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Sports-Related Concussion:
From the Sidelines to the Office

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While it may not garner as many sports page headlines (pardon the pun) as performance enhancing drugs or the orthopedic repair of a celebrity athlete's knee, sports-related concussion is an injury that will eventually present itself in the office of anyone who provides health care for young athletes.

Approximately 300,000 sports-related concussions are reported each year; the actual number is thought to be two to three times higher. Underreporting occurs for many reasons: The athlete's desire to not be removed from competition; the failure of coaches or parents to recognize the injury; the lack of health care providers on the sidelines who have appropriate training.

Recent studies of NCAA football players suggest that about 6% will suffer concussion in a given season. The risk is likely higher for younger athletes, given the relative immaturity of the nervous system and cerebral circulation, and the lower levels of skill in this population. Of course, concussion frequently occurs in other sports as well, including basketball, ice hockey, soccer, and wrestling.

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Symptoms of Concussion

While concussion may cause loss of consciousness, this is NOT always the case. Symptoms can include:

Physical symptoms

- Headache
- Dizziness
- Sensitivity to light
- Nausea

Cognitive symptoms

- Amnesia of events that happen before (retrograde) or after (post-traumatic) injury
- Confusion
- Difficulty concentrating
- Short-term memory and recall deficits

Emotional symptoms

- Tearfulness
- Giddiness
- Sharp mood swings

Concussions: Simple and complex

More than 25 grading scales for sports-related concussion have been published, but no prospective studies validate one scale over another. Recent guidelines for the management of sports-related concussion recommend against using these scales and their associated return-to-play guidelines. Rather, most experts agree that a simpler approach is to categorize concussions as either simple or complex.

Simple concussions account for nearly 90% of all sports-related concussions. Symptoms are often short-lived, although it may take as many as seven days for all symptoms to resolve. Simple concussions do not result in prolonged cognitive impairment, and can be managed with straightforward return-to-play guidelines (see below).

Complex concussions are defined by a prolonged symptom course, often longer than 10 days. Complex concussions may be associated with more worrisome clinical symptoms, such as loss of consciousness or amnesia. The clinical course may create enough concern that neuro-imaging is obtained; however, clinicians should remember that sports-related concussions are often a functional as opposed to structural injury. This means that imaging with CT or MRI rarely reveals findings of significance; the few findings that are discovered are usually incidental and unrelated to the concussion. Symptoms that indicate the need for neuro-imaging include:

- Loss of consciousness for longer than 5 minutes
- Worsening of such symptoms as headache or nausea
- Possible skull fracture
- Focal neurological signs

Management of concussion

Appropriate management of concussion starts on the sidelines. In the pediatric population, a conservative approach is advised. Whenever concussion is suspected, the athlete should immediately be removed from competition, and NOT return to competition until he or she has been symptom-free for at least 24 hours. Any concussed athlete should be evaluated by their healthcare provider or team physician prior to beginning a gradual return-to-play program.

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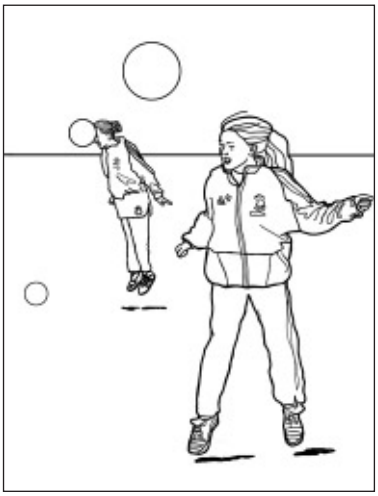
Second impact syndrome. One reason for a conservative approach is to avoid second-impact syndrome. A rare and somewhat controversial diagnosis, second-impact syndrome has been reported in young athletes who suffer a second concussion before the symptoms of the first concussion have completely resolved. The clinical course entails a rapid progression of neurological deterioration that almost uniformly results in coma and brain death. Research with animal models suggest that younger athletes may have immature regulation of cerebral blood flow in the face of recurrent injury, which may ultimately lead to increased intracranial pressure and the clinical course described.

Sideline care

Sideline assessment of the athlete should include questions that test orientation, short-term memory and recall, and concentration. Questions can be tailored to the athletic event itself, such as asking the athlete to give the location of the current game, the current game scenario, the most recent series of plays, and who scored last. Concentration can be tested by having the patient count backward by 7s, starting at 100, or recite the months of the year in reverse order, although a significant number of young athletes will have difficulty with these tests at baseline. Any sideline assessment is at best a tool to aid the health care provider's judgment and not an absolute measure of function.



