



Concussion Management

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Overview

- * Diagnosis and treatment of concussions
- * Utah laws regarding return to play
- * New AAP guidelines
- * Our process for trying to create an algorithm for concussion management



<http://scienceline.org/wp-content/uploads/2008/04/concussion.jpg>

Case

- * 16-year-old female with concussion in October 2012 from ATV crash, momentary LOC
- * Headache one day later
- * Second concussion 1 month later when hit another player during soccer game
- * Fatigue, restless sleep, light and noise sensitivity
- * Poor academic performance in school
- * What to do?

Concussion Facts

- * Between 1.6 million and 3.8 million sports related concussions occur in the United States each year
- * Also known as mild traumatic brain injury (MTBI)
- * Classification systems for grading (1, 2, or 3)
- * Athletes often do not report concussions
- * More likely to occur in organized sports than leisure
 - * Up to 20% of football players get concussions each season

Concussion Facts



- * Sports-related concussions may be more common in girls than boys in similar sports
- * Boys often participate in higher risk sports such as football and boxing
- * High-school aged American football players have more concussions than college-aged players

<http://www.google.com/imgres?imgref=8&source=images&cd=3&ad=aja&uact=8&docid=5XBatoCAIw3eM&tbid=60kntj29E3XgnM&ved=0CAUQRw&url=http://www.momateam.com/2012/07/health/safety/22/concussions-safety/22/news-study-2012/concussions-in-sports-does-gender-matter&ei=JbkcU8HBLZLrAHK44DICQ8&v=62578316daVc&psig=AFQjCNHaDmlawkg15OfikP4McbEQAmQWQ&ust=139447728992965>

Pathophysiology

- * Direct or indirect biomechanical forces
 - * Acceleration—deceleration
 - * Rotational
- * Disruption of axonal neurofilament organization
- * Axonal swelling, degeneration, transection
- * Free radicals
- * Increased extracellular potassium
- * Increased intracellular sodium and calcium

High School Sports with Concussions

1. American football
2. Girls soccer*
3. Ice hockey
4. Boys lacrosse
5. Boys soccer*
6. Girls basketball
7. Wrestling
8. Girls lacrosse
9. Softball
10. Boys basketball
11. Volleyball
12. Baseball



<https://lh3.googleusercontent.com/-wfyysaQzFC8/TW0mdingGCI/AAAAAAAAABvY/YazyUvTW45I/s1600/Screen+shot+2011-03-01+at+11.01.12+AM.png>

*Heading of a soccer ball not necessarily found to be associated with concussions

Symptoms

- * Headache
- * Dizziness and imbalance
- * Nausea, vomiting
- * Fatigue
- * Difficulty sleeping
- * Blurry vision
- * Light and noise sensitivity
- * Hearing difficulties
- * Numbness
- * Seizures
- * Difficulties with attention or concentration
- * Depression, anxiety
- * Agitation, irritability, or aggression



http://www.uihealthcare.org/uploadedImages/UIHealthcare/Content/News_and_Events/Archive/2012/September_2012/concussion-clinic-banner.jpg?n=659

Diagnosis of Concussions

- * External force causing head injury with new onset of
 - * Transient confusion
 - * Disorientation
 - * Change in consciousness
 - * Amnesia
 - * Neurologic dysfunction
 - * Headache, dizziness, other symptoms

Red Flags

- * Worsening headache
- * Seizure
- * Difficult to awaken
- * Repeated vomiting
- * Slurred speech
- * Cannot recognize people or places
- * Increasing confusion
- * Weakness or numbness
- * Unusual behavior change
- * LOC for >30 seconds



Special Tests

- * ****Most tests need to have baseline to be most helpful****
- * Standardized Assessment of Concussion (SAC)
 - * Sideline measure of orientation, immediate memory, concentration, delayed recall, neurologic testing, and exertional maneuvers
- * Post-concussion Symptom Scale and Graded Symptom Checklist
 - * Scale from 0 to 6 for symptoms

