

## **CONCUSSION INFORMATION - When in Doubt, Sit Them Out!**

A concussion is a type of mild traumatic brain injury, or mTBI, caused by a bump, blow or jolt to the head or by a hit to the body that causes your head and brain to move rapidly back and forth. This sudden movement causes the brain to bounce around or twist inside the skull, stretching the brain cells which in turn causes chemical changes in the brain. These chemical changes lead to an energy crisis in the brain causing the signs and symptoms we associate with concussion and making the brain more sensitive to stress from school, video games, and emotions.

Medical providers describe a concussion as a 'mild' traumatic brain injury because concussions are usually not life threatening. It is important to recognize that loss of consciousness is not required to have a concussion. In fact, less than 10% of athletes lose consciousness, and if there is a loss of consciousness, it does not necessarily indicate a more severe injury or increased risk for worse outcomes. Even though concussions are called a "mild" traumatic brain injury, the effects of a concussion need to be taken seriously as improper management can lead to prolonged symptoms, permanent functional deficits, and in rare cases, death.

Concussion is a functional injury, not a structural injury. This means that concussion will not show up on MRI or CT scan and these are not recommended for care of most concussions. However, imaging studies might be needed to rule out worse injury, like a skull fracture or brain bleed.

Most concussions will completely resolve and not leave any residual problems or deficits. Younger athletes will take longer than adult athletes to recover from a concussion but often recover within 4 weeks. However, research does show that 20% of adolescents with concussion may take longer than a month to recover. Here are some other differences between middle school/high school athletes and adults with concussion:

- 1) Youth and adolescents appear to have a higher risk of sustaining a concussion.
- 2) Most youth sports, from recreational activity to club sports to school sports, do not have the benefit of an athletic trainer. Thus, the athletes, coaches and parents assume the largest responsibility for identifying a possible concussion.
- 3) Research has shown that youth and adolescents can also be reluctant to admit their symptoms to avoid being removed from play and because young athletes are afraid to let down their parents or coaches.

Based on recent high school injury surveillance information, the following sports have moderate to higher risk of concussion: football, boys' & girls' ice hockey, boys' & girls' lacrosse, boys' & girls' soccer, wrestling, boys' & girls' basketball, girl's field hockey, and softball. It appears that girls' have a higher risk of concussion than boys. Importantly, concussion can happen to anyone in any sport or even to individuals who are not involved in sports. Concussions can also occur in physical education class, on the playground, while skiing or snowboarding, or when involved in a motor vehicle collision.

Allowing an injured athlete to return to sport before fully recovered may increase the risk for repeat concussion and/or prolonged recovery. Repeat concussion may also cause Second Impact Syndrome; which is a rare phenomenon that happens only in young athletes that can cause rapid brain swelling and death. Although multiple concussions may increase the chance of long term problems, like chronic headaches and decreased function, there is no "magic number" for these outcomes.

Concussions present with a variety of different signs and symptoms. Signs are what can be seen by others, like unsteadiness and slow response to questions, whereas, symptoms are how the injured athlete feels, like headache and dizzy. The following are a list of common signs and symptoms categorized into 4 different categories: physical, cognitive/thinking, emotional, and sleep/energy.



## MANAGEMENT

Everyone involved with youth sports must be alert for potential injuries on the field and be able to recognize signs and symptoms of concussion. While coaches are not expected to make a diagnosis of concussion, coaches should be aware that their athletes may have a concussion. Thus, it is important for clubs sports and schools to educate their athletes, coaching staff and parents in the preseason about the seriousness of concussion and the importance of athletes honestly reporting their symptoms and injuries.

Remember, most concussions do not result in an athlete dramatically stumbling around the playing field or result in the athlete being knocked out. Most athletes appear physically "normal". Since athletes may not always report their injury or symptoms, always ask questions and interact with the athlete after a possible injury. If you **suspect** a player may have a concussion, the responsibility is simple: that athlete should be immediately removed from play. **"When in doubt sit them out."** The injured athlete should be kept out of play until they are cleared to return by an appropriate health care provider. It is important to also notify a parent or guardian when an athlete is thought to have a concussion.

If the athlete has a concussion, that athlete should never be allowed to return to activity (conditioning, practice or competition) that day. Athletes with a concussion should never be allowed to return to activity while they still have symptoms.

Some injured athletes will require emergency care. Anytime you are uncomfortable with an athlete on the sideline, it is reasonable to activate the Emergency Medical System (911). The following are reasons to activate EMS, as any worsening signs or symptoms may represent a medical emergency:

- 1) Loss of consciousness
- 2) Decreasing level of alertness or unusually sleepy
- 3) Severe or worsening HA
- 4) Seizure
- 5) Persistent vomiting
- 6) Symptoms that are progressively worsening

A player with a concussion must be carefully observed throughout that practice or competition to be sure the player does not get worse. Even though the athlete is not playing, never send a concussed athlete to the locker room alone and never allow the injured athlete to drive home.

A major concern with concussion in students is that it can interfere with school performance. The difficulty with focus and concentration may temporarily turn a good student into a poor student. A Return to Learn (RTL) program will help students, families and schools reduce the problems associated with returning to the classroom after a concussion. While students are expected to be fully recovered before returning to sport, we cannot expect a student to stay out of school until they are fully recovered and therefore it is important to understand that students will have symptoms when they return to school. The goal during concussion recovery is to avoid overexerting the brain to the level of significantly worsening symptoms so determining the appropriate balance between how much cognitive exertion and rest is needed is the hallmark of the management plan during cognitive recovery. A RTL program includes strategies for getting students back to full days of school and academic adjustments to keep kids learning, not let grades fall, and allow for recovery. These adjustments may include scheduled breaks, extra time to complete homework and tests, eliminating unnecessary make-up work, pre-printed notes, and access to tutoring. PE class is not allowed until the student is fully recovered.

