The Latest Management Guidelines of Concussions in the Young Student-Athlete

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
Washington, DC
Disclosure

Test Author

- Behavior Rating Inventory of Executive Function (BRIEF) Psychological Assessment Resources, Inc.
- Tasks of Executive Control (TEC)
- Pediatric Immediate Post-Concussion Assessment and Cognitive Testing (Pediatric ImPACT)
Today’s Objectives

- Achieve a **working understanding** of concussion
- Develop knowledge of **evaluation** & **management** of concussion

- Acute Concussion Evaluation (ACE)
- ACE Care Plan
- Zurich Statement
Injury to the Head Occurs

What is your **Clinical Protocol?**

**Injury Scenario**

What can the Physician/ Clinician Do?

What Guidelines to Return to Play?

What tools can help?
New Rules
Supplement

Consensus Statement on Concussion in Sport: the 3rd International Conference on Concussion in Sport held in Zurich, November 2008

P McCrory,1 W Meeuwisse,2 K Johnston,3 J Dvorak,4 M Aubry,5 M Molloy,6 R Cantu7

This paper is a revision and update of the recommendations developed following the 1st (Vienna) and 2nd (Prague) documents and to develop further conceptual understanding of this problem using a formal consensus-based approach. A detailed description of the consensus process is outlined at the end of this document. This document is developed for use by physicians, therapists, certified athletic trainers, health professionals, coaches and other people involved in the care of injured athletes, whether at the recreational, elite or professional level. While agreement exists pertaining to principal messages conveyed within this document, the authors acknowledge that the science of concussion is evolving and consensus statement:

Acute simple concussion

- Which symptom scale and which sideline assessment tool is best for diagnosis and/or follow up?
- How extensive should the cognitive assessment be in elite athletes?
- How extensive should clinical and neuropsychological (NP) testing be at non-elite level?
- Who should do/interpret the cognitive assessment?
- Is there a gender difference in concussion incidence and outcomes?

Future directions

- Should athletes with persistent symptoms be screened for depression/anxiety?

Paediatric concussion

- Which symptoms scale is appropriate for this age group?
- Which tests are useful and how often should baseline testing be performed in this age group?
- What is the most appropriate RTP guideline for elite and non-elite child and adolescent athletes?

Specific Research Questions and Consensus Discussion

1. Concussion
1.1 Definition of concussion
A panel discussion regarding the definition of concussion and its separation from mild traumatic brain injury (mTBI) was held. Although there was acknowledgement that the terms refer to different
Coming Soon

- AAN Revised Practice Parameter for Sport-Related Concussion (2011-12)
Concussion: “Facts & Figures”

- Annually, millions of children sustain a TBI
- 80-90% “mild” → concussion
- New CDC estimates of sports/recreation TBI alone (adults and children): 1.6 – 3.8 million per year (revised from previous estimate of 300K)
Anatomical Timeline of a Concussion
Defining the Key Factors

A. Injury Characteristics

Pre-Injury Risks
- Retrograde Amnesia: 20-35%

B. Symptom Assessment

- LOC <10%
- Anterograde Amnesia: 25-40%
- Neurocog dysfx & Post-Concuss Sx’s

C. Risk Factors

Sec-Hrs
- Hours - Days - Weeks+

Sec-Min
- Sec-Hrs
Recovery From Concussion: How Long Does it Take?

N=134 High School athletes

Collins et al., 2006, Neurosurgery
Increased Risks if not properly identified and managed

- Symptoms can take **significantly longer** to recover.
- Player is **more likely** to be re-injured.
- Second/ third... injuries:
  - Are more likely to be more severe
  - Could cause permanent brain damage
  - Can take longer to recover from
  - Increase risk of retirement from sport
What’s My Clinical Protocol?

Acute Concussion Evaluation (ACE)
Acute Concussion Evaluation (ACE)
Improving Identification and Diagnosis of Mild Traumatic Brain Injury With Evidence: Psychometric Support for the Acute Concussion Evaluation

Gerard A. Gioia, PhD; Michael Collins, PhD; Peter K. Isquith, PhD

**Objectives:** A dearth of standardized assessment tools exists to properly assess and triage mild traumatic brain injury (mTBI) in primary care and acute care settings. This article presents evidence of appropriate psychometric properties for the Acute Concussion Evaluation (ACE), a new structured clinical interview. **Participants:** Parent informants of 354 patients, aged 3 to 18 years, with suspected mTBI completed the ACE via telephone interview. **Measure:** Acute Concussion Evaluation. **Results:** Evidence is presented for appropriate item-scale membership, internal consistency reliability as well as content, predictive, convergent/divergent, and construct validity of the ACE symptom checklist. **Conclusions:** Overall, the ACE symptom checklist exhibits reasonably strong psychometric properties as an initial assessment tool for mTBI. **Keywords:** acute concussion evaluation, assessment, concussion, mild traumatic brain injury, postconcussion symptoms, triage
Acute Concussion Evaluation (ACE)