Symptoms of concussion should be documented during the sideline assessment to provide a benchmark for future evaluation. Athletes should be reassessed frequently on the sideline, as often as every 5-10 minutes. Any athlete with highly concerning findings, such as prolonged loss of consciousness or focal neurological signs, should be immediately referred for evaluation. At the 30-minute mark, any athlete whose symptoms have not abated in severity or seem to be worsening should be referred for evaluation.

Return-to-Play Guidelines

The following guidelines for return-to-play, recommended by international consensus statement guidelines on sports concussion, are used by most sports medicine specialists. Each step in the protocol takes 24 hours, and if an athlete has a recurrence of symptoms, they are required to stop the protocol until the athlete is asymptomatic for another 24 hours. Then the protocol is restarted one step prior to where it was when the symptoms recurred. This protocol calls for:

- No activity until 24 hours without symptoms
- After 24 hours without symptoms: Light aerobic activity only (treadmill, stationary bike)
- After 48 hours without symptoms: Moderate speed, sport-specific activities (position drills)
- After 72 hours without symptoms: Non-contact, scrimmage, or game-scenario activities
- After 96 hours without symptoms: Medical evaluation before resuming full-contact activities
- Ongoing monitoring for return of symptoms

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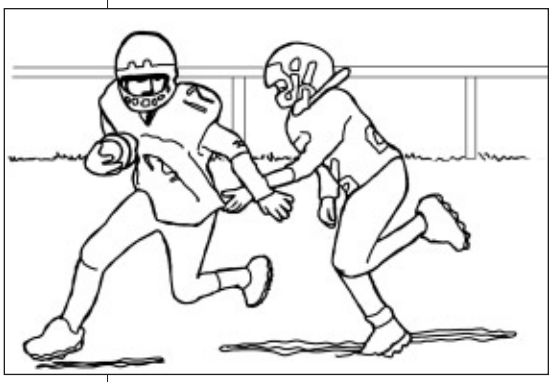
Implementing this return-to-play protocol is facilitated by having a full sports medicine team. In the absence of a full-time athletic trainer at school, a health care provider may give written instructions describing the protocol to the athlete's coach and parents, and use a combination of their reports and office visits to make a return-to-play decision.

Fortunately, most concussions fully resolve within seven days, and most can be managed by the athlete's primary care provider. Athletes with prolonged symptoms, especially cognitive impairment, and athletes with a history of multiple concussions should be referred for further evaluation by a specialist with experience in managing sports-related concussions.

Research

Research in concussion management may one day provide more accurate assessment of brain injury and prognosis for recovery. Studies are investigating the correlation of functional MRI and PET scans with specific tests of cognitive function. Athletic teams are employing neuro-psychological testing more frequently for baseline assessments of cognitive function. While computerized versions of such testing make it more available, costs and the lack of trained personnel are obstacles for many community school systems.

Evidence is accumulating that the effects of multiple concussions are additive, and that a history of multiple concussions increases the risk of future concussions. While a definite "cutoff" number of concussions for removal from sport does not yet exist, a history of multiple concussions may warrant a discussion of the appropriateness of continuing in a particular sport. Evidence from studies of genetic markers and traumatic brain injury may also provide future information for an athlete's risk of sports-related concussion and potential long-term effects.



For now, providers should use a conservative approach in caring for the patient with sports-related concussion. Pediatric and adolescent athletes who have been concussed should be withheld from competition for the remainder of the day and should not return to play until all symptoms have resolved and a protocol of gradually increasing activities is completed. While most concussions will resolve within a week, a significant percentage will result in prolonged symptoms that may include cognitive impairment. Health care providers should be diligent in identifying complex concussion and referring patients with this condition for appropriate evaluation and management.

A Guide to Concussion for Parents and Young Athletes

Having your bell rung. Getting dinged. Seeing stars. We minimize concussions -- and we shouldn't.

What is a concussion?

A concussion is a brain injury caused by a blow to the head. Concussions are most common in football, ice hockey, and soccer, but occur in many other sports as well. Athletes of all ages suffer concussions.

How serious is a concussion?