Concussion symptoms may vary from student to student and even from concussion to concussion in the same individual who sustains more than one concussion.

Therefore, a “cookie cutter” approach to managing a concussion and a return to the classroom cannot be applied. However, most of the difficulties that arise in students can be handled with similar adjustments, depending on the signs or symptoms they are experiencing. Regular communication among the school, coaches, and parents is helpful in setting expectations and keeping recovery moving in the right direction. Teachers and those on the school academic “team” should reassess progress at weekly intervals to determine the effectiveness and continued need of academic adjustments.



It is also important to remember that the athlete’s concussion can interfere with work and social events (movies, dances, attending games, etc.). Because many young athletes are highly socially connected through their electronics and social media, blanket recommendations to have

young athletes with a concussion completely avoid the use of electronics, computers, television, and texting is discouraged. Individuals who have light sensitivity or oculomotor dysfunction may find their symptoms worsen while using electronics and may need to limit their overall screen time, adjust brightness levels, or increase font sizes to reduce episodes of symptom worsening. A complete elimination of electronics may result in feeling socially isolated from friends, which may lead to depressive or anxious symptoms.

Sleep can also be impacted by concussion, some kids will struggle to fall asleep while others will sleep too much. In the early stages of recovery, an athlete may need to nap but we recommend napping no longer than 30-45 minutes at a time. Parents should try to maintain the child's normal sleep schedule and they should be aiming for 8-10 hours of sleep per night.

The first day or two after injury, patients should also rest from any physical activity. Allowing 15 to 30 minutes of light aerobic activity (walking or low level stationary biking) that does not worsen symptoms may be helpful. However, never allow contact, collision, or any high risk activities (skiing, skateboarding, etc.) until medically cleared. For sports, Children's Hospital of Wisconsin Concussion Program recommends that athletes are not allowed to observe practices until back at full school/academics.

Computerized concussion testing has become more common in concussion management. This is a type of neuropsychological testing, or a way to measure brain functioning. Written or formal neuropsychological testing can also be very helpful, however, it is important to remember that this is only a tool that can help providers evaluate treatment plans and ensure safe return to activity. Neuropsychological testing cannot stand alone as the only decision maker in concussion management.

If computerized neuropsychological testing is available, ideally a baseline or pre-injury test is obtained prior to the season. This baseline should be done in a quiet and distraction-free environment when the athlete is well rested. Ideally baseline testing is done every 1 to 2 years in youth and adolescent athletes as they are rapidly developing brain function. Without a baseline test, the injured athlete's scores may be compared to age-based norms. A complete baseline evaluation should include multiple assessments including eye tracking, neuropsychological or computerized testing, and balance testing. The more pre-injury information that is obtained, the more safely providers can make return to play decisions.

## **RETURN TO PLAY**

Current recommendations require a stepwise return to play program as described below. In order to resume athletic activity past Step #2 of the return to play protocol, the athlete must be **symptom free** and off any pain control or headache medications. The athlete should be carrying a full academic load without any significant adjustments. Finally, the athlete must have clearance from an appropriate health care provider.

Athletes with multiple concussions and athletes with prolonged symptoms often require a very different return to activity program and should be managed by a physician that has experience in treating concussion.

The following program allows for one step every 24 hours. The program allows for a gradual increase in heart rate/physical exertion, coordination, and then allows contact. If symptoms return during exertion, the athlete should stop activity and notify their healthcare provider before progressing to the next level.

**STEP #1:** Symptom-limited activities of daily life (school and walking).

STEP #2: Light aerobic exercise: 15-30 minutes on an exercise bike or light jogging. No weight lifting, resistance training, or any other exercise outside of this.

STEP #3: Moderate aerobic exercise: 20-40 minutes of running/biking at moderate intensity in the gym or on the field. Attempt interval workouts alternating sprinting/jogging, etc. No helmet or other equipment.

STEP #4: NON-CONTACT agility/sports specific drills: May begin weight lifting, resistance training, aerobic conditioning and all other noncontact exercise if no return of symptoms. May wear helmet but no additional equipment at this step.

STEP #5: Full contact practice or training in full equipment.

STEP #6: Full game play, no restrictions.

## **PREVENTION**

All schools and clubs should have Emergency Action Plans for every sport and field. This covers what to do for an allergic reaction, severe asthma attack or an athlete that collapses. They should also have a Concussion Action Plan that details what happens if an athlete is injured and the steps needed to allow for return to play. Examples of these can be provided by the Children's Hospital of Wisconsin Sports Medicine and Concussion Programs.

While concussions cannot be absolutely prevented, improving awareness through education is helpful and can reduce the risk of problems associated with concussion.

- Always report any possible injury immediately
- While protective equipment does not reduce concussion risk, it should always be worn and fitted properly. Helmets do reduce the risk of skull fractures and mouth guards do reduce the risk of dental injury.
- Teach proper technique for play and avoid leading with helmet for contact.
- Follow the rules of play and penalize illegal contact.

We encourage every sports organization and school to promote concussion education and bring about a positive change in concussion culture by discussing this topic with all teachers, coaches, athletes and parents.

Further reading and additional education material can be obtained through the following websites:

[www.chw.org/concussion](http://www.chw.org/concussion)

[www.wiaawi.org](http://www.wiaawi.org)

<https://www.nfhs.org/sports-resource-content/nfhs-concussion-course/> (concussion education program)

<https://www.cdc.gov/headsup/highschoolsports/index.html> (Heads Up program)