- ACE is a *clinical protocol* to assist diagnosis of mTBI/concussion in medical settings
- Ages 4-adult
- Elements of clinical assessment protocol are evidence-based
- Link to follow-up care via ACE Care Plan
Acute Concussion Evaluation (ACE)

- Patient or parent/other as reporter of signs & symptoms
- Assess for presence/absence of 22 symptoms
  - somatic
  - cognitive
  - emotional
  - sleep
- Length of time approx. 5 minutes (N=354)
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

---

A. Injury Characteristics

Date/Time of Injury: Sept. 7, 2008

Reporter: Patient✓Parent__Spouse __Other____

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.

1a. Is there evidence of a forcible blow to the head (direct or indirect)?  ✓Yes __No __Unknown
1b. Is there evidence of intracranial injury or skull fracture?  __Yes __No ✓Unknown
1c. Location of Impact: __Frontal __Lft Temporal ___Rt Temporal __Lft Parietal __Rt Parietal ✓Occipital __Neck __Indirect Force

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?

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____________________________________
**Acute Concussion Evaluation (ACE)**

**B. Symptom Checklist**

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**B. Symptom Check List**

Since the injury, has the person experienced *any* of these symptoms any *more than usual* today or in the past day?

Indicate presence of each symptom (0=No, 1=Yes).

*Lovell & Collins, 1998 JHTR*

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

**Exertion:** Do these symptoms *worsen* with:

- Physical Activity  __Yes __No  ✓N/A
- Cognitive Activity  ✓Yes __No ___N/A

**Overall Rating:** How *different* is the person acting compared to his/her usual self? (circle)

- Normal 0 1 2 3 4 5 6 Very Different

**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.
D. Red Flags for Neurological Deterioration

<table>
<thead>
<tr>
<th>D. RED FLAGS for acute emergency management:</th>
<th>Refer to the emergency department with <strong>sudden onset</strong> of any of the following:</th>
</tr>
</thead>
<tbody>
<tr>
<td>* Headaches that worsen</td>
<td>* Looks very drowsy/can’t be awakened</td>
</tr>
<tr>
<td>* Seizures</td>
<td>* Can’t recognize people or places</td>
</tr>
<tr>
<td>* Focal neurologic signs</td>
<td>* Increased confusion or irritability</td>
</tr>
<tr>
<td></td>
<td>* Weakness or numbness in arms/legs</td>
</tr>
<tr>
<td></td>
<td>* Neck pain</td>
</tr>
<tr>
<td></td>
<td>* Unusual behavioral change</td>
</tr>
<tr>
<td></td>
<td>* Change in state of consciousness</td>
</tr>
</tbody>
</table>

Physicians and parents/patients need to be aware of signs that signal the need for emergency care.
Acute Concussion Evaluation (ACE)

E. Diagnosis

E. Diagnosis (ICD): ✔ Concussion w/o LOC 850.0  __ Concussion w/ LOC 850.1  __ Concussion (Unspecified) 850.9  __ Other (854) __________  
__ No diagnosis

850.0 (Concussion, with no loss of consciousness)
850.1 (Concussion, with brief loss of consciousness < 1 hour)
850.9 (Concussion, unspecified)

Moderate TBI - diagnostic code 854 (Intracranial injury) should be considered.
Acute Concussion Evaluation (ACE)

E. Follow-Up Action Plan/ Referral

F. Follow-Up Action Plan

- No Follow-Up Needed

- Physician/Clinician Office Monitoring: Date of next follow-up ________________

- Referral:
  - Neuropsychological Testing
  - Physician: Neurosurgery___ Neurology___ Sports Medicine___ Physiatrist___ Psychiatrist___ Other__________________________
  - Emergency Department

ACE Completed by: ___________________________ MD RN NP PhD ATC

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This form is part of the "Heads Up: Brain Injury in Your Practice" tool kit developed by the Centers for Disease Control and Prevention (CDC).

