

Concussion Reference Guide

Children's Healthcare of Atlanta Concussion Program

Children's Healthcare of Atlanta is dedicated to protecting our youth. This document is intended to serve as a guideline or a user's manual for local school boards and governing bodies who are tasked with developing and implementing a concussion policy for their district.

choa.org/concussion



These materials have been endorsed by the
Georgia Department of Public Health.



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This is general information and not specific medical advice. Always consult with a doctor or healthcare provider if you have questions or concerns about the health of a child. This piece was created by the concussion team at Children's Healthcare of Atlanta.

Return to Play Act of 2013

On April 23, 2013, Governor Nathan Deal signed into law, the “Return to Play Act of 2013” at a ceremony held at our Scottish Rite hospital. This legislation is aimed at developing return-to-play policies for youth athletes who are concussed during a game, educating parents on the risks of concussions and preventing Second Impact Syndrome (SIS). The return-to-play policies are based on three guiding principles in the management of concussions:

- **Educate**—Educate athletes, parents, coaches, officials, administrators (school and league) and teachers on the importance of early recognition of concussion and the risk of returning to play before complete recovery.
- **Recognize**—Recognize the signs and symptoms of concussion early so the athlete can be removed from play immediately and the concussion management plan can be implemented.
- **Return to Play**—Immediately remove the athlete who is suspected of suffering a concussion from play immediately. Do not allow him to return to play until he has been evaluated and cleared by a healthcare provider who is trained in the management of concussions.

Schools

The Return to Play Act of 2013 requires all local boards of education and governing bodies of nonpublic, state and charter schools to develop a concussion policy with the following components:

- Prior to the beginning of each athletic season, an information sheet that educates parents or legal guardians of the risk of concussions must be provided.
- If a youth athlete, ages 7 to 18, participating in a youth athletic activity, exhibits signs or symptoms of a concussion, he must be removed from play and evaluated by a healthcare provider.
- Before a youth athlete can return to play, he must be cleared by a healthcare provider who is trained in the management of concussions.

Recreational leagues

Additionally, the law requires recreational leagues to provide an information sheet on the risks of concussion at the time of registration to the parents or legal guardians of all youth athletes. Leagues, as well as parents and guardians, are strongly encouraged to adopt a concussion management policy consistent with the school requirements.



A sample concussion policy can be found in the appendix.



Concussion overview

Over the past several years, there has been a media storm surrounding sports-related concussions. It seems that one can't watch a sporting event over a weekend without hearing about a high-profile athlete missing playing time because of a concussion. Public awareness about concussions is at an all-time high.

The Centers for Disease Control and Prevention (CDC) estimates between 1.6 and 3.8 million sports-related concussions occur annually in the U.S. and account for 5 to 90 percent of all sports-related injuries. Thirty percent of all concussions in individuals between 5 and 19 years of age are sports related and result in a significant number of emergency department visits. The majority of concussions occurring in organized sports in the U.S. are sustained in football, ice hockey, wrestling, girls soccer, boys soccer and girls basketball.

Concussions occur off the playing fields as well. Home, bicycle and playground falls can also result in a concussion. The same principles that apply to sports-related concussions also apply to non-sports related concussions.

What is a concussion?

A concussion is a form of traumatic brain injury (TBI). This injury can occur as a result of a blow to or around the head that causes acceleration forces to the brain. This movement of the brain within the skull causes a functional disturbance in how the brain works or processes information—also known as transient alteration in cognitive functioning.

It is important to remember that:

- A concussion usually does not result in loss of consciousness (LOC)—Ninety percent of cases do not involve LOC.
- Headache is the most common symptom, but it does not have to be present.
- Since a concussion does not involve a structural injury to the brain, standard imaging, such as CT and MRI, is normal.

What happens to the brain during a concussion?

A concussion results in a disturbance in the brain's ability to function properly. The individual's abilities to concentrate, reason, remember, solve problems and learn new information are compromised. Contrary to popular belief, it is not a bruise to the brain. When the head is struck, the brain accelerates inside the skull opposite the direction of the blow. It is this acceleration force that causes the functional disturbance in the brain.

This acceleration force alters the chemical balance in the brain and results in impaired function and decreased blood flow. It is possible the brain needs rest to restore this balance and return to its normal state. Some studies, however, report that the blood flow to the concussed brain is decreased, thus limiting the brain's ability to recover. This creates a supply-and-demand mismatch of energy being provided to the concussed brain. Only when proper blood flow is restored can the brain recover completely. This process often takes several weeks.

Recognizing the signs and symptoms of a concussion

A concussion can be diagnosed by various signs and symptoms that are observed in the injured athlete. The actual injury may not have been directly witnessed, so any athlete who is suspected of suffering a blow to the head, has fallen from a height or collides with another person or object may have sustained a concussion.

