the key. You should not participate in any high risk activities (e.g., sports, physical education (PE), riding a bike, etc.) if you still have any of the symptoms below. It is important to limit activities that require a lot of thinking or concentration (homework, job-related activities), as this can also make your symptoms worse. If you no longer have any symptoms and believe that your concentration and thinking are back to normal, you can slowly and carefully return to your daily activities. Children and teenagers will need help from their parents, teachers, coaches, or athletic trainers to help monitor their recovery and return to activities.

Today the following symptoms are present (circle or check).				___ No reported symptoms
Physical		Thinking	Emotional	Sleep
Headaches	Sensitivity to light	Feeling mentally foggy	Irritability	Drowsiness
Nausea	Sensitivity to noise	Problems concentrating	Sadness	Sleeping more than usual
Fatigue	Numbness/Tingling	Problems remembering	Feeling more emotional	Sleeping less than usual
Visual problems	Vomiting	Feeling more slowed down	Nervousness	Trouble falling asleep
Balance Problems	Dizziness			

RED FLAGS: Call your doctor or go to your emergency department if you suddenly experience any of the following

Headaches that <u>worsen</u>	Look <u>very</u> drowsy, can't be awakened	Can't <u>recognize</u> people or places	Unusual behavior change
Seizures	<u>Repeated</u> vomiting	Increasing confusion	Increasing irritability
Neck pain	Slurred speech	Weakness or numbness in arms or legs	Loss of consciousness

Returning to Daily Activities

1. Get lots of rest. Be sure to get enough sleep at night- no late nights. Keep the same bedtime weekdays and weekends.
2. Take daytime naps or rest breaks when you feel tired or fatigued.
3. **Limit physical activity as well as activities that require a lot of thinking or concentration. These activities can make symptoms worse.**
 - Physical activity includes PE, sports practices, weight-training, running, exercising, heavy lifting, etc.
 - Thinking and concentration activities (e.g., homework, classwork load, job-related activity).
4. Drink lots of fluids and eat carbohydrates or protein to main appropriate blood sugar levels.
5. **As symptoms decrease, you may begin to gradually return to your daily activities. If symptoms worsen or return, lessen your activities, then try again to increase your activities gradually.**
6. During recovery, it is normal to feel frustrated and sad when you do not feel right and you can't be as active as usual.
7. Repeated evaluation of your symptoms is recommended to help guide recovery.

Returning to School

1. If you (or your child) are still having symptoms of concussion you may need extra help to perform school-related activities. As your (or your child's) symptoms decrease during recovery, the extra help or supports can be removed gradually.
2. Inform the teacher(s), school nurse, school psychologist or counselor, and administrator(s) about your (or your child's) injury and symptoms. School personnel should be instructed to watch for:
 - Increased problems paying attention or concentrating
 - Increased problems remembering or learning new information
 - Longer time needed to complete tasks or assignments
 - Greater irritability, less able to cope with stress
 - Symptoms worsen (e.g., headache, tiredness) when doing schoolwork

~Continued on back page~

SCHOOL VERSION

ACE school plan recommendations

Returning to School (Continued)

Until you (or your child) have fully recovered, the following supports are recommended: (check all that apply)

- No return to school. Return on (date) _____
- Return to school with following supports. Review on (date) _____
- Shortened day. Recommend ___ hours per day until (date) _____
- Shortened classes (i.e., rest breaks during classes). Maximum class length: ____ minutes.
- Allow extra time to complete coursework/assignments and tests.
- Lessen homework load by ____%. Maximum length of nightly homework: ____ minutes.
- No significant classroom or standardized testing at this time.
- Check for the return of symptoms (use symptom table on front page of this form) when doing activities that require a lot of attention or concentration.
- Take rest breaks during the day as needed.
- Request meeting of 504 or School Management Team to discuss this plan and needed supports.

Returning to Sports

1. You should NEVER return to play if you still have ANY symptoms – (Be sure that you do not have any symptoms at rest and while doing any physical activity and/or activities that require a lot of thinking or concentration.)
2. Be sure that the PE teacher, coach, and/or athletic trainer are aware of your injury and symptoms.
3. It is normal to feel frustrated, sad and even angry because you cannot return to sports right away. With any injury, a full recovery will reduce the chances of getting hurt again. It is better to miss one or two games than the whole season.