None

Office Monitor (Re-Assess in 1-2 days)

Referral: Testing, MD, ED
Neuropsychological Effects of Concussion

- Attention, concentration
- “Working memory” (holding info in mind during activity)
- New learning & memory storage/retrieval
- Speed of processing information
- Reaction time
3.3 Neuropsychological Assessment

The application of neuropsychological (NP) testing in concussion has been shown to be of clinical value and continues to contribute significant information in concussion evaluation.\textsuperscript{21–26} Although in most case cognitive recovery largely overlaps with the time course of symptom recovery, it has been demonstrated that cognitive recovery may occasionally precede or more commonly follow clinical symptom resolution suggesting that the assessment of cognitive function should be an important component in any return to play protocol.\textsuperscript{27,28} It must be emphasized, however, that NP assessment should not be the sole basis of management decisions; rather, it should be seen as an aid to the clinical decision-making process in conjunction with a range of clinical domains and investigational results.
**Clinical Protocol**

**Pre-Concussion Baseline Testing**

- **1-3 Days**
- **Day 5-10**
- **Day 12-16**

**Cognitive Functions**

**Symptoms**

*Barth et al., 2002*
Concussion Evaluation: The Whole Story

Clinical History

Understanding of Testing

Clinical Presentation

Response to Exertion

Clinical Protocol

Pre-Concussion Baseline Testing

1-3 Days

Day 5-10

Day 12-16

*Barth et al., 2002
Developing New Tools for Concussion Assessment & Treatment In Children & Teens

Multi-modal Assessment Model

CDC # U17/CCU323352

New Approaches to Assessment and Monitoring of Concussion in Children

Gerard A. Gioia, PhD; Peter K. Isquith, PhD; Jillian C. Schneider, PhD; Christopher G. Vaughan, PsyD
New Assessment Methods
Multi-modal Assessment Model
CDC # U17/CCU323352

• Computerized testing of specific cognitive skills
• Standardized symptom rating
  • Child/teen self-report
  • Parent
  • Teacher

**All of these methods allow for monitoring of & guiding recovery over time**
Normal Age Trends – Learning & Memory

Particip Age

Mean Learn.Mem.Regr.ICV.BL1 Factor Score

Developmental Change

Remember that Trip!

N=650
Normal Age trends – Response Time

N=650

Developmental Change

Catch Those Tiger Cubs!
Neurocognitive Differences
MTBI vs ADHD vs Matched Ctls

Sample
Age 5-12 years old
Concussed (n=38) vs ADHD (n=17) vs Matched Control (n=45)
Visit 1-2 interval = Concussed=7 days  Controls = 2.5 days
Symptom Assessment

Which symptom assessments and approaches are uniquely appropriate for paediatric concussion?

G A Gioia,1 J C Schneider,1 C G Vaughan,1 P K Isquith2

ABSTRACT
Objective: To (a) identify post-concussion symptom scales appropriate for children and adolescents in sports; (b) review evidence for reliability and validity; and (c) recommend future directions for scale development.
Design: Quantitative and qualitative literature review of symptom rating scales appropriate for children and adolescents aged 5 to 22 years.
Intervention: Literature identified via search of Medline, Ovid-Medline and PsycInfo databases; review of reference lists in identified articles; querying sports concussion specialists. 29 articles met study inclusion criteria.
Results: 5 symptom scales examined in 11 studies for ages 5–12 years and in 25 studies for ages 13–22. 10 of 11 studies for 5–12-year-olds presented validity evidence for three scales; 7 studies provided reliability evidence for two scales; 7 studies used serial

To effectively manage concussion in younger student-athletes, they must be understood differently than older, more neurologically mature, athletes.6–8 To do so, it is necessary to use age-appropriate clinical assessment measures and developmentally-appropriate evidence-based management guidelines. In their review of the clinical management of sport-related mild traumatic brain injury in younger children, Kirkwood, Yeates & Wilson6 assert that this age group has not received adequate attention. Younger athletes may be distinguished from older athletes along several dimensions, including biomechanical properties of injury, variations in pathophysiological responses

Unique Issues
Symptom Assessment

- **Child as reporter of symptoms**
  - Symptom ID skill & reliability
  - Developmental differences in symptom ID

