Community Partnerships for Youth
Concussion Care: Power of the Medical Neighborhood

Gerard A. Gioia, Ph.D.
Pediatric Neuropsychologist
Chief, Division of Pediatric Neuropsychology
Director, Safe Concussion Outcome, Recovery & Education (SCORE) Program
Children’s National Medical Center
Professor, Depts of Pediatrics and Psychiatry & Behavioral Sciences
George Washington University School of Medicine
Washington, DC
Objectives

1. Articulate knowledge of post-concussion evaluation & management to maximize primary care services to “typical” concussions
2. Introduce a clinical pathway for the management of the “typical” concussion recovery
3. Describe tools to assist concussion evaluation and management
4. Contribute to Return to School process in collaboration with local schools’ Concussion Management Team (CMT)
5. Identify conditions to refer to concussion specialist

**Offer opportunities for additional, in-depth training via Concussion Academy Skill Training (CAST) Program**

SIGN UP!
Concussion as ADHD in 1980

**ADHD**
- 1980: Most kids were evaluated and treated by specialists
- 2016: Most kids treated by primary care physicians
  - Refer Complex Cases

**Concussion**
- Pre-2016: Care is more variable. More ED/ Urgent Care/ specialists
- 2016+: Most kids treated by primary care physicians
  - Refer Complex Cases
Concussion’s Medical Neighborhood

**Point of Healthcare Entry**
- Emerg Dept
- Urgent Care
- Primary Care

**Continued Care “Typical”**
- Primary Care

**Continued Care “Atypical”**
- Specialty Care
- Rehabilitation Services

**School Return & Supports**

**Sports & Recreation Return**
Concussion is a Traumatic Brain Injury
Clinical Report—Sport-Related Concussion in Children and Adolescents

Mark E. Halstead, MD, Kevin D. Walter, MD, and THE COUNCIL ON SPORTS MEDICINE AND FITNESS

KEY WORDS
concussion, sports, head injury, mild traumatic brain injury, return to play, athletes, second-impact syndrome, postconcussion syndrome

ABBREVIATIONS
CIS—concussion in sport
LOG—loss of consciousness
SAG—Standardized Assessment of Concussion
BESS—Balance Error Scoring System
SCAT2—Sport Concussion Assessment Tool 2
CT—computed tomography

abstract

Sport-related concussion is a “hot topic” in the media and in medicine. It is a common injury that is likely underreported by pediatric and adolescent athletes. Football has the highest incidence of concussion, but girls have higher concussion rates than boys do in similar sports. A clear understanding of the definition, signs, and symptoms of concussion is necessary to recognize it and rule out more severe intracranial injury. Concussion can cause symptoms that interfere with school, social and family relationships, and participation in sports. Recognition and education are paramount, because although proper equipment, sport technique, and adherence to rules of the sport may decrease the incidence or severity of concussions, nothing has been shown to prevent them. Appropriate management is essential for reducing the risk of long-term symptoms and complications. Cognitive and physical rest is the mainstay of management after diagnosis, and neuropsychological testing is a helpful tool in the management of concussion. Return to sport should be accomplished by using a progressive exercise program while evaluating for any return of signs or symptoms. This report serves as a basis for understanding the diagnosis and management of concussion in children and adolescent athletes.

Pediatrics 2010;126:597–615
A concussion (or mild traumatic brain injury) is defined as a complex pathophysiologic process affecting the brain, induced by traumatic biomechanical forces secondary to direct or indirect forces to the head.
Disturbance of brain function is related to:
- neurometabolic dysfunction, rather than structural injury
- typically associated with normal structural neuroimaging findings (i.e., CT scan, MRI).

Concussion may or may not involve a loss of consciousness (LOC). (<10%)
Concussion results in a constellation of symptoms: physical, cognitive, emotional and sleep-related. Duration of symptoms are variable may last for as short as several minutes and last as long as several days, weeks, months or even longer in some cases.
Anatomical Timeline of a Concussion
Defining the Key Factors

A. Injury Characteristics
- LOC <10%
- Anterograde Amnesia 25-40%
- Retrograde Amnesia 20-35%

B. Symptom Assessment
- Neurocog/balance dysfx & Post-Concuss Sx’s

C. Risk Factors
- Pre-Injury Risks
- Sec-Hrs
- Sec-Min
- Sec-Hrs
- Hours - Days - Weeks+

Children's National
Recovery From Concussion: How Long Does it Take?

N=134 High School athletes  
Collins et al., 2006, Neurosurgery
Primary Care Clinical Pathway
Concussion Management
CHOP/ CDC study

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. Pfeiffer, MPH; Mark R. Zonfrillo, MD, MSCE; Juliet Haarbauder-Krupa, PhD; Matthew J. Breiding, PhD; Victor G. Coronado, MD, MPH; Christina L. Master, MD

- **8083 patients with diagnosed concussions**
- **First visit point of entry**
  - Primary care = 81.9%
  - ED = 11.7%
  - Specialty care = 5.7%
- **Age variation:** 0-4 yrs 52% to ED, > 75% 5-17 to PC
- **Insurance status:** Medicaid 37% to ED, pvt 7% to ED
Triggers to Concussion Evaluation

1. Blunt force or deceleration/acceleration event

2. Alteration of consciousness or mental status

Change in Function/Behavior/Performance

Post-Concussion Signs & Symptoms

<table>
<thead>
<tr>
<th>Physical</th>
<th>Cognitive</th>
<th>Emotional</th>
<th>Sleep</th>
</tr>
</thead>
<tbody>
<tr>
<td>Headache</td>
<td>Concentrate</td>
<td>Irritability</td>
<td>More</td>
</tr>
<tr>
<td>Fatigue</td>
<td>Memory</td>
<td>Emotional</td>
<td>Less</td>
</tr>
<tr>
<td>Balance/Dizziness</td>
<td>Speed of control</td>
<td>Sadness</td>
<td>Cannot</td>
</tr>
</tbody>
</table>
(Phone) Triage- Mild TBI SCREEN