Special Tests

- * Acute Concussion Evaluation (ACE)
- * Characteristics of injury
- * Types and severity of symptoms
- * Risk factors that can lead to protracted period of recovery

ACUTE CONCUSSION EVALUATION (ACE)
PHYSICIAN/CLINICIAN OFFICE VERSION
 Gerard Giola, PhD¹ & Micky Collins, PhD²
¹Children's National Medical Center
²University of Pittsburgh Medical Center

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

A. Injury Characteristics Date/Time of Injury _____ Reporter: Patient Parent Spouse Other _____

1. Injury Description _____

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 Lt Temporal Rt Temporal Lt Parietal Rt Parietal Occipital Neck Indirect Force

2. Cause: MVC Pedestrian-MVC Fall Assault Sports (specify) _____ 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 _____

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

PHYSICAL (10)		COGNITIVE (4)		SLEEP (4)	
Headache	0 1	Feeling mentally foggy	0 1	Drowsiness	0 1
Nausea	0 1	Feeling slowed down	0 1	Sleeping less than usual	0 1 N/A
Vomiting	0 1	Difficulty concentrating	0 1	Sleeping more than usual	0 1 N/A
Balance problems	0 1	Difficulty remembering	0 1	Trouble falling asleep	0 1 N/A
Dizziness	0 1	COGNITIVE Total (0-4) _____		SLEEP Total (0-4) _____	
Visual problems	0 1	EMOTIONAL (4)		Exertion: Do these symptoms worsen with: Physical Activity <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A Cognitive Activity <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> 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	
Fatigue	0 1	Irritability	0 1		
Sensitivity to light	0 1	Sadness	0 1		
Sensitivity to noise	0 1	More emotional	0 1		
Numbness/Tingling	0 1	Nervousness	0 1		
PHYSICAL Total (0-10) _____		EMOTIONAL Total (0-4) _____			
(Add Physical, Cognitive, Emotion, Sleep totals) Total Symptom Score (0-22) _____					

C. Risk Factors for Protracted Recovery (check all that apply)

Concussion History? Y <input type="checkbox"/> N <input type="checkbox"/>	Headache History? Y <input type="checkbox"/> N <input type="checkbox"/>	Developmental History	Psychiatric History
Previous # 1 2 3 4 5 6+	Prior treatment for headache	Learning disabilities	Anxiety
Longest symptom duration Days _____ Weeks _____ Months _____ Years _____	History of migraine headache Personal _____ Family _____	Attention-Deficit/ Hyperactivity Disorder	Depression
If multiple concussions, less force caused reinjury? Yes <input type="checkbox"/> No <input type="checkbox"/>		Other developmental disorder	Other psychiatric disorder

List other comorbid medical disorders or medication usage (e.g., hypothyroid, seizures) _____

D. RED FLAGS for acute emergency management: Refer to the emergency department with sudden onset of any of the following:
 * Headaches that worsen * Looks very drowsy/ can't be awakened * Can't recognize people or places * Neck pain
 * Seizures * Repeated vomiting * Increasing confusion or irritability * Unusual behavioral change
 * Focal neurologic signs * Slurred speech * Weakness or numbness in arms/legs * Change in state of consciousness

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

F. Follow-Up Action Plan Complete ACE Care Plan and provide copy to patient/family.
 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