Concussions are more serious in young athletes than in adults. The effects of a concussion vary from child to child. Some result in minor, temporary effects. Others cause permanent disability and even death. It is very important to get proper care for a young athlete who has received a concussion.

Is it true that a concussion is serious only if it causes unconsciousness?

No. A person – child or adult – can have a serious brain injury and never lose consciousness.

Your child has been sidelined following a hit. How worried should you be?

Be concerned if your young athlete doesn't remember what happened just before or after the hit, seems confused, or cannot answer questions like "Who are we playing tonight? What play were you running? Who scored last? Can you name the months in reverse order? Count backward from 100 by sevens?"

You are a young athlete who has just taken a blow to the head. What symptoms should you tell your coach or parent about right away?

Headache
Problems with balance, movement
Fuzzy or double vision
Nausea
Sensitivity to light, sounds
Feeling spacey, groggy
Drowsiness
Ringing in your ears

As a parent, what should you do on the sidelines if concussion is a possibility?

Don't let your youngster return to play. Get immediate medical attention if your youngster is unconscious for more than 5 minutes, or has severe symptoms. Assess your child's symptoms every 5-10 minutes. If they are getting worse, or continue for 30 minutes, get medical attention. Remember that you are responsible for safeguarding your child's health. Sometimes this will require stepping in to take your child out of a game.

What should you as a parent do if concussion is confirmed?

Give your child's brain time to heal. Follow your primary care provider's guidance, and monitor your young athlete carefully. Insist that return to play follows a gradual process that is overseen by your family health care provider. Seek medical attention if symptoms return or worsen.

What is second-impact syndrome?

This syndrome has been reported in young athletes who suffer a second concussion before an earlier concussion has healed. Research suggests that immature brains may have trouble regulating blood flow in the face of repeated injury, and this can result in coma and brain death.

What symptoms may appear over time?

Symptoms of concussion that can develop over time include difficulty with:

Paying attention
Fatigue
Irritability
Short-term memory and recall
Changes in sleep patterns
Inability to solve problems
Mood swings, weepiness
Personality changes
Learning disorders

A young athlete should not return to play until these symptoms are gone.

How soon can your youngster return to play following concussion?

Returning too soon can place a young athlete at real risk. It is important that return to play be gradual and carefully monitored. A young athlete should not return until free of symptoms for 24 hours. Then:

- After 24 hours without symptoms: Light aerobic activity only (treadmill, stationary bike)
- After 48 hours without symptoms: Moderate speed, sport-specific activities (position drills)
- After 72 hours without symptoms: Non-contact, scrimmage, or game-scenario activities
- After 96 hours without symptoms: After medical evaluation, full-contact activities

If at any point symptoms reappear, stop all activity. When the athlete has been free of all symptoms for 24 hours, begin the process again at a point one step before where the child was when symptoms recurred.

Should you tell coaches and health care providers about past concussions?

Be sure to tell coaches if your child has ever had a concussion. That way, they can help your youngster avoid additional injury by providing appropriate safety gear and coaching the team in playing by the rules. You should also tell your family's health care providers about any previous concussion, so that they can provide appropriate care and guidance to you and your child.

Conditions that Affect Sports Participation

DO NOT LIMIT SPORTS PARTICIPATION

Diabetes, well-controlled
Congenital heart disease, mild and well-controlled
Sickle cell trait
Asthma, well-controlled with no indication of pulmonary insufficiency
Ovary, absence of one
Testicle, absent or undescended (use protective cup in contact sports)
Seizure disorder, well-controlled
HIV (with appropriate precautions regarding body fluids)

SIGNIFICANTLY LIMIT OR PROHIBIT SPORTS PARTICIPATION

Acute illness that is contagious or will worsen with participation
Fever
Carditis (inflammation of the heart)
Sickle cell disease - No contact or collision sports
Pulmonary insufficiency (unsatisfactory oxygenation during graded stress test)
Spleen, acute enlargement
Skin disorders that are contagious (boils, herpes, impetigo, scabies)
Seizure disorders that are poorly controlled -- No archery, climbing or sports involving heights, power lifting, riflery, scuba diving, strength training, swimming, weight lifting
Diarrhea, moderate to severe
Liver, acute enlargement