The following are recommended at the present time:

- Do not return to PE class at this time
- Return to PE class
- Do not return to sports practices/games at this time
- Gradual** return to sports practices under the supervision of an appropriate health care provider (e.g., athletic trainer, coach, or physical education teacher).
- Return to play should occur in **gradual steps** beginning with aerobic exercise only to increase your heart rate (e.g., stationary cycle); moving to increasing your heart rate with movement (e.g., running); then adding controlled contact if appropriate; and finally return to sports competition.
 - Pay careful attention to your symptoms and your thinking and concentration skills at each stage of activity. Move to the next level of activity only if you do not experience any symptoms at the each level. If your symptoms return, let your health care provider know, return to the first level, and restart the program gradually.

Gradual Return to Play Plan

1. No physical activity
2. Low levels of physical activity (i.e., *symptoms do not come back during or after the activity*). This includes walking, light jogging, light stationary biking, light weightlifting (lower weight, higher reps, no bench, no squat).
3. Moderate levels of physical activity with body/head movement. This includes moderate jogging, brief running, moderate-intensity stationary biking, moderate-intensity weightlifting (reduced time and/or reduced weight from your typical routine).
4. Heavy non-contact physical activity. This includes sprinting/running, high-intensity stationary biking, regular weightlifting routine, non-contact sport-specific drills (in 3 planes of movement).
5. Full contact in controlled practice.
6. Full contact in game play.

*Neuropsychological testing can provide valuable information to assist physicians with treatment planning, such as return to play decisions.

This referral plan is based on today's evaluation:

- Return to this office. Date/Time _____
- Refer to: Neurosurgery ___ Neurology ___ Sports Medicine ___ Psychiatrist ___ Psychologist ___ Other ___
- Refer for neuropsychological testing
- Other _____

ACE Care Plan Completed by: _____ MD RN NP PhD ATC

Modification of Teaching Strategies: SOS

- Structure
- Organization
- Strategies
 - Differ in degree of external control required



Resources

- ❖ Dartmouth concussion clinic
 - ✓ (in development)
 - ✓ Clinical assessment and neuropsychological concussion screening
 - Concussed athletes from schools without management programs
 - Other students
 - ✓ Triage to rehab, neurology, etc
 - Schedule with June 650-5824
 - (“concussion clinic” or “ImPACT testing”)
 - Same or next week
- ❖ BIANH has services

Sports related concussions – ages 11 and up



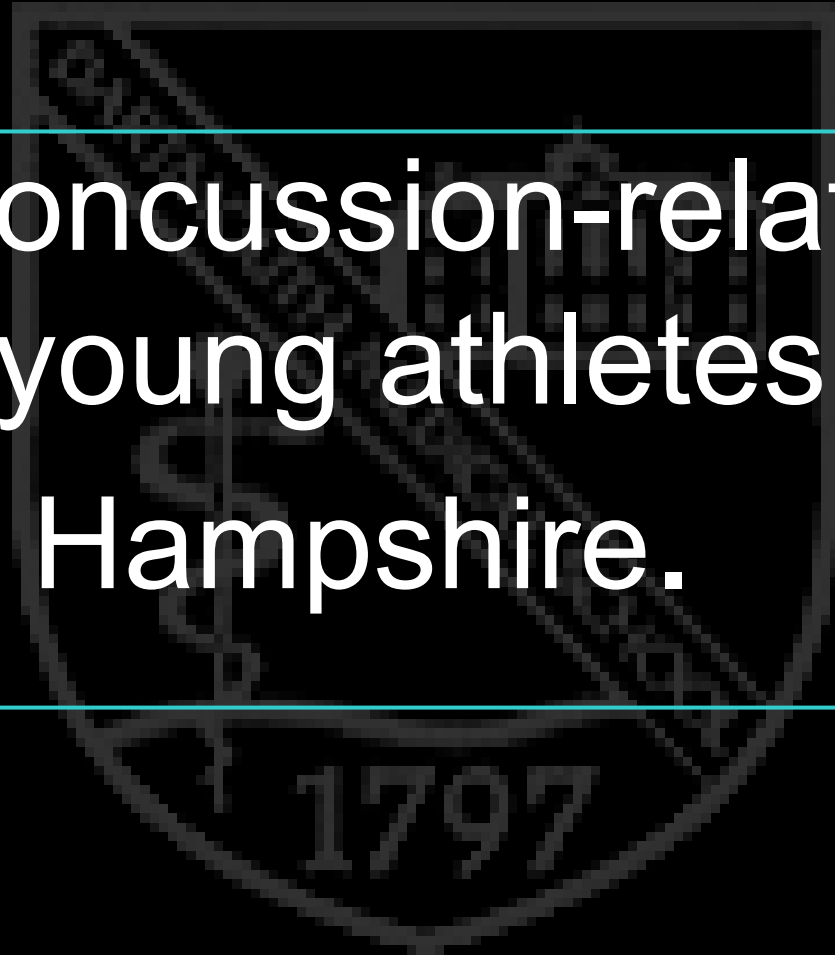
- ❖ Largest number of concussions
- ❖ Specific protocols have been developed
- ❖ Not really translated to general population (yet)