- **Parent/ teacher as natural observational source**
  - Tradition of parent/ teacher standardized ratings
  - Home ADL and School learning as natural data sources
<table>
<thead>
<tr>
<th>Item</th>
<th>Before the Injury/ Pre-Injury</th>
<th>Within the Past Few Days</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Complained of headaches</td>
<td>0 1 2 3 4 5 6 0</td>
<td>0 1 2 3 4 5 6 0</td>
</tr>
<tr>
<td>2. Complained of nausea</td>
<td>0 1 2 3 4 5 6 0</td>
<td>0 1 2 3 4 5 6 0</td>
</tr>
<tr>
<td>3. Vomited</td>
<td>0 1 2 3 4 5 6 0</td>
<td>0 1 2 3 4 5 6 0</td>
</tr>
<tr>
<td>4. Had balance problems</td>
<td>0 1 2 3 4 5 6 0</td>
<td>0 1 2 3 4 5 6 0</td>
</tr>
<tr>
<td>5. Appear or complained of dizziness</td>
<td>0 1 2 3 4 5 6 0</td>
<td>0 1 2 3 4 5 6 0</td>
</tr>
<tr>
<td>6. Had trouble falling asleep</td>
<td>0 1 2 3 4 5 6 0</td>
<td>0 1 2 3 4 5 6 0</td>
</tr>
<tr>
<td>7. Woke sleeping more than usual</td>
<td>0 1 2 3 4 5 6 0</td>
<td>0 1 2 3 4 5 6 0</td>
</tr>
<tr>
<td>8. Woke sleeping less than usual</td>
<td>0 1 2 3 4 5 6 0</td>
<td>0 1 2 3 4 5 6 0</td>
</tr>
<tr>
<td>9. Appear drowsy</td>
<td>0 1 2 3 4 5 6 0</td>
<td>0 1 2 3 4 5 6 0</td>
</tr>
<tr>
<td>10. Was sensitive to light</td>
<td>0 1 2 3 4 5 6 0</td>
<td>0 1 2 3 4 5 6 0</td>
</tr>
<tr>
<td>11. Was sensitive to noise</td>
<td>0 1 2 3 4 5 6 0</td>
<td>0 1 2 3 4 5 6 0</td>
</tr>
<tr>
<td>12. Was irritable</td>
<td>0 1 2 3 4 5 6 0</td>
<td>0 1 2 3 4 5 6 0</td>
</tr>
<tr>
<td>13. Appear sad</td>
<td>0 1 2 3 4 5 6 0</td>
<td>0 1 2 3 4 5 6 0</td>
</tr>
<tr>
<td>14. Acted nervous</td>
<td>0 1 2 3 4 5 6 0</td>
<td>0 1 2 3 4 5 6 0</td>
</tr>
<tr>
<td>15. Acted more emotional</td>
<td>0 1 2 3 4 5 6 0</td>
<td>0 1 2 3 4 5 6 0</td>
</tr>
<tr>
<td>16. Appear or complained of numbness or tingling</td>
<td>0 1 2 3 4 5 6 0</td>
<td>0 1 2 3 4 5 6 0</td>
</tr>
<tr>
<td>17. Appear or appeared slowed down</td>
<td>0 1 2 3 4 5 6 0</td>
<td>0 1 2 3 4 5 6 0</td>
</tr>
<tr>
<td>18. Appear or appeared mentally &quot;fogy&quot;</td>
<td>0 1 2 3 4 5 6 0</td>
<td>0 1 2 3 4 5 6 0</td>
</tr>
<tr>
<td>19. Had difficulty concentrating</td>
<td>0 1 2 3 4 5 6 0</td>
<td>0 1 2 3 4 5 6 0</td>
</tr>
<tr>
<td>20. Had difficulty remembering</td>
<td>0 1 2 3 4 5 6 0</td>
<td>0 1 2 3 4 5 6 0</td>
</tr>
<tr>
<td>21. Appear or complained of visual problems (blurry, double vision)</td>
<td>0 1 2 3 4 5 6 0</td>
<td>0 1 2 3 4 5 6 0</td>
</tr>
<tr>
<td>22. Appear more tired or atgued</td>
<td>0 1 2 3 4 5 6 0</td>
<td>0 1 2 3 4 5 6 0</td>
</tr>
<tr>
<td>23. Appear dazzled or stunned</td>
<td>0 1 2 3 4 5 6 0</td>
<td>0 1 2 3 4 5 6 0</td>
</tr>
<tr>
<td>24. Become confused with directions or tasks</td>
<td>0 1 2 3 4 5 6 0</td>
<td>0 1 2 3 4 5 6 0</td>
</tr>
<tr>
<td>25. Appear to move in a clumsy manner</td>
<td>0 1 2 3 4 5 6 0</td>
<td>0 1 2 3 4 5 6 0</td>
</tr>
<tr>
<td>26. Answer questions more slowly than usual</td>
<td>0 1 2 3 4 5 6 0</td>
<td>0 1 2 3 4 5 6 0</td>
</tr>
</tbody>
</table>

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

* No Difference: 0 1 2 3 4 5 6 0
* Major Difference: 9 1 2 3 4 5 6 0

Circle your rating with "0" indicating "Normal" (No Difference) and "9" indicating "Very Different" (Major Difference)
Over the past day...