1. Was there a blunt force to the head and/or did the head move back and forth with a lot of force (like whiplash)?
   - No — No Trigger
   - Yes – Next Question

2. Was there a change in mental status (e.g., confusion, dazed, disoriented, or poor memory for events around the injury) or a change in the level of consciousness (seemed out of it, not responding as you normally do)?
   - No — No Trigger
   - Yes - Trigger, consider Mild TBI; complete ACE

D. RED FLAGS for acute emergency management: Refer to the emergency department with sudden onset of any of the following:

- Headaches that worsen
- Seizures
- Focal neurologic signs
- Looks very drowsy/can’t be awakened
- Repeated vomiting
- Slurred speech
- Can’t recognize people or places
- Increasing confusion or irritability
- Weakness or numbness in arms/legs
- Neck pain
- Unusual behavioral change
- Change in state of consciousness
Primary Care
What’s My Clinical Protocol?

Acute Concussion Evaluation (ACE)
Sport Concussion Assessment Tool, 3rd Ed. (SCAT-3)
# Primary Care Clinical Pathway

<table>
<thead>
<tr>
<th>Event</th>
<th>Action</th>
<th>Tools</th>
<th>Communication</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Injury via Phone Call</td>
<td>Triage - Determine if ED visit is necessary</td>
<td>Two Trigger Questions (Blow, S&amp;S)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>ACE CDC Red Flags</td>
</tr>
<tr>
<td>2</td>
<td>Office Visit 1 - Diagnosis</td>
<td>Assess suspected concussion Establish diagnosis</td>
<td>Acute Concussion Evaluation (ACE)</td>
</tr>
<tr>
<td>3</td>
<td>Office Visit 1 - Management</td>
<td>Develop management strategy</td>
<td>ACE Home/School Instructions</td>
</tr>
<tr>
<td></td>
<td></td>
<td>School: Return date, symptom profile</td>
<td>ACE Return to School Letter</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sports/ PE/ Recreation</td>
<td>ACE Home/School Instructions</td>
</tr>
</tbody>
</table>
## Primary Care Clinical Pathway

<table>
<thead>
<tr>
<th>Event</th>
<th>Action</th>
<th>Tools</th>
<th>Communication</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Office Visit - Follow Up</strong></td>
<td>Monitor symptoms, exertional response to management</td>
<td>Post-Concussion Symptom Inventory-PCSI (Parent, Student)</td>
<td><strong>To Family:</strong> ACE Care Plan with updated symptom profile</td>
</tr>
<tr>
<td></td>
<td>Home Management guidance</td>
<td>ACE Care Plan</td>
<td><strong>To Family:</strong> activity management; decisions to increase tolerable cognitive/school, social, physical activity</td>
</tr>
<tr>
<td></td>
<td>School progress update</td>
<td>School Symptom Monitor</td>
<td><strong>To School:</strong> ACE Care Plan w updated symptom profile, input on accommodations &amp; adjustments</td>
</tr>
<tr>
<td><strong>Office Visit - Clearance</strong></td>
<td>Assess for full recovery</td>
<td><em>PCSI</em> (Student, Parent) <em>Medical Clearance for Gradual Return</em> Full Return follows completion of grad RTP program *Gradual Return to Sport guide</td>
<td><strong>To Family:</strong> counsel on gradual return process <strong>To School:</strong> clearance to return to PE <strong>To Sport:</strong> clearance to begin gradual Return to Play protocol; monitor until Final Clearance</td>
</tr>
<tr>
<td></td>
<td>1. No symptoms at rest/ no medication use to manage symptoms</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2. No return of symptoms with typical physical and cognitive activities</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>3. Cognitive functions at typical baseline</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>4. Normal balance and coordination</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>5. No other medical/neuro complaints</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Acute Concussion Evaluation (ACE) Key Elements

A. Define **Injury Characteristics**
B. Assess for **Symptoms (22)** (Lovell & Collins, 1998)
C. Identify **Risk Factors** for Prolonged Recovery
D. **Red Flags** for Neurological Deterioration
E. Establish the **Diagnosis**
F. Plan **Follow-Up** Action / Referral
# Acute Concussion Evaluation (ACE)

## A. Injury Characteristics

### Injury Description

Cause:

- Amnesias (retrograde, anterograde)
- Loss of Consciousness (LOC), Seizures

### Early Signs

- **Fell to ground, hit head on ground, kneed in right temporal region; dazed initially but continued to play with bad headache. Felt sluggish and confused.**

### A. Injury Characteristics

<table>
<thead>
<tr>
<th>A. Injury Characteristics</th>
<th>Date/Time of Injury</th>
<th>Reporter:</th>
<th>Patient</th>
<th>Parent</th>
<th>Spouse</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Injury Description</td>
<td>Sept. 7, 2008</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. **Injury Description**

- Fell to ground, hit head on ground, kneed in right temporal region; dazed initially but continued to play with bad headache. Felt sluggish and confused.