New Hampshire Advisory Council on Sport-related Concussions

- ❖ Partnership between BIANH & Dept. of Psychiatry, DMS/DHMC
- ❖ Current focus un sports-related concussions
- ❖ Sport-Related Concussion Consensus Statement

Mission

Improve concussion-related
safety of young athletes in
New Hampshire.



Organization

- ❖ Funding through BIANH & DHPA
- ❖ Executive Committee
 - ✓ BIANH, DHPA, NH Brain Injury Services, NH Musculoskeletal Institute
 - ✓ Sets policy, final decisions
- ❖ Council Members
 - ✓ Non-profit stakeholders
 - ✓ Reviews material, advises EC
- ❖ Providers
 - ✓ Pilot schools funded through BIANH
 - ✓ Others

Member Organizations

NH Advisory Council on Sport-Related Concussion

Brain Injury Association of NH	NH Bureau of Developmental Services & Injury Prevention Program
Children's Hospital at Dartmouth	NH Emergency Nurses Association
Dartmouth Neuropsychiatry Brain Imaging Group	NH Interscholastic Athletic Association
Dartmouth Traumatic Brain Injury Program	NH Medical Society
NH Association of School Psychologists	NH Musculoskeletal Institute
NH Athletic Directors Association	NH School Learning Incentives
NH Athletic Trainers Association	NH School Nurses Association
NH Department of Education	Northern New England Neurological Society

Executive Board

- ❖ Council Chair: Arthur C. Maerlender, PhD
Neuropsychologist, Dartmouth Medical School
- ❖ Council Vice Chair: Laura C. Decoster, ATC
Executive Director, NH Musculoskeletal Institute
- ❖ BIANH Liaison: Steve Wade, Executive Director,
Brain Injury Assn of NH
- ❖ Executive Board Members
 - ✓ Laura Flashman, Dartmouth Medical School
 - ✓ John Capuco, NH HHS Bureau of
Developmental Services

Council Objectives

- ❖ Adopt statewide “consensus statement” that defines concussion and outlines the issues involved in managing return-to-play and return-to-school decisions for youth athletes.
- ❖ Develop “best practice” recommendations for concussion prevention, education and clinical management based on consensus statement.
- ❖ Devise and test concussion management protocols based on consensus and “best practice” recommendations that can readily be adapted to safely return athletes to school and play.
- ❖ Test/implement a “model” education and outreach effort for parents, youth athletes, coaches and physicians.