MAY LIMIT SPORTS PARTICIPATION
Students require individual assessment

Organ transplant
Cancer
Diabetes, poorly controlled
Heat-related illness, history of
Bleeding disorders
Heart disease, moderate or postoperative
Hypertension
Sickle cell disease - May participate in non-contact sports
Asthma, uncontrolled, with pulmonary insufficiency
Cystic fibrosis
Musculoskeletal disorders, sprain, overuse, fracture, disease, etc.
Atlantoaxial instability (instability of vertebra in neck, may occur in Down syndrome)
Cerebral palsy
Spleen, chronic enlargement
Amenorrhea, other menstrual cycle disorders
Kidney, absence of one
Spine trauma
Head trauma, concussion, craniotomy (surgery involving the skull), other head injury
Eye injury or previous surgery; loss of function in one eye – May participate if uses eye guard;
Detached retina - Consult ophthalmologist
Eating disorders, anorexia or bulimia
Liver, chronic enlargement
Obesity

FOR MORE INFORMATION

on the topics below, visit the American Academy of Pediatrics at http://www.aap.org/healthtopics/sports.cfm

- Ankle sprains
- Cardiac dysrhythmias
- Disability and sports training
- Eyewear, protective
- Female athlete triad
- Female athletes, health issues
- Finger injuries
- Head injuries
- Heat stress and heat-related illness
- Health issues in specific sports: Baseball, inline skating, swimming, boxing, softball, trampolines, ice hockey, soccer, wrestling
- HIV and other blood-borne viral pathogens
- Hypertension, systemic
- Intensive training and sports specialization
- Knee pain
- Medical conditions affecting sports participation
- Nutrition
- Organized sports for children
- Sports physical evaluation form (PDF)
- Steroid use
- Strength training
- Weight control, healthy

Coming Your Way...

Iowa's Healthy Mental Development Initiative for Young Children (ABCD II)

A promising pilot program to promote healthy mental development of young children is on its way to a successful conclusion at the end of this year. Preliminary data from demonstration sites shows:

- More children are getting effective developmental and mental health screening
- Health care providers are reporting that through the pilot program they are able to provide better care, and that they are planning to continue these screening practices in the future

Called the Iowa Healthy Mental Development Initiative for Young Children, this program is supported by an ABCD II grant from the National Academy for State Health Policy and the Commonwealth Fund. The initiative approaches developmental services for children birth through age 3 through a three-level system of care: At the first level are services for all children; at the second, services for children at risk; and at the third level, services for children with a diagnosed condition.

Proposed standards of care

http://www.iowaepsdt.org/ScreeningResources/Standards.htm

HCMN forms

http://www.iowaepsdt.org/ScreeningResources/clinNotesForms.htm

The first goal of the initiative is to build the capacity of primary health care providers to deliver better screening, identification, and developmental services for young children. Pilot sites applied Iowa's proposed standards for the identification of developmental and social-emotional problems, and tested Iowa's new Health Maintenance Clinical Notes (HMCN) as a part of each child's exam. These age-appropriate HCMNs include:

- A concise tool to facilitate review of developmental milestones
- Questions to help identify autism, behavior issues, and parent risk factors
- Topics to be included in anticipatory guidance

A second goal of the Healthy Mental Development Initiative is the testing of model public-private partnerships to link at-risk children and families to services. A strategy that shows real promise is a "hot line" health care providers can call for prompt assistance with referrals for at-risk children.

Learn more about the Iowa Mental Development Initiative for Young Children and proposed standards in the next issue of the EPSDT Care for Kids Newsletter.

What's in this issue

If you have questions about **billing** related to EPSDT Care for Kids services, please call Provider Services: **1-800-338-7909**

If you have questions about **clinical issues** and EPSDT Care for Kids services, please call **1 -800-383-3826**

Please note: Due to budget restraints, the *EPSDT Care for Kids Newsletter* is sent to offices and organizations, rather than to individuals.

The newsletter is also available online at http://iowaepsdt.org/EPSDTNews/

The **EPSDT Care for Kids Newsletter** is published three times a year, in print and online, as a joint effort of the Iowa Prevention of Disabilities Policy Council, the Iowa Department of Human Services, the Iowa Department of Public Health, and the Center for Disabilities and Development, which is nationally designated as Iowa's University Center for Excellence on Disabilities. The goal of this newsletter is to inform Iowa health care professionals about the EPSDT Care for Kids program, to encourage them to make use of this important resource, and to provide them with information about a wide range of developments in the field of health care.

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