2. **Cause:**

- MVC
- Pedestrian-MVC
- Fall
- Assault
- Sports (specify) **basketball**
- Other

3. **Amnesia Before (Retrograde)**

- Are there any events just BEFORE the injury that you/ person has no memory of (even brief)?
  - Yes
  - No
  - Duration

4. **Amnesia After (Anterograde)**

- Are there any events just AFTER the injury that you/ person has no memory of (even brief)?
  - Yes
  - No
  - Duration

5. **Loss of Consciousness:**

- Did you/ person lose consciousness?
  - Yes
  - No
  - Duration

6. **EARLY SIGNS:**

- Appears dazed or stunned
- Is confused about events
- Answers questions slowly
- Repeats Questions
- Forgetful (recent info)

7. **Seizures:**

- Were seizures observed?
  - No
  - Yes
  - Detail

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**Note:** The document contains a table that is not fully transcribed in the image. The table is used to record and organize information related to the injury characteristics, including dates, locations, causes, and early signs. The specific details filled in the table are not visible in the provided image.
# Acute Concussion Evaluation (ACE)

## B. Symptom Checklist

*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*

<table>
<thead>
<tr>
<th>PHYSICAL (10)</th>
<th>COGNITIVE (4)</th>
<th>SLEEP (4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Headache 0</td>
<td>Feeling mentally foggy 0</td>
<td>Drowsiness 0</td>
</tr>
<tr>
<td>Nausea 0</td>
<td>Feeling slowed down 0</td>
<td>Sleeping less than usual 0</td>
</tr>
<tr>
<td>Vomiting 0</td>
<td>Difficulty concentrating 0</td>
<td>Sleeping more than usual 0</td>
</tr>
<tr>
<td>Balance problems 0</td>
<td>Difficulty remembering 0</td>
<td>Trouble falling asleep 0</td>
</tr>
<tr>
<td>Dizziness 0</td>
<td><strong>COGNITIVE Total (0-4)</strong> 4</td>
<td><strong>SLEEP Total (0-4)</strong> 2</td>
</tr>
<tr>
<td>Visual problems 0</td>
<td><strong>EMOTIONAL (4)</strong></td>
<td></td>
</tr>
<tr>
<td>Fatigue 0</td>
<td>Irritability 0</td>
<td></td>
</tr>
<tr>
<td>Sensitivity to light 0</td>
<td>Sadness 0</td>
<td></td>
</tr>
<tr>
<td>Sensitivity to noise 0</td>
<td>More emotional 0</td>
<td></td>
</tr>
<tr>
<td>Numbness/Tingling 0</td>
<td>Nervousness 0</td>
<td></td>
</tr>
<tr>
<td><strong>PHYSICAL Total (0-10)</strong> 5</td>
<td><strong>EMOTIONAL Total (0-4)</strong> 1</td>
<td></td>
</tr>
</tbody>
</table>

(Add Physical, Cognitive, Emotion, Sleep totals)
*Total Symptom Score (0-22) 12*
Acute Concussion Evaluation (ACE)

C. Risk Factors for Protracted Recovery

Research findings have linked these risk factors to longer periods of recovery.

<table>
<thead>
<tr>
<th>Concussion History? Y ___ N ___</th>
<th>✓</th>
<th>Headache History? Y ___ N ___</th>
<th>✓</th>
<th>Developmental History</th>
<th>✓</th>
<th>Psychiatric History</th>
</tr>
</thead>
<tbody>
<tr>
<td>Previous # 1 2 3 4 5</td>
<td>✓</td>
<td>Prior treatment for headache</td>
<td>✓</td>
<td>Learning disabilities</td>
<td>✓</td>
<td>Anxiety</td>
</tr>
<tr>
<td>Longest symptom duration</td>
<td>✓</td>
<td>History of migraine headache</td>
<td>✓</td>
<td>Attention-Deficit/ Hyperactivity Disorder</td>
<td>✓</td>
<td>Depression</td>
</tr>
<tr>
<td>Days ___ Weeks ___ Months ___ Years ___</td>
<td>✓</td>
<td>___ Personal</td>
<td>✓</td>
<td>Sleep disorder</td>
<td>✓</td>
<td>Sleep disorder</td>
</tr>
<tr>
<td>If multiple concussions, less force caused reinjury? Yes __ No ___</td>
<td>✓</td>
<td>___ Family</td>
<td>✓</td>
<td>Other developmental disorder</td>
<td>✓</td>
<td>Other psychiatric disorder</td>
</tr>
</tbody>
</table>

List other comorbid medical disorders or medication usage (e.g., hypothyroid, seizures).
Pediatric Assessment and Management of Concussions

Gerard A. Gioia, PhD

Concussions and mild traumatic brain injuries have become more widely recognized and understood during the past 5 to 10 years. Earlier and more active evaluation and management of this brain injury is necessary to reduce risk to the developing child and adolescent. Pediatricians play a central role in the evaluation and management of concussions and should develop a working understanding of the injury and its clinical manifestations.

An individualized approach to evaluation and management by the pediatrician requires the development of a skillset to define the characteristics of the injury, conduct a full assessment of post-concussion symptoms, and define any risk history that may modify recovery.

This evaluation forms the basis of concussion treatment, which involves the active management of the child’s knowledge of the patient’s post-injury status. Without the pediatrician’s active and informed involvement, service coordination is not likely to be as effective, result-
Tracking Recovery with Child & Parent
Symptom Reports
Post-Concussion Symptom Inventory (PCSII)

Child Report
- Age 5-7 – 5 items
- Age 8-12 – 17 items
- Age 13-18 – 21 items

Parent Report
- Age 5-18 – 20 items

Assesses:
- 4 symptom categories
- Pre- and Post-Injury ratings to identify injury-specific effects
- Developmentally sensitive
- Psychometric support
- Included in the NIH CDE toolkit
- Used worldwide

Psychometric Characteristics of the Postconcussion Symptom Inventory in Children and Adolescents

Maegan D. Sady*, Christopher G. Vaughan, Gerard A. Gioia
Division of Pediatric Neuropsychology, Children’s National Health System, Rockville, MD 20850, USA
*Corresponding author at: Division of Pediatric Neuropsychology, Children’s National Health System, 15245 Shady Grove Road, Suite 350, Rockville, MD 20850, USA. Tel.: +1-301-765-5454; fax: +1-301-765-5497.
E-mail address: msady@childrensnational.org (M.D. Sady).
Accepted 11 March 2014
### Post-Concussion Symptom Inventory for Children (PCS-I-C)

#### Pre/Post Version 5 to 12

**Name:**

**Today's date:**

**Birthdate:**

**Age:**

**Grade:**

**Instructions:** We would like to know if you have had any of these symptoms before your injury. Next, we would like to know if these symptoms have changed after your injury.