Education

- ❖ Parents
- ❖ Coaches
- ❖ Nurses
- ❖ MD's – PCP,
ED
- ❖ EMT
- ❖ Athletes

- ❖ Play safely
 - ✓ Wear that helmet
 - ✓ Follow rules/change rules
- ❖ Concussions effect functioning
- ❖ Pay attention to symptoms
- ❖ Accommodate
- ❖ Admit it...its quicker

Pilot Project

- ❖ Funding through BIANH to establish concussion management protocols in 10 NH high schools
 - ✓ Taking apps for second round now
 - ✓ <http://www.bianh.org/concussion.asp>
- ❖ Provides education and training
- ❖ Baseline neuropsychological screening tests for athletes
- ❖ Neuropsychological consultation

Protocol

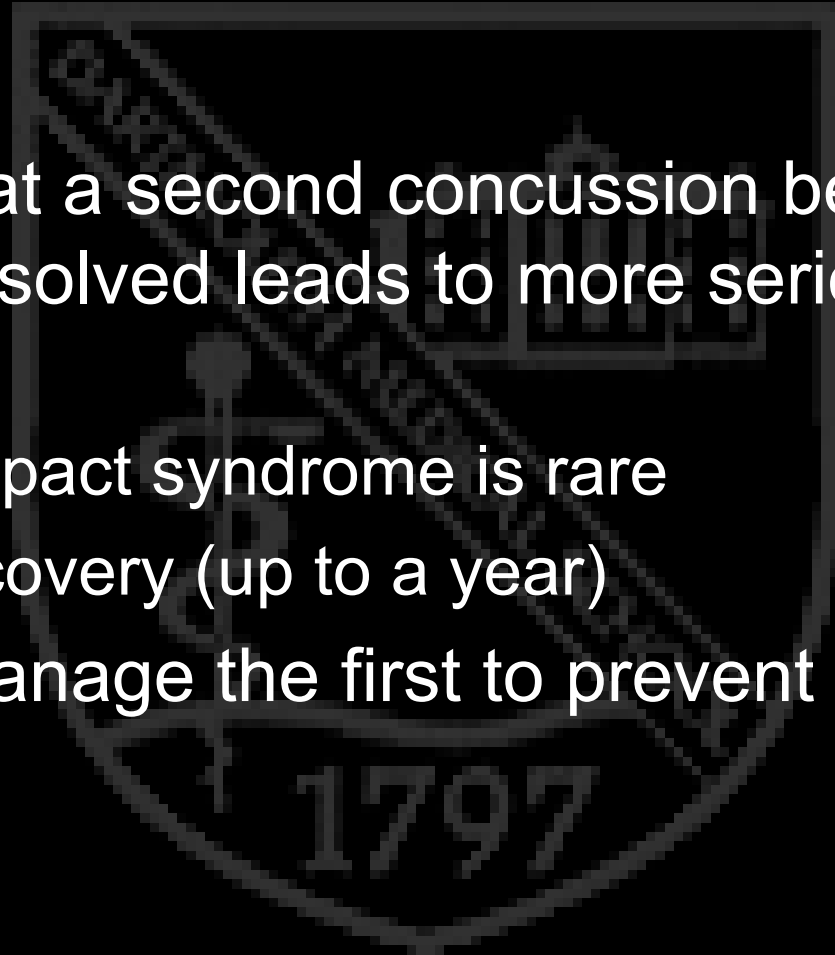
- ❖ All athletes obtain baseline tests and symptom review
- ❖ When athlete has been identified with concussion, takes post-concussion test
- ❖ Athlete is not cleared for RTP until symptoms and test scores return to baseline
 - ✓ Serial testing until 'recovered'
- ❖ ATC communicates with PCP and parents

The role of the nurse

- ❖ Often the front line in identification
 - ✓ Coordinate with ATC where available
- ❖ Can advocate
 - ✓ Use of counselor?
 - ✓ Use of ACE for documentation?
- ❖ Can nurses administer computerized testing?
 - ✓ With consultative support

Goal of concussion management

- ❖ We know that a second concussion before the first is resolved leads to more serious damage
 - ✓ Second impact syndrome is rare
 - ✓ Longer recovery (up to a year)
- ❖ Goal is to manage the first to prevent the second



New Guidelines

- ❖ International consensus statement (Zurich 2009) makes several recommendations, all of which appear in the NH consensus statement (www.bianh.org/concussion)
- ❖ “when in doubt, sit them out”
- ❖ CDC Head’s up
<http://www.cdc.gov/concussion/HeadsUp/youth.html>

The goal is Safe return to activities



Thank you



- NHACSC: <http://www.bianh.org/concussion.asp>
- Pediatric NP referrals:
http://dms.dartmouth.edu/psych/referral_form/