- **Symptoms** are feelings that the athlete reports. They include headache, nausea, difficulty concentrating and memory loss.
- **Signs** are conditions that are noticed by others, such as coaches, parents and teammates. They include poor coordination, vomiting, memory loss and appearing confused or "out of it."



Signs and symptoms usually appear within minutes after the injury. However, they can appear later—for several hours or several days after the injury. If a school staff member observes a student displaying signs or symptoms of a concussion, he should accompany the student to the school nurse. If there is no school nurse or if the nurse is unavailable, the parent or guardian must be contacted. In accordance with the Return to Play Act of 2013, any student suspected of having a concussion, either from direct observation of the head injury or from reported symptoms, must be removed from physical activities. If there is a suspected concussion, he should also not participate in recess or PE class. The student should be observed and referred to a medical provider for evaluation if needed.

Signs observed by staff can include:

- Appears dazed or stunned
- Confused about assignment
- Forgets plays
- Is unsure of game or opponent
- Moves clumsily
- Answers questions slowly
- Loses consciousness—even temporarily
- Shows behavior or personality changes
- Forgets events prior to hit—retrograde amnesia
- Forgets events after hit—anterograde amnesia

Symptoms reported by athlete can include:

- Headache
- Nausea
- Balance problems
- Dizziness
- Double vision
- Fuzzy vision
- Sensitivity to light or noise
- Feeling sluggish
- Feeling foggy
- Change in sleep pattern
- Concentration problems
- Memory problems



Concussion management

Immediate post-concussion management

If an athlete suffers a suspected blow to the head and exhibits any of the above signs or symptoms, he should immediately be removed from play and evaluated. Ideally, the evaluation should include standard emergency management principles and be performed by a licensed physician, certified athletic trainer or registered nurse trained in the assessment and management of concussions. Unfortunately, trained medical personnel are not always immediately available. Therefore, a coach should be comfortable and familiar with the basic sideline assessment for concussions.

Note: Be aware that cervical spine or neck injuries may occur with a concussion. Any report of neck pain or numbness in the arms or legs should prompt staff to keep the athlete motionless on the field with a neck collar applied. In case of an urgent concern or emergency, call 911 and seek emergency medical assistance. DO NOT ATTEMPT TO REMOVE THE HELMET.

Recognize

The initial step in the sideline assessment is recognizing that a concussion may have occurred. This is often difficult because athletes don't always report their symptoms. The athlete may not be aware he has been concussed or may not report symptoms for fear of losing playing time, his position on the team or respect from teammates and coaches. There are other conditions that result in signs and symptoms similar to a concussion such as dehydration, heat illness and low blood sugar.

Sideline assessment tools were developed by Children's to aid the caregiver in more accurately diagnosing concussion. See appendix for sideline tools.

Notify

If a concussion did occur, the athlete's parent or guardian should be notified immediately. Appropriate disposition will be determined by a healthcare provider. If there is no licensed healthcare provider immediately available, the student-athlete should be referred to a medical facility for evaluation.

If the athlete demonstrates any of the following symptoms at any time during the evaluation or observation period, immediate referral to a healthcare facility via ambulance is warranted:

- Worsening headache
- Persistent vomiting
- Altered mental status
- Seizure
- Slurred speech
- Trouble recognizing people or places
- Tiredness or difficulty waking
- Blood or fluid coming from the nose or ear
- Weakness in the arms or legs

The cornerstone of proper concussion management is both cognitive and physical rest, until symptoms improve followed by a gradual return to school and sports. Without cognitive and physical rest, symptoms may worsen and prolong recovery. The school should receive written recommendations from a physician for physical and cognitive rest. These recommendations must be followed both at school and home.

A guardian concussion notification template can be found in the appendix.

Cognitive rest: Strategies for returning to school

The chemical disturbance resulting in the supply-and-demand mismatch in the brain require rest in order to recover. Any task requiring the brain to think, concentrate, remember and reason stresses the concussed brain beyond its capability, prolongs recovery and may even worsen symptoms.

Such tasks include:

- Watching television
- Studying or doing homework
- Playing on computers and video games (even on small smart phone screens)
- Reading or writing
- Bright lights
- Texting or social media
- Loud music

As the symptoms improve, the student may be able to complete some schoolwork at home in a quiet environment. When the child is ready to go back to school, he should follow a gradual return with an academic recovery plan developed by the treating physician and the school.



Academic recovery plan

In conjunction with a student, his parents or guardians, and healthcare providers, the school will develop an academic recovery plan (ARP). This will consist of instructions to monitor the student for mental activities that worsen the signs and symptoms of a concussion. Any activity that produces or worsens signs and symptoms of a concussion should be ceased. Initially, the student may be able to complete only a couple hours of school. As he continues to recover, he will be able to accommodate a larger academic load and eventually remain symptom free after a full school day.

School personnel should be aware that concussed students may exhibit increased difficulty with focusing, learning and retaining new information, as well as being more impulsive and emotional. The school should develop a policy for making up missed assignments, tests and quizzes. This make-up plan should span a time equal to that which the student was absent. The ARP will also develop and recommend academic modifications for the student as he returns to school.