I am going to ask you to tell me about your symptoms at two points in time - Before the injury and Yesterday / Today. 

### Post-Concussion Symptom Inventory (PCS-I-P)

#### Parent Report Form

**Student's Name:**

**Today's date:**

**Birthdate:**

**Age:**

**Grade:**

**Person Completing Form:**

**Relation:** Mother / Father / Other

**Instructions:** We would like to know if your child has had problems with these symptoms before their injury. Next, we would like to know if these symptoms have changed after the injury. Please rate the problem at two points in time - Before the Injury / Pre-Injury and Current Symptoms / Yesterday and Today.

Please answer all the items the best you can. Do not skip any items. Circle the number to tell us how much of a problem this symptom has been for your child.

### Before the Injury / Pre-Injury vs Current Symptoms / Yesterday and Today

<table>
<thead>
<tr>
<th>Symptom / Item</th>
<th>Before the Injury</th>
<th>Current Symptoms</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Complains of headaches</td>
<td>0 1 2 3 4 5 6</td>
<td>0 1 2 3 4 5 6</td>
<td>No Difference</td>
</tr>
<tr>
<td>2. Complains of nausea</td>
<td>0 1 2 3 4 5 6</td>
<td>0 1 2 3 4 5 6</td>
<td>No Difference</td>
</tr>
<tr>
<td>3. Has balance problems</td>
<td>0 1 2 3 4 5 6</td>
<td>0 1 2 3 4 5 6</td>
<td>No Difference</td>
</tr>
<tr>
<td>4. Appears or complains of dizziness</td>
<td>0 1 2 3 4 5 6</td>
<td>0 1 2 3 4 5 6</td>
<td>No Difference</td>
</tr>
<tr>
<td>5. Appears drowsy</td>
<td>0 1 2 3 4 5 6</td>
<td>0 1 2 3 4 5 6</td>
<td>No Difference</td>
</tr>
<tr>
<td>6. Sleeping more than usual</td>
<td>0 1 2 3 4 5 6</td>
<td>0 1 2 3 4 5 6</td>
<td>No Difference</td>
</tr>
<tr>
<td>7. Sensitivity to light</td>
<td>0 1 2 3 4 5 6</td>
<td>0 1 2 3 4 5 6</td>
<td>No Difference</td>
</tr>
<tr>
<td>8. Sensitivity to noise</td>
<td>0 1 2 3 4 5 6</td>
<td>0 1 2 3 4 5 6</td>
<td>No Difference</td>
</tr>
<tr>
<td>9. Acts irritable</td>
<td>0 1 2 3 4 5 6</td>
<td>0 1 2 3 4 5 6</td>
<td>No Difference</td>
</tr>
<tr>
<td>10. Appears sad</td>
<td>0 1 2 3 4 5 6</td>
<td>0 1 2 3 4 5 6</td>
<td>No Difference</td>
</tr>
<tr>
<td>11. Acts nervous</td>
<td>0 1 2 3 4 5 6</td>
<td>0 1 2 3 4 5 6</td>
<td>No Difference</td>
</tr>
<tr>
<td>12. Acts more emotional</td>
<td>0 1 2 3 4 5 6</td>
<td>0 1 2 3 4 5 6</td>
<td>No Difference</td>
</tr>
<tr>
<td>13. Acts or appears mentally &quot;foggy&quot;</td>
<td>0 1 2 3 4 5 6</td>
<td>0 1 2 3 4 5 6</td>
<td>No Difference</td>
</tr>
<tr>
<td>14. Has difficulty concentrating</td>
<td>0 1 2 3 4 5 6</td>
<td>0 1 2 3 4 5 6</td>
<td>No Difference</td>
</tr>
<tr>
<td>15. Has difficulty remembering</td>
<td>0 1 2 3 4 5 6</td>
<td>0 1 2 3 4 5 6</td>
<td>No Difference</td>
</tr>
<tr>
<td>16. Has or complaints of visual problems (blurred or double vision)</td>
<td>0 1 2 3 4 5 6</td>
<td>0 1 2 3 4 5 6</td>
<td>No Difference</td>
</tr>
<tr>
<td>17. Appears more tired or fatigued</td>
<td>0 1 2 3 4 5 6</td>
<td>0 1 2 3 4 5 6</td>
<td>No Difference</td>
</tr>
<tr>
<td>18. Becomes confused with directions or tasks</td>
<td>0 1 2 3 4 5 6</td>
<td>0 1 2 3 4 5 6</td>
<td>No Difference</td>
</tr>
<tr>
<td>19. Appears to move in a clumsy manner</td>
<td>0 1 2 3 4 5 6</td>
<td>0 1 2 3 4 5 6</td>
<td>No Difference</td>
</tr>
<tr>
<td>20. Answers questions more slowly than usual</td>
<td>0 1 2 3 4 5 6</td>
<td>0 1 2 3 4 5 6</td>
<td>No Difference</td>
</tr>
</tbody>
</table>

