

Adolescent Update

The Missouri Department of Health and Senior Services (DHSS), Bureau of Special Health Care Needs has received the Traumatic Brain Injury (TBI) Implementation Partnership Project Grant. "The overall goal of the grant is to provide individuals with traumatic brain injuries and their families with improved access to comprehensive, multidisciplinary, coordinated and easily accessible systems of care".

One of the populations at highest risk for TBI is children and youth according to the Public Health Burden Report completed by the DHSS in March 2007. The Missouri Needs and Resource Assessment completed in 2004 identified that the lack of public awareness was a contributing factor to this population being underserved.

Dr. Dyck's article is an initiative of the grant in partnership with Council of Adolescent and School Health and Children's Mercy Adolescent Shorts to increase awareness about TBI signs and symptoms and best practices. For information about the TBI grant initiatives and partnerships contact Melody Boling, TBI Project Coordinator at Melody.Boling@dhss.mo.gov.

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Concussion in Sports

By David D. Dyck, Jr., DO, FAOASM

A concussion is a mild traumatic brain injury. It occurs when the brain experiences a blow to the head or a sudden violent rotational force. Any blow to the head which results in symptoms is considered a concussion. Because the brain is complex, every brain injury is different. Concussion results in physiologic changes in the brain metabolism (neuronal hyperexcitation) with subsequent decrease in cerebral blood flow. This increased metabolic demand and decreased energy supply create a "metabolic crisis" within the brain resulting in the common signs and symptoms manifest in concussion.

In the past, concussion severity was related to the presence or absence of loss of consciousness. It is not necessary to lose consciousness to have a concussion. Recent advances in the understanding of concussion have eliminated the familiar grading systems of the past and their dependence on loss of consciousness as criteria in determining severity. Recommendations now emphasize a retrospective determination of severity following patient recovery. Ninety percent of sports concussions are mild and resolve in 7-10 days if given a proper chance to recover. The remaining 10% may require 6 months to a year for full recovery.

Nearly 1.5 million head injuries occur in the United States each year. The Center for Disease Control estimates more than 20% of those injuries (>300,000) are sports-related concussions. More than 5% of high school athletes are concussed each year while participating in collision sports. The most common sports include football, ice hockey, soccer, wrestling, lacrosse, basketball, baseball, softball, field hockey, and volleyball. Risk of injury depends on game, position, and use of helmet.

Adolescent athletes have increased susceptibility to concussions related to immaturity of the central nervous system and lack of recognition of concussion. Many concussions go unreported because of failure to appreciate their seriousness. The old adages "Got your bell rung" or "Got the cobwebs cleaned out" trivialize this potentially serious condition. Make no mistake: a concussion is a brain injury!

The diagnosis of concussion is based on the presence of recognized symptoms during the clinical examination. A complete review of history including previous head injury or concussion with a comprehensive physical examination looking at neurocognitive function is essential to determine a starting point for recovery. The latest recommendations suggest precompetition neurocognitive testing to establish baseline brain function for later comparison in the event of concussion. The use of imaging studies continues to focus on serious sequelae associated with brain injury and not for establishing the diagnosis.

Understanding the signs and symptoms associated with concussion by parents, coaches, and athletes will greatly improve care for the injured athlete. The following table lists common signs and symptoms associated with concussion. Although not exclusive for concussion, in the presence of head injury their existence should be considered diagnostic of concussion.

Signs	Symptoms
Appears dazed	Headache
Confused about play	Nausea
Answers question slowly	Balance problems
Personality/behavior change	Double vision
Forgets plays prior to hit	Photosensitivity
Retrograde amnesia	Feeling sluggish
Anterograde amnesia	Feeling foggy
Loss of consciousness	Change in sleep pattern
	Cognitive changes

When head injury occurs, the most common question is when or if the athlete should be evaluated. The athlete will need to be evaluated by a physician comfortable with managing concussion before being allowed to return to competition safely. The following are indicators for physician evaluation.

