

Head Injuries and Concussion

When in Doubt, Sit Them Out!

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BACKGROUND

A concussion is a type of traumatic brain injury that interferes with normal function of the brain. All concussions are brain injuries. The WIAA recommends avoiding the use of nicknames like “ding” or “bell ringer” to describe concussion as those terms minimize the seriousness of concussion.

A concussion is most commonly caused by a direct blow to the head, but can also be caused by a blow to the body. Even what appears to be a mild blow to the head or body can result in a concussion. It is important to know that loss of consciousness is not required to have a concussion. In fact, less than 10% of athletes lose consciousness.

A concussion is a complex physiologic event that causes problems with brain functioning (energy use and communication between nerves), but does not cause swelling or bleeding that affects brain structure. Therefore, CT/CAT scan and MRI are usually normal in athletes with concussion. Imaging studies are not indicated for most concussions, but may be needed in some instances to rule out more severe injuries, like brain bleeds.

Research has shown that concussion in the adolescent age range takes longer than previously thought to recover, with 20-30% of high school athletes taking over 4 weeks to fully recover. Athletes must be fully recovered before considering medical clearance to return to full participation.

There are unique concerns surrounding concussion in high school sports:

1. Adolescents get concussions more often than collegiate and professional athletes
2. Adolescents take longer than adults to heal from concussion
3. Most high schools may not have access to a team physician or an athletic trainer for all of their teams & activities, thus the responsibility for identifying a possible concussion falls on athletes, coaches and parents
4. High school players may try to hide symptoms or be reluctant to admit their symptoms due to fear of removal from play

High school injury surveillance research has shown the following sports have higher risk of concussion: Football, Boys & Girls Soccer, Boys & Girls Ice Hockey, Boys & Girls Lacrosse, Boys & Girls Wrestling, Girls Field Hockey, Competitive Cheer, and Girls Basketball.

Noticeable in this data is that the risk for girls is higher than boys in the same sports; in fact, soccer & basketball carry twice the risk for concussion in girls than boys. It is unclear why girls appear to have a higher risk of concussion.

Most importantly, concussion can happen to anyone in any sport. Concussions also occur away from organized school sports: physical education class, on the playground, while skiing or snowboarding, and when involved in a motor vehicle collision. Coaches and athletic trainers need to be aware of non-sport injuries and how they affect participation.

Everyone involved with high school athletics 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 are expected to be aware of possible injuries and understand that their athletes may have a concussion. **Any athlete with a suspected concussion should be held out of all activity until medically cleared by a healthcare provider.** It is important for athletes and coaches to communicate possible injuries to the athletic trainer, parents, and teachers.

Schools should educate their athletes, coaches and parents in the preseason about the seriousness of concussion and the importance of athletes honestly reporting their symptoms and injuries. This education should also include information on the school policy (supported by state law and WIAA guidance) on the steps an athlete with a concussion must complete to return to participation. The information is best delivered at preseason meetings, but also reinforced throughout the season.

SIGNS AND SYMPTOMS

Signs are what can be seen by others, like clumsiness / stumbling off the field. Symptoms are what the injured player feels, like a headache. Remember, athletes should report their symptoms, but they may not unless they are directly asked about how they feel. Even then, it is important to consider that athletes may not be telling the truth.

These are some SIGNS of concussion (what others can see in an injured athlete):

- Dazed or stunned appearance
- Change in the level of consciousness or awareness
- Confused about assignment

- Forgets plays
- Unsure of score, game, opponent
- Clumsy
- Answers more slowly than usual
- Shows behavior changes
- Loss of consciousness
- Asks repetitive questions or memory concerns

Concussion SYMPTOMS are often categorized into four main areas:

1. Physical – This describes how they feel: headache, nausea, vomiting, dizziness, tired and loss of consciousness (which is uncommon in concussion). Vision and balance problems are also recognized as potential signs and symptoms of a concussion.
2. Thinking or Cognitive – Poor memory and concentration, responds to questions more slowly and asks repetitive questions. Concussion can cause an altered state of awareness and thinking.
3. Emotions- A concussion can make a person more irritable or sad and cause mood swings.
4. Sleep – Concussions frequently cause trouble falling asleep and may wake athletes up overnight, which can make them more fatigued throughout the day.

Injured athletes can exhibit many or just a few of the signs and/or symptoms of concussion. However, if a player exhibits any signs or symptoms of concussion, the responsibility is simple: remove them from participation. A student-athlete should never return to play on the same day. **“When in doubt sit them out.”**

It is important to notify a parent or guardian of any student-athlete with a suspected concussion. All student-athletes with a concussion must be evaluated and receive written medical clearance by an appropriate health care provider before returning to practice (including conditioning and weight lifting) or competition.