### Total Symptom Score

<table>
<thead>
<tr>
<th>PCS-I Total Symptom Score</th>
<th>Before the Injury</th>
<th>Current Symptoms</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0 1 2 3 4 5 6</td>
<td>0 1 2 3 4 5 6</td>
<td>No Difference</td>
</tr>
</tbody>
</table>

**In general, to what degree is your child acting differently than before the injury (not acting like himself or herself)?**

**PCS-I Total Symptom Score**

**No Difference** 0 1 2 3 4 Major Difference

Circle your rating with "0" indicating "Normal" (No Difference) and "4" indicating "Very Different" (Major Difference)

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**Author(s):** Gobia, J., Eady, V., Vaughan, S. & Isquith, P. 2012.
Concussion Management
Concussion Management

Protect/ Restrict further Risk
Managed Activity/ Gradual Reintroduction
Symptom Monitor
General Principles of Recovery

- No additional forces to head/brain
- Get good sleep
- Managing/facilitating physiological recovery
  - Not over-exerting body or brain
  - Avoid activities that produce symptoms

Ways to over-exert

- Physical
- Cognitive! (concentration, learning, memory)
- (Emotional)
Benefits of Strict Rest After Acute Concussion: A Randomized Controlled Trial

Danny George Thomas, MD, MPH, Jennifer N. Apps, PhD, Raymond G. Hoffmann, PhD, Michael McCrea, PhD, Thomas Hammeke, PhD

were recruited. Participants underwent neurocognitive, balance, and symptom assessment in the ED and were randomized to strict rest for 5 days versus usual care (1–2 days rest, followed by stepwise return to activity). Patients completed a diary used to record physical and mental health outcomes. However, the intervention group reported more daily postconcussive symptoms (total symptom score over 10 days, 187.9 vs 131.9, \( P < .03 \)) and slower symptom resolution. CONCLUSIONS: Recommending strict rest for adolescents immediately after concussion offered no added benefit over the usual care. Adolescents’ symptom reporting was influenced by recommending strict rest.
Managed Activity

Concussion in Sports: Postconcussive Activity Levels, Symptoms, and Neurocognitive Performance
Cynthia W. Majerske, MD, MS*; Jason P. Mihalik, MS, CAT(C), ATC†; Dianxu Ren, PhD*; Michael W. Collins, PhD*; Cara Camiolo Reddy, MD*; Mark R. Lovell, PhD*; Amy K. Wagner, MD*

Objective: To examine the role postinjury activity level plays in postconcussive symptoms and performance on neurocognitive tests in a population of student-athletes.

Results: Level of exertion was significantly related to all outcome variables ($P < .02$ for all comparisons). With multivariate analysis, activity intensity remained significant with respect to visual memory ($P = .003$) and reaction time ($P < .001$).

Conclusions: Activity level after concussion affected symptoms and neurocognitive recovery. Athletes engaging in high levels of activity after concussion demonstrated worse neurocognitive performance. For these tasks, those engaging in moderate levels of activity demonstrated the best performance.
Rest

Managed Activity

**Key Messages**

- You will get better.
- You will improve and recover.
- You have control of your activity.
- Your efforts to control your activity and time will pay off.
- Find your “sweet spot” of activity.
Standardized Acute Injury
Instructions for Home and School

ACE POST-CONCUSSION
HOME/SCHOOL INSTRUCTIONS

You have been evaluated for a suspected concussion. Following these instructions can prevent further injury and help recovery.

WHEN TO SEEK CARE URGENTLY
Seek care quickly if symptoms worsen or if there are any behavioral changes. Also, watch for any of the following Danger Signs:

<table>
<thead>
<tr>
<th>Headaches that worsen</th>
<th>Very drowsy, can't be awakened</th>
<th>Can't recognize individuals, can't speak, or be active as usual</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seizures</td>
<td>Repeated vomiting</td>
<td></td>
</tr>
<tr>
<td>Neck pain</td>
<td>Slurred speech</td>
<td></td>
</tr>
<tr>
<td>Unusual behavior change</td>
<td>Significant irritability</td>
<td></td>
</tr>
</tbody>
</table>

If you observe any of the above signs, contact your doctor or return to the ER immediately.

Soon to be Updated

RETURNING TO DAILY ACTIVITIES
The key to recovery is sleeping, resting physically and mentally, and avoiding activities that might cause head injury.

- Avoid:
  - Physical activities that produce concussion symptoms, as this might increase the recovery time.
  - Lengthy mental activities requiring concentration (i.e., homework, schoolwork, job-related work, extended video game playing) as these activities worsen symptoms and prolong recovery.
  - Sleep: Get good sleep and take naps if tired. No late nights or sleepovers. It is NOT necessary to wake up periodically.
  - The injured person should not participate in ANY high risk activities that might result in head injury until

Cognitive | Emotional | Sleep
---|---|---
Feeling mentally foggy | Irritability | Drowsiness
Feeling tired | Sadness | Sleeping less than usual
Sensitivity to light or noise | More emotional | Sleeping more than usual
Difficulty remembering | Nervousness | Trouble falling asleep
Difficulty concentrating | |
Ongoing Prescriptive Management

ACE Care Plan
Symptom definition
Reinforcing Balanced Activity-Exertion
Sleep recommendations
Emotional response

Guidance on Return to:
- Daily Activities
- School
- Physical Activity/ Sport
Concussion’s Effects on School Learning
Return to Life in School

- **School:**
  - Kid’s Major “Job” is **new learning/acquiring** knowledge
  - Practicing incompletely learned knowledge (HW)
  - Mental and physical **exertion** is essential to new learning/practice

ALSO: Social with peers
- Interacting with teachers
- Managing the environment
- Academic pressure
Medical-School Partnership in Guiding Return to School Following Mild Traumatic Brain Injury in Youth