- Loss of consciousness on the field
- Amnesia lasting longer than 15 minutes
- Deterioration of neurologic function*
- Decreased level of consciousness*
- Decrease or irregularity in respirations*
- Decrease or irregularity in pulse*
- Unequal, dilated, or unreactive pupils*
- Any signs or symptoms of associated injuries, spine or skull fracture, or bleeding*
- Mental status changes: lethargy, difficulty maintaining arousal, confusion, or agitation*
- Motor, sensory, balance or cranial deficits subsequent to initial on-field assessment
- Post concussion symptoms that worsen
- Additional post concussion symptoms as compared with those on the field
- Athlete is still symptomatic at the end of the game (especially at high school level)

*Require immediate transport to emergency department

Return to play is based on symptom-free participation in activity. The athlete is restricted from both physical and cognitive activity while experiencing symptoms. It is important the athlete understand the necessity for cognitive rest in addition to physical activity restriction. Following resolution of symptoms, a graduated program of physical activity is implemented to guide safe return. The stepwise progression is instituted beginning with light activity and progressing through moderate then heavy non-contact activities and finally full contact. If the athlete can perform the activity at the appropriate level without return of symptoms in 24 hours they are advanced to the next phase. Any return of symptoms during this period requires decreasing the level of activity to the previous symptom free stage for another 24 hours before reattempting to increase activity.

Rehabilitation Stage	Functional Exercise at Each Stage of Rehabilitation
No activity	Complete physical and cognitive rest
Light activity	Walking, light jogging, light stationary biking, light weightlifting (lower weight, higher reps, no bench, no squat)
Moderate activity	Moderate jogging/brief running, moderate-intensity stationary biking, moderate intensity weightlifting (reduced time and/or reduced weight from typical routine)
Heavy non-contact activity	Sprinting/running, high-intensity stationary biking, regular weightlifting routine, non-contact sport-specific drills
Full-contact practice	Following medical clearance, participate in normal training activities
Return to play	Normal game play

The importance of controlled return to participation is related to the brain's vulnerability during recovery. During the recovery period, the brain is vulnerable to a rare condition known as "second impact syndrome". During this period of vulnerability a second blow to the head, even a minor trauma, can result in rapid decompensation. It is thought that the autoregulatory control over cerebral blood flow is disrupted, leading to vascular engorgement and marked increase in intracranial pressure. This increase in pressure may ultimately lead to uncal herniation and death.

Those providing care for the athlete with concussion should be educated for proper management techniques and to avoid misconceptions on treatment. The following table is helpful for parents of athletes with concussion when implementing care immediately after concussion.

It is OK to:	There is NO need to:	Do NOT:
Use acetaminophen (Tylenol) for headaches	Check eyes with a flashlight	Drink alcohol
Use ice pack on head & neck as needed to comfort	Wake up every hour	Drive while symptomatic
Eat a light diet	Test reflexes	Exercise or lift weights
Go to sleep	Stay in bed	Take ibuprofen, aspirin, naproxen or other non-steroidal anti-inflammatory medications
Rest (no strenuous activity or sports)		

R E S O U R C E S

Heads Up: Concussion in Youth Sports website with information/handouts for coaches, parents, athletes and physicians
<http://www.cdc.gov/concussion/HeadsUp/youth.html>

Immediate Post-Concussion Assessment and Cognitive Testing (ImPACT) website information www.impacttest.com

Websites with information on neurocognitive testing for athletes
www.headminder.com www.cogstate.com/go/sport

Consensus Statement on Concussion in Sport: The 3rd International Conference on Concussion in Sport held in Zurich, November 2008
www.nata.org/jat/readers/archives/44.4/attr-44-04-434.pdf

The Missouri Greenbook: Living with Brain Injury
<http://www.dhss.mo.gov/SHCN/Publications.html>

Brain Injury Association of Missouri and resources
<http://www.biamo.org/Resources.asp>

Adolescent "SHORTS" is a bimonthly newsletter supported by the Missouri Department of Health and Senior Services about adolescent issues for Missouri providers. Any comments or suggestions are welcome and should be directed to either Daryl Lynch, MD or Patti Van Tuinen.



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Adolescent "SHORTS" is produced to advocate for and promote adolescent health and well being. Information contained in their newsletter is not a substitute for legal, medical or policy advice. Readers are urged to consult their own advisor about specific situations or questions.

Articles in *Adolescent "SHORTS"* refer to boys and girls. For simplicity, the pronouns "he" and "she" are used interchangeably unless otherwise noted.