Have you had headaches? Has your head hurt?
Over the past day…

Have you had headaches? Has your head hurt?

How much?

A Little?

A Lot?
Post Concussion Symptom Inventory
Total Score Serial Ratings

Parent
Child

Reporter

PreConcuss
Post Concuss 1
Post Concuss 2
Post Concuss 3
4. CONCUSSION MANAGEMENT

The cornerstone of concussion management is physical and cognitive rest until symptoms resolve and then a graded program of exertion prior to medical clearance and return to play. The recovery and outcome of this injury may be modified by a number of factors that may require more sophisticated management strategies. These are outlined in the section on modifiers below.
Treating the Student-Athlete

Student
- Developing School System Supports
- Manage Learning/ Return to Academics

Athlete
- Removal – When In Doubt, Sit Them Out
- Protect / Manage Recovery/Return to Play
Keys to Recovery

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

Ways to over-exert

- Physical
- Emotional
- Cognitive! (concentration, learning, memory)
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.

**Purpose of Care Plan**

Guide recovery

Educate

Manage exertional activity, safety
Mental/ Cognitive Rest?

- No prolonged concentration
- No prolonged homework
- No prolonged classes (block scheduling)
- No prolonged days
What is cognitive “rest?”

- The concept of cognitive exertional activity (and rest) viewed along a continuum of activity

No activity/full rest ← Full activity/no rest

- In reality, no cognitive activity/full cognitive rest not practical/likely (unless asleep or comatose)

- **Therapeutic goal** is to limit cognitive activity to a level that is tolerable, and does not exacerbate or cause the re-emergence of symptoms

- Cognitive Management
When Return to Play?
Criteria for RTP

- No longer have symptoms
  - No longer need medicine to control symptoms.
- Neurocognitive function & balance back to “normal.”
  - After rest and gradual activity (exertion)
- Cleared by medical professional.

**Zurich**: Recognition that the child/adolescent student-athlete may take longer, and we should proceed more cautiously
### Gradual Return-To-Play Protocol

<table>
<thead>
<tr>
<th>Rehabilitation Stage</th>
<th>Functional Exercise at Each Stage of Rehabilitation</th>
<th>Objective of Each Stage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. No activity</td>
<td>Complete physical and cognitive rest</td>
<td>Recovery</td>
</tr>
<tr>
<td>2. Light aerobic exercise</td>
<td>Walking, swimming or stationary cycling keeping intensity &lt;70% MPHR; no resistance training</td>
<td>Increase HR</td>
</tr>
<tr>
<td>3. Sport-specific exercise</td>
<td>Skating drills in ice hockey, running drills in soccer; no head impact activities</td>
<td>Add movement</td>
</tr>
<tr>
<td>4. Non-contact training drills</td>
<td>Progression to more complex training drills, eg, passing drills in football and ice hockey; may start progressive resistance training</td>
<td>Exercise, coordination, and cognitive load</td>
</tr>
<tr>
<td>5. Full contact practice</td>
<td>Following medical clearance, participate in normal training activities</td>
<td>Restore confidence and assess functional skills by coaching staff</td>
</tr>
<tr>
<td>6. Return to play</td>
<td>Normal game play</td>
<td></td>
</tr>
</tbody>
</table>

*British Journal of Sports Medicine 2009 43 (Suppl I) i76-i84.*
Summary

• Must improve early identification & diagnosis

• Careful individualized clinical assessment and tracking from time of injury
  • Acute Concussion Evaluation (ACE)
  • Neuropsychological, Balance Testing

• Implement active treatment in home & school
  • ACE Home & School Instructions, ACE Care Plan
Summary

- Relying on symptom assessment alone is relying on limited and possibly faulty information.
- Neuropsychological testing is sensitive and valid tool to help augment clinical evaluation and guide concussion management.
- Student-athlete should not return to play until symptom free & post-injury test results are normal at rest and after exertion.
- Familiarize yourself with Zurich Consensus and AAP guidelines.
Concussion Educational Materials

Heads Up: Concussion in High School Sports
Heads Up: Concussion in Youth Sports
Heads Up: Concussion in Your Practice
Heads Up to Schools: Know your Concussion ABCs

www.cdc.gov/concussion