Gerard A. Gioia, PhD

Abstract
Mild traumatic brain injury is recognized as a prevalent and significant risk concern for youth. Appropriate school return is particularly challenging. The medical and school systems must be prepared partners to support the school return of the student with mild traumatic brain injury. Medical providers must be trained in assessment and management skills with a focused understanding of school demands. Schools must develop policies and procedures to prepare staff to support a gradual return process with the necessary academic accommodations. Ongoing communication between the family, student, school, and medical provider is essential to supporting recovery. A systematic gradual return to school process is proposed including levels of recommended activity and criteria for advancement. Targets for intervention are described with associated strategies for supporting recovery. A 10-element Progressive Activities of Controlled Exertion (PACE) model for activity-exertion management is introduced to manage symptom exacerbation. A strong medical-school partnership will maximize outcomes for students with mild traumatic brain injury.
Heads Up to Schools: KNOW YOUR CONCUSSION ABCs

Assess the situation
Be alert for signs and symptoms
Contact a health care professional

Signs and Symptoms of a Concussion
A concussion is caused by a bump, blow, or jolt to the head. Concussions can also occur from a fall or blow to the body that causes the head to move rapidly back and forth. Even what seems to be a mild bump to the head can be serious. Be alert for any of the following signs and symptoms.

**Signs Observed by School Professionals**
- Appears dazed or stunned
- Is confused about events
- Answers questions slowly
- Repeats questions
- Can’t recall events prior to hit, bump, or fall
- Can’t recall events after hit, bump, or fall
- Loses consciousness (even briefly)
- Shows behavior or personality changes
- Forgets class schedule or assignments

**Symptoms Reported by the Student**

**Thinking/Remembering**
- Difficulty thinking clearly
- Difficulty concentrating or remembering
- Feeling more slowed down
- Feeling sluggish, hazy, foggy, or groggy

**Physical**
- Headache or "pressure" in head
- Nausea or vomiting
- Balance problems or dizziness
- Fatigue or feeling tired
- Blurry or double vision
- Sensitivity to light or noise
- Numbness or tingling
- Does not "feel right"

**Emotional**
- Irritable
- Sad
- More emotional than usual
- Nervous

**Sleep**
- Drowsy
- Sleeps less than usual
- Sleeps more than usual
- Has trouble falling asleep

*Only ask about sleep symptoms if the injury occurred on a prior day.

What can school professionals do?

Know your Concussion ABCs:
A—Assess the situation
B—Be alert for signs and symptoms
C—Contact a health care professional

For more information and to order additional materials, visit: www.cdc.gov/Concussion

U.S. Department of Health and Human Services
Centers for Disease Control and Prevention

CDC
What kinds of school problems are you having SINCE YOUR INJURY?

Ransom et al. (2015)

<table>
<thead>
<tr>
<th>Type of Problem</th>
<th>Elementary (n=42)</th>
<th>Middle (n=78)</th>
<th>High School (n=120)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Headaches interfering</td>
<td>53%</td>
<td>73%</td>
<td>71%</td>
</tr>
<tr>
<td>Can’t pay attention</td>
<td>47%</td>
<td>58%</td>
<td>66%</td>
</tr>
<tr>
<td>Feeling too tired</td>
<td>53%</td>
<td>61%</td>
<td>52%</td>
</tr>
<tr>
<td>Homework taking much longer</td>
<td>35%</td>
<td>48%</td>
<td>63%*</td>
</tr>
<tr>
<td>Difficulty understanding material</td>
<td>29%</td>
<td>46%</td>
<td>54%</td>
</tr>
<tr>
<td>Difficulty studying for tests</td>
<td>18%</td>
<td>36%</td>
<td>53%*</td>
</tr>
<tr>
<td>Difficulty taking Notes</td>
<td>18%</td>
<td>17%</td>
<td>35%*</td>
</tr>
<tr>
<td>Average # reported Mn (SD)</td>
<td>2.53 (2.1)</td>
<td>3.37 (1.7)</td>
<td>3.92 (2.1)</td>
</tr>
</tbody>
</table>

* Significant (p<.05) difference across grade level
Key Medical-School Questions

**Medical 1º Role**

1. When should the student return to school? How long should they remain out of school?
2. When the student returns to school, should it be for a full day or partial day?
   - If a partial day is recommended, how and when should they transition into a full day?

**School 1º Role**

3. What types of in-school accommodations should the student receive and for how long?
4. What tools are available to guide Return to School planning?
Medical Provider’s Role: Return to School

1. Conduct initial medical evaluation to assist with school management plan
   – Definition of student’s symptom profile
   – Ongoing monitoring of symptom status through to recovery

2. Student symptom profile communicated to the school CMT by the medical provider in a standardized manner (ACE Return to School Letter) facilitating the school management plan

3. Assist with referral for additional medical/rehabilitation needs
Dear School Staff:

The student currently reporting the following symptoms. They should be viewed as the targets for classroom adjustments using the **Symptom Targeted Accommodation & Management Plan**.

**PHYSICAL**
- Headaches ☐
- Visual problems ☐
- Balance Problems ☐
- Sensitivity to noise ☐
- Dizziness ☐
- Fatigue ☐
- Difficulty concentrating ☐
- Sensitivity to light ☐
- Nausea ☐
- Numbness/tingling ☐

**THINKING/COGNITIVE**
- Feeling mentally foggy ☐
- Problems remembering ☐
- Feeling slowed down ☐
- Problems concentrating ☐

**SOCIAL/EMOTIONAL**
- Irritability/easily angered ☐
- Nervousness ☐
- Sadness ☐
- Feeling more emotional ☐

Do any of the symptoms worsen with:
- Physical activity ☐ Yes ☐ No ☑ N/A
- Cognitive activity ☐ Yes ☑ No ☐ N/A

Based on the current symptoms, the student is ☐ permitted to return to school, OR ☑ is excused for ___ days.