Some injured student-athletes may require emergency care & necessitate the activation of the Emergency Medical System (911). If you are uncomfortable with the athlete on the sideline or unable to ensure they are going home to a safe environment, it is reasonable to activate EMS/911. The following are other examples to activate EMS:

1. Loss of consciousness, as this may indicate more severe head injury
2. Concern for cervical spine injury
3. Worsening symptoms
4. Decreasing level of alertness
5. Unusually drowsy
6. Severe or worsening headaches
7. Seizures
8. Vomiting
9. Difficulty breathing

MANAGEMENT

If you **suspect** a player may have a concussion, that student-athlete should be immediately removed from play. The injured student-athlete should be kept out of play until they are cleared to return by an appropriate health care provider. If the athlete has a concussion, that athlete should never be allowed to return to activity (conditioning, practice or competition) that day. Student-athletes with a concussion should never be allowed to return to activity while they still have symptoms.

A player with a concussion must be carefully observed throughout the practice or competition to be sure they are not feeling worse. Even though the athlete is not playing, never send a concussed athlete to the locker room alone, as the athlete might not have the wherewithal to understand and report worsening symptoms. Do not allow the injured athlete to drive themselves home.

Most concussions are temporary and will completely resolve without causing residual or long-term problems. About 20-30% of high school athletes will take longer than a month to recover. This prolonged recovery is commonly known as Post-Concussion Syndrome (PCS). Common PCS symptoms include headache, difficulty concentrating, poor memory, mood changes and sleep disturbances. This prolonged recovery often leads to academic troubles, family and social difficulties.

Allowing an injured athlete to return too quickly increases the risk for repeat concussion. Repeat head injury while still recovering from a concussion may cause Second Impact Syndrome. This is a rare phenomenon occurring in young athletes that leads to rapid brain swelling, brain damage and potentially death (50% of cases).

Repeat concussions may increase the chance of long-term problems, such as decreased brain function, persistent symptoms and potentially chronic traumatic encephalopathy (CTE), a disorder that causes early degeneration of the brain. It is felt that these long-term complications are very rare in high school athletes, and the risk can be minimized by proper

reporting and care of every concussion. The development of CTE is still an unclear pathway that requires more research.

Return to Learn

A major concern in high school student-athletes is that concussion can negatively affect school performance and grades. Symptoms (headache, nausea, etc.), poor short-term memory, poor concentration and organization may temporarily turn a good student into a problem student. The best way to address this is to decrease the academic workload, and potentially taking time off from school or attending partial days (although time missed should almost always be less than 5 days). Injured athletes should be allowed extra time to complete homework and tests, and they should be given written instructions for homework. New information should be presented slowly and repeated. Injured athletes will need time to catch up and may benefit from tutoring. If an athlete develops worsening symptoms at school, he/she should be allowed to visit the school nurse or take a rest break in a quiet area. The school and coaches should maintain regular contact with the injured athlete's teachers and parents to update progress.

All injured students should be removed from PE class until medically cleared.

In conjunction with Children's Wisconsin, Healthy Kids Learn More developed a free "Return to Learn" educational webinar to help schools and teachers improve their academic care of students with a concussion and create school-based return to learn plans.

<https://www.healthykidslearnmore.com/Healthy-Kids-Learn-More/Course-Topics/Concussion/Return-to-Learn>

Student-athletes with a concussion must return to full speed academics without accommodations before returning to sports (practice and competition).

Other Treatment Strategies

Relative rest remains an essential component of concussion treatment. It is helpful for parents to decrease stimulation at home by limiting video games, but a reduction (not elimination) of screen time (phone, computer, tablet, TV) may be helpful. "Cocoon therapy," or avoiding all brain stimulation, has been shown to negatively impact recovery and is no longer a recommended treatment style.

Physical activity may be beneficial for recovery of injured student-athletes. However, high-level activity (weight lifting, practice level training and conditioning) should still be avoided. Simple physical exertion, like walking or gentle stationary biking, that does not worsen symptoms may be done for short periods of time. Any post-injury exercise plan should be authorized and overseen by an appropriate health care provider.

A student-athlete's concussion can interfere with work and social events (movies, dances, attending games, etc.). Good hydration and dietary habits and good sleep habits (8-10 hours per night) are important parts of the recovery process. There are no medications or supplements that help speed the recovery process.

Neuropsychological Testing

Neuropsychological testing has become more commonplace in concussion evaluation as a means to provide an objective measure of brain function. Testing is currently done using computerized neuropsychological testing (example: ImPACT, Sway) or through a more detailed pen and paper test administered by a neuropsychologist. It is only a tool to help ensure safe return to activity and not as the only piece of the decision making process.

If neuropsychological testing is available, ideally a baseline or pre-injury test is completed prior to the season. This baseline should be done in a quiet environment when the athlete is well rested. It is felt that baseline testing should be repeated every one to two years for the developing adolescent brain. **Multi-modal baseline evaluation assessing baseline symptoms, cognitive functioning, visual tracking, reaction time, and balance are ideal.**

If there is no baseline available, the injured student-athlete's computerized test scores can be compared to age established norms. This requires a provider experienced in the use and interpretation of computerized testing. The WIAA feels that neuropsychological testing can be a useful tool with regard to concussion management, but research does not support mandating computerized baseline evaluations.