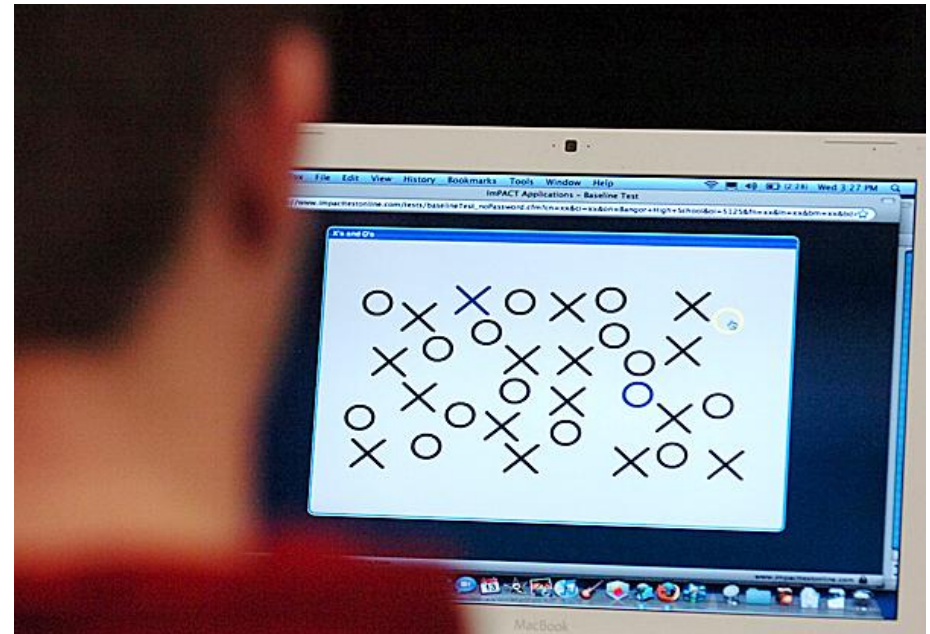
ACE Completed by: _____ © Copyright G. Giola & M. Collins, 2006
This form is part of the "Heads Up: Brain Injury in Your Practice" tool kit developed by the Centers for Disease Control and Prevention (CDC).

Special Tests

- * Sport Concussion Assessment Tool 2 (SCAT2)
 - * Subjective symptoms, GCS, SAC, evaluation of balance and coordination
 - * Endorsed by a Consensus Statement on Concussion in 2008
- * Westmead post-traumatic amnesia scale (WPTAS)
 - * Asks questions such as name, place, month, year, town, age, DOB, time

Special Tests

- * Immediate Postconcussion Assessment and Cognitive Testing (ImPACT)
- * Computerized test
 - * Memory (visual and verbal)
 - * Motor speed
 - * Reaction time
 - * Impulse control
 - * Symptom score



http://static.bangordailynews.com/wp-content/uploads/2010/01/1263600939_669b.jpg

Special Tests

- * Balance Error Scoring System (BESS)
- * Six 20-second trials of balance on ground and foam

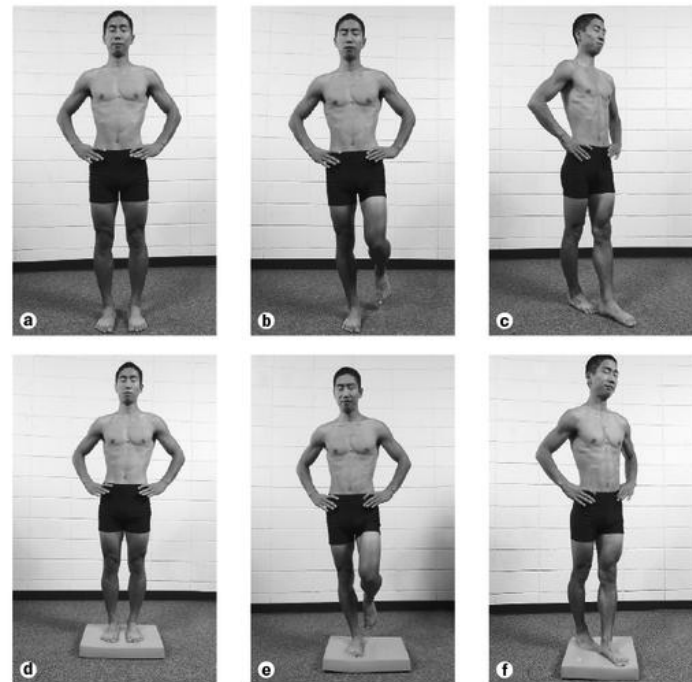


FIGURE 12.3 Balance error scoring system (BESS). Top row, firm surface condition. Bottom row, soft surface condition. Left column, parallel stance. Middle column, single-leg stance. Right column, tandem stance.