Please see the Gradual Return to School (GRS) guide (back) for guidance on recommended levels of activity in school and criteria to move to the next stage. As general guidance, the student can return to school when:

1. They can concentrate on school work for 30 minutes before symptoms worsen significantly; AND
2. Symptoms reduce or disappear with cognitive rest breaks, allowing return to activity.

The student requires the following physical restrictions until cleared by a health professional:
- No physical activity during recess
- No PE class
- No Contact Sports

---

**Symptom Targeted Accommodation & Management Plan (STAMP)**

Below, please see the symptoms they are currently experiencing. To promote recovery, the student will be provided with the following classroom accommodations that support their academic learning and performance.

<table>
<thead>
<tr>
<th>Symptom (check)</th>
<th>Functional school problem</th>
<th>Accommodation/management strategy (select)</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ How can I reduce my exposure to anxiety triggers?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>□ How can I manage my stress levels?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>□ How can I pace myself?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>□ How can I break down tasks and increase my confidence?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>□ How can I access peer support and resources?</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Writing**
- Provider accommodations for written output (word bank, oral response, etc.)
- Use of calculators
- Shorter writing passages

**Other**
Dear School Staff:

_______________ sustained a concussion on _____________. Every concussion is different and recovery typically can take between several days to several weeks. While it is important for the student to return to school as soon as they can tolerate, the key to assisting recovery is to manage their physical and cognitive activity. Too much cognitive or physical activity can make symptoms worse and possibly prolong recovery, while too little activity can unnecessarily create anxiety and cause him/her to fall behind in their school work. As symptoms resolve and the student’s learning/cognitive functioning returns to normal, they can gradually progress to their normal school day.

The student is currently reporting the following symptoms. They should be viewed as the targets for classroom adjustments using the Symptom Targeted Accommodation & Management Plan.

<table>
<thead>
<tr>
<th>PHYSICAL</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>□ Headaches</td>
<td>□ Visual problems</td>
</tr>
<tr>
<td>□ Fatigue</td>
<td>□ Dizziness</td>
</tr>
<tr>
<td>□ Balance Problems</td>
<td>□ Sensitivity to noise</td>
</tr>
<tr>
<td>□ Sensitivity to light</td>
<td>□ Nausea</td>
</tr>
<tr>
<td>□ Vomiting</td>
<td>□ Numbness/tingling</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>THINKING/COGNITIVE</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>□ Feeling mentally foggy</td>
<td>□ Problems remembering</td>
</tr>
<tr>
<td>□ Feeling slowed down</td>
<td>□ Problems concentrating</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SOCIAL/EMOTIONAL</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>□ Irritability/easily angered</td>
<td>□ Nervousness</td>
</tr>
<tr>
<td>□ Sadness</td>
<td>□ Feeling more emotional</td>
</tr>
</tbody>
</table>

Do any of the symptoms worsen with: Physical activity □Yes □No □N/A
Cognitive activity □Yes □No □N/A

Based on the current symptoms, he/she is □ permitted to return to school. OR □ is excused for ___ days. Please see the Gradual Return to School (RTS) guide (on back) for guidance on recommended levels of activity in school and criteria to move to the next stage. As general guidance, the student can return to school when:

(1) They can concentrate on school work for 30 minutes before symptoms worsen significantly, AND
(2) Symptoms reduce or disappear with cognitive rest breaks, allowing return to activity.

The student requires the following physical restrictions until cleared by a health professional:

* No physical activity during recess
* No PE class
* No Contact Sports
* Other ________
# Gradual Return to School

## ACE Post-Concussion

**Gradual Return to School (RTS) Guide**

**Use of the Gradual Return to School Guide:** Every student’s recovery from concussion is different. The five progressive stages were designed to give the medical provider and school team general guidance to assist the student’s gradual return to school. The stages should not be viewed as absolute for every student if their symptoms do not warrant it. What is important is to strike a balance between providing the student with the necessary supports for symptom relief while progressing to their normal school schedule. Students with faster recoveries may skip a stage or two. Use of the *Symptom Targeted Accommodation & Management Plan* should accompany this guide.

<table>
<thead>
<tr>
<th>Stage</th>
<th>Description</th>
<th>Day</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Full Day, Maximal Supports (required throughout day)</td>
<td>* Able to attend most classes, with 2-3 rest breaks (20-30’). * Expectations for productivity: Minimal – moderate. No tests. Homework &lt; 60’.</td>
<td>To Move To Stage 3: Symptom number &amp; severity improving, needs 1-2 cognitive rest breaks during school day.</td>
</tr>
<tr>
<td>3</td>
<td>Return to Full Day, Moderate Supports (provided in response to symptoms during day)</td>
<td>* Attend all classes with 1-2 rest breaks (20-30’). * Expectations for productivity: Moderate. Begin quizzes. Moderate homework 60-90’ * Design schedule for make-up learning/work</td>
<td>To Move To Stage 4: Continued symptom improvement, needs no more than 1 cognitive rest break per day</td>
</tr>
<tr>
<td>4</td>
<td>Return to Full Day, Minimal Supports (Monitor final recovery)</td>
<td>* Attend all classes with 0-1 rest breaks (20-30’). * Expectations for productivity: Moderate-maximum. Begin modified tests (breaks, extra time). Homework 90’</td>
<td>To Move To Stage 5: No active symptoms, no exertional effects across the full school day.</td>
</tr>
<tr>
<td>5</td>
<td>Full Return, No Supports Needed</td>
<td>* Full class schedule, no rest breaks. * Expectations for productivity: Maximum * Begin to address make-up learning/work</td>
<td>N/A</td>
</tr>
</tbody>
</table>
School Concussion Management Team