RETURN TO PLAY

In order to resume activity, the student-athlete must be **symptom free** and off any pain control or headache medications that they were not taking prior to the concussion. The athlete should be carrying a full academic load without any significant accommodations for 1-2 days. Finally, the athlete must have written medical clearance from an appropriate health care provider.

The program described below is a guideline for returning concussed student-athletes when they are symptom free. Student-athletes with multiple concussions and athletes with prolonged symptoms often require a prolonged or 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 per 24 hours. The program allows for a gradual increase in heart rate/physical exertion, coordination, and then allows contact. If symptoms return, the athlete should stop activity and notify their

healthcare provider before progressing to the next level.

STAGE ONE: Daily activities that do not increase symptoms (gradual reintroduction of school, work and walking).

STAGE TWO: Light aerobic exercise: slow to medium pace jogging, stationary cycling. No resistance training. No increase in symptoms. This stage allows for increased heart rate - begin with <55% of max HR, but if tolerating, can progress to <70% of max HR.

STAGE THREE: Sport-specific exercise: moderate to higher intensity running or skating drills, but no activities with risk of head impact. This allows for increased heart rate and agility/movement.

STAGES 4-6 should only begin after the resolution of any symptoms, abnormalities in cognitive function, and any other clinical finding related to the current concussion, including during and after physical exertion.

STAGE FOUR: Non-contact training: Higher intensity aerobic fitness, and non-contact/non-collision team training drills (e.g., passing drills). May begin progressive resistance training. This increases coordination and thinking during sport.

STAGE FIVE: Full contact practice. Written medical clearance is required to resume contact or high-risk activity, allowing the athlete to participate fully in normal training activities. This restores confidence and allows coaches to assess functional skills.

STAGE SIX: Full clearance / Normal game play.

PREVENTION / RISK REDUCTION

There is nothing that truly prevents concussion. Education and recognition of concussion are the keys in reducing the risk of problems with concussion.

Wisconsin State Concussion Law (Act 172) was passed in 2011. This law mandates distribution of preseason educational information sheets to be signed by coaches, athletes and parents. It also recommends immediate removal of any athlete with a suspected concussion and no same day return to play. Finally, all injured athletes require written medical clearance from an appropriate health care professional. Research has indicated that the state law has helped improve education and awareness of concussion.

Proper equipment fit and use may reduce the risk of concussion. Proper maintenance and reconditioning of equipment is important.

- Mouthguards have been shown to decrease dental injuries, but have not been shown to reduce risk of concussion.
- Soccer headgear has been shown not to reduce the risk of concussion.
- Helmets are useful in preventing facial injuries and skull fractures; however, helmets have not been reliably shown to decrease concussion rates.
 - Virginia Tech University has created a helmet rating system for the Varsity Football age range. Helmets with lower scores may be less protective, but research is still needed to prove risk reduction. <https://www.helmet.beam.vt.edu/varsity-football-helmet-ratings.html>
 - The NFL has also created a helmet rating system for NFL aged players, which may not correlate with high school student-athletes. Research is still needed to prove true risk reduction. <https://www.nfl.com/playerhealthandsafety/equipment-and-innovation/equipment-testing/helmet-laboratory-testing-performance-results>
- Third party “add-on” equipment for helmets (external padding or strips applied to the outside of the helmet) have not shown a decrease in concussion risk, and any add-on may void the helmet warranty.

Proper technique for hitting/initiating contact is vital. For example, student-athletes that lower their head while making a football tackle have a significantly higher risk for concussion and neck injuries. Athletes should never lead with their head or helmet.

Rule changes and proper enforcement of rules have been shown to reduce concussion rates. WIAA limitations in contact football practices have reduced concussion rates since implementation.

All schools should have an Emergency Action Plan for each team and practice / competition area. This plan can be used for any medical emergency from a concussion to a neck injury to anaphylaxis (severe allergic reaction). Ideally, these plans are reviewed annually.

The WIAA encourages every member school to promote concussion education and bring about a positive change in culture by discussing concussion with all teachers, coaches, athletes and parents. We recommend a preseason discussion with athletes and families to set expectations for what will happen if a student has a suspected concussion, including the steps the student must go through to return to play. Coaches should use in-season concussions as “teachable moments” to remind teammates about the importance of reporting their injuries and supporting their injured teammate through the recovery process.

Further reading and additional materials can be obtained at no charge through these resources:

www.nfhslearn.com (Concussion in Sports Course)

www.cdc.gov (Heads Up Tool Kit)

www.healthykidslearnmore.com (Concussion Return to Learn Course)