http://www.humankinetics.com/AcuCustom/Sitename/DAM/081/309_photos_Ma in.png

Prognosis

- * History of three or more prior concussions associated with three times more risk of future concussion and slower recovery
- * Second-impact syndrome may cause more problems when another concussion occurs without adequate recovery from prior
- * Post-traumatic sequelae
 - * Post-concussion syndrome
 - * Headaches
 - * Seizures
 - * Vertigo
 - * Cranial nerve injuries
 - * Chronic traumatic encephalopathy

Utah Law

- * In 2011, Utah State Legislature passed the Protection of Athletes with Head Injuries Act
- * Requires amateur sports organizations and schools (except ski resorts) to adopt and enforce a concussion and head injury policy and to get written approval of the policy by parents/legal guardians before their child participates in a sport activity
- * When head injury occurs, the child must be removed from play and may only return after written clearance from a qualified health care provider
- * Qualified health care providers must have taken a continuing education course in the evaluation and management of a concussion within the last three years

New AAP Recommendations

- * American Academy of Pediatrics published report in 2013 showing the need for **rest from school**
- * Need for academic adjustments
 - * Individualized education plan (IEP) commonly known as special education under the Individuals with Disabilities Education Act
 - * 504 plan under the Rehabilitation Act and ADA, provides a student not eligible for special education under IEP but needs accommodations in regular education
 - * Individualized health care plan – document created by school nurse made from information supplied by child's PCP

School Accommodations

- * Physical exertion
 - * No activity
 - * Laws dictate need to be taken out of game until cleared
 - * Return to play protocols

Graduated Return-to-Play Protocol

- * Stage 1 – Light aerobic exercise
- * Stage 2 – Sport-specific exercise
- * Stage 3 – Non-contact training drills
- * Stage 4 – Full contact practice
- * Stage 5 – Full contact in games

School Accommodations

- * Brain exertion
 - * Homework, after-school activities
 - * Reading, television, texting, computers
 - * Loud noise, music
- * Academic accommodations
 - * Time away from school
 - * Attendance, visual stimuli, workload, breaks, audible stimuli, testing, work



Return to School Plan

Stage	Hours per day	Frequency
1	2	Twice a week
2	2	Three times a week
3	4	Twice a week
4	4	Three times a week
5	4	Four times a week
6	6-8	Three times a week
7	8	Four times a week
8	8	Five times a week

Courtesy Bryan Bushman, PhD

Creating an Algorithm

- * All high schools have athletic trainers who can help with concussion testing and management
- * Other club groups and junior highs may not have the same resources
- * Multidisciplinary approach
- * Variety of practitioners can clear concussions but may not be up to date on the latest testing and laws

Creating an Algorithm

- * Goal:

- * To be able to tell parents where to send their children to get concussion testing and repeat follow up
- * How to deal with the majority of concussion cases that resolve within 1 month or less
- * Have a central location where testing and treatment can occur
- * Coordination with schools, teachers, coaches, parents

Creating an Algorithm

- * Possible global fee versus flat rate per visit
- * Whether to involve insurance companies because trainers cannot bill the same as physicians
- * How to not place too much burden on athletic trainers
- * Clearing children for play by trainers or physicians
- * How to involve other practitioners such as neuropsychologists

Creating an Algorithm

- * Have had meetings about logistics of creating a concussion center in Weber County
- * Athletic trainers located at physical therapy offices
- * Neuropsychologists can help with difficult cases

Complicated Cases

- * Neuropsychologists
 - * IQ test
 - * Working memory
 - * Processing speed
 - * Memory impairment
- * Visual therapy
 - * Computerized dynamic posturograph
 - * Ocular examinations
 - * Dynamic visual acuity tests
- * Speech therapy
- * Physical therapy
- * Vestibular rehabilitation
- * Behavioral optometry
- * Sleep medicine
- * Neurology
- * PM&R



http://www.upmc.com/media/media-kit/concussion/PublishingImages/High%20Res/Vestibular_Anne2.jpg

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