**Two Key Roles**

– Medical monitor:
  • monitors the symptom status of the student, using standardized symptom scale
  • Liaisons with community medical provider
  • Reports status to academic monitor

– Academic monitor:
  • oversees & guides academic support process - Day 1 to recovery
  • Links student symptom status with accommodations
  • Liaisons with, student, teachers and medical monitor
# Symptom Targeted Accommodation & Management Plan (STAMP)

Below, please see the symptoms they are currently experiencing. To promote recovery, the student will be provided with the following classroom accommodations that support their academic learning and performance:

## Symptom (check) | Functional school problem | Accommodation/management strategy (select)
---|---|---
### Cognitive Symptoms
- [ ] Attention & concentration difficulties | Short focus on lecture, classwork, homework | Shorter assignments (odd/even problems, requiring outline or bullet points instead of full written responses)
- | | Break down tasks and tests into chunks/segments
- | | Lighter workload: May opt to work at a lower level (e.g., skills level work) for the remainder of the year
### Physical Symptoms
- [ ] Headaches | Interferes with concentration, increased irritability | Intersperse rest breaks
- | | Allow for short naps in quiet location (e.g., nurse’s office)
- [ ] Light/noise | Symptoms worsen in bright or loud environment | Wear sunglasses, seating away from bright sunlight
- | | Limit exposure to SMART board, provide hard copy of class notes
### Emotional Symptoms
- [ ] Irritability | Poor tolerance for stress | Reduce stimulation and stressors (e.g., overwhelmed with missing work)
- [ ] Anxiety/nervousness | Worried about falling behind, pushing through symptoms | Reassurance from teachers and team about accommodations, workload reduction, alternate forms of testing
- | | Time built in for socialization
- [ ] Depression/withdrawal | Withdrawal from school or friends because of stigma or activity restrictions | Allow student to be engaged with peers during selected low stress/extra curricular activities as tolerated
- | | Lunch in a quiet room with friends
### Course Specific Recommendations
- [ ] Course specific difficulties
- [ ] Writing | Provide alternatives to written output (word bank, oral response, etc.)
- [ ] Mathematics calculation | Use of calculator
- | | Shorter reading passages
- | | Provide tools to assist with visual tracking or comprehension of information (e.g., use of audio books)
- [ ] Reading comprehension
- [ ] Other:
School Care Pathway

1. Med/Symptom Monitor
2. Academic Monitor

HCP Evaluation

Student Returns to School

Periodic Monitoring

Re-Adjustments

Recovery

Communication w HCP
<table>
<thead>
<tr>
<th>Event</th>
<th>Action</th>
<th>Tools</th>
<th>Communication</th>
</tr>
</thead>
<tbody>
<tr>
<td>Office Visit - Follow Up</td>
<td>Monitor symptoms, exertional response to management</td>
<td>Post-Concussion Symptom Inventory-PCSI (Parent, Student)</td>
<td>To Family: ACE Care Plan with updated symptom profile</td>
</tr>
<tr>
<td>Home Management</td>
<td></td>
<td>ACE Care Plan</td>
<td>To Family: activity management; decisions to increase tolerable cognitive/school, social, physical activity</td>
</tr>
<tr>
<td>School progress update</td>
<td></td>
<td>School Symptom Monitor</td>
<td>To School: ACE Care Plan w updated symptom profile, input on accommodations &amp; adjustments</td>
</tr>
<tr>
<td>Office Visit - Clearance</td>
<td>Assess for full recovery</td>
<td>*PCSI (Student, Parent) *Medical Clearance for Gradual Return *Gradual Return to Sport guide</td>
<td>To Family: counsel on gradual return process To School: clearance to return to PE To Sport: clearance to begin gradual Return to Play protocol; monitor until Final Clearance</td>
</tr>
</tbody>
</table>
When to Refer: Complex Concussion Case

- **Complex** injury (e.g., multiple blows within a short time period, possible rotational / neck injury, significant injury characteristics including types / severity of signs & symptoms)
- **Persistent** symptom pattern (greater than 2 weeks) without significant improvement (< 20% symptom improvement)
- No change in **cognitive** dysfunction/ ongoing **school** problems and challenges
- Significant **emotional factors** possibly interfering w recovery
- Presence of **risk factors** (e.g., medical/ neurological, psychiatric, learning/ attention disorders) possibly related to prolonged recovery
- History of **multiple** concussions
- **Confirm/ clearance** for return to risk activities
Concussion Management
2016 and Beyond

- Primary care takes on management of “typical” cases
  - Follow Primary Care Clinical Pathway

- Conduct Activity Management with patient
  - Activity-rest balance across recovery: use symptoms as guide
  - School → Home → Recreation/ Athletics

- Collaborate with schools: Use ACE Return to School Letter, identify symptom targets for CMT programming; co-monitor

- Recovery: Apply Criteria for Medical Clearance
  - Allow return to risk only with COMPLETE recovery; gradual RTP
  - Collaborate with local athletic trainers

- Refer complex, slow to recover cases to specialist
Parents & Coaches & Athletes

www.cdc.gov/headsup

Schools

Healthcare Providers

Healthcare Providers
Interested in learning more?
Sign up for the Concussion Academy Skill Training (CAST) Program

ggioia@childrensnational.org
Want more training?

Step 1 - Text “ggioia” to 22333 to let us know!

Step 2 - Type your email address
Hit “Send”

Step 3 – Type “Leave”

We will contact you!

ggioia@cnmc.org
SCORE
Safe Concussion Outcome, Recovery & Education

Let’s Do It!

PLAY HARD.
PLAY SAFE.
PLAY SMART!