Such academic modifications may include:

- A shorter school day
- Only attending core classes and resting in the school nurse's office during non-core classes
- Providing the student with pre-printed class notes
- Not giving quizzes or tests
- Alternative assignments
- Allowing students to audiotape classes
- Providing assignments in writing
- Preferential seating to minimize distractions
- Eating lunch with a friend in the school nurse's office
- Leaving class five minutes early to avoid noisy hallways
- Shortened homework assignments

Acute period (Days 0-13 after sustaining a concussion)

Actions:

1. Take time off from school, if needed.
2. Get a letter of Academic Accommodation from a healthcare provider.
3. Schedule Student Support Team meeting with the school and parent/guardian.

Note:

- Most concussion symptoms will resolve within seven to 10 days.
- Some students with severe symptoms may require time off from school, but this period is usually limited to three days or fewer.

- In general, a quick return to academics is recommended because removal from school can lead to anxiety about making up work as well as separation from one's normal circle of friends, which can have negative social consequences.

Letter of Academic Accommodation

The Letter of Academic Accommodation, or Letter of Academic Adjustment, is the first step for the healthcare provider in assisting the patient with a gradual return to school. The letter should be implemented at the time of the initial evaluation with a copy of the letter saved in the physician records for documentation. This letter notifies the school of the patient's academic needs. This step helps initiate changes in the school day and encourages a Student Support Team (SST) meeting. This letter is:

- A physician-implemented tool
- Not legally binding
- Intended to provide concussed individuals with immediate access to recovery strategies
- A customizable document that allows a treating physician to use his or her clinical expertise to make recommendations that will allow a patient to return to school without exacerbating his or her symptoms.

Student Support Team meeting

A Student Support Team (SST) meeting is the first step in the process of identifying a concussed child that may need assistance at school. Each school has a SST—an interdisciplinary group that uses a systematic process to address learning and behavior problems of students, K-12, in a school. The SST includes the referring teacher and other participants such as school principals, counselors and the parent/guardians. The SST is:

- Not the same as a 504 Plan or IEP (If the concussion symptoms become chronic, a more formal plan may be utilized.)
- An informal process to discuss the Letter of Academic Accommodation and next steps for implementation
- Created to ensure the school staff, parents and student are aware of post-concussive symptoms and the academic implications

Subchronic (Days 14-28 after concussion)

This time period is critical in preventing long-term academic issues.

Actions:

1. Get a letter of Academic Accommodation from a healthcare provider.
2. Schedule a Student Support Team meeting to discuss the academic accommodations and determine next steps.



3. Transition to longer-term accommodations if needed, such as a 504 Plan or IEP.

The 504 Plan

Section 504 is part of the Rehabilitation Act of 1973 and is designed to protect the rights of individuals with disabilities who are enrolled in programs that receive federal financial assistance from the U.S. Department of Education. Section 504 requires a school district to provide a “free, appropriate public education” to each qualified student with a disability who is in the school district’s jurisdiction regardless of the nature or severity of the disability. Most students who sustain a concussion will not require a 504 Plan.

A 504 Plan:

- Should not be considered as a first step, unless the patient has a medically complicated case.
- May be appropriate for a student whose concussion symptoms last several months or longer.
- Is a legally binding document that requires a school to eliminate barriers that would prevent a student from participating in the programs and services offered in the general curriculum. This plan calls for reasonable accommodations to be part of a documented plan, but it does not require an individualized education program.
- Requires a formal meeting to determine eligibility and accommodations, but written consent from the parent or guardian is not mandatory.
- Varies in length of time to implement, but may take three to four weeks to implement due to the process of gathering information and meeting participants.
- Requires legal documentation.
- Does not provide additional funding to the school district to offset costs.
- Does not provide an Independent Educational Evaluation (IEE) at the expense of the school district if the student’s parents or guardians disagree with the evaluation provided by the school district. Parents or guardians must pay for an IEE if they seek one.

504 Plan accommodations may include:

- A quiet learning environment
- Repeated or simplified instructions
- Use of a note taker or recording device
- Textbooks in tape, CD or MP3 format
- Additional time to commute between classes
- Permission to wear sunglasses indoors

Individualized Education Program

An Individual Education Program (IEP) is a plan derived from the Individuals with Disability Education Act of 2004.

The IEP:

- Provides individuals with supplemental educational services beyond those included in the general curriculum.
- Requires neuropsychological testing.
- Is a legally binding document that requires a Multi-factored Evaluation (MFE). An MFE indicates various assessment tools be used to gather functional information, including cognitive performance, to determine whether the child has a disability and how it affects the child’s educational program.
- Requires written consent by a parent or guardian to conduct the MFE.
- Varies in length of time to implement, but there may be up to an eight-week waiting period due to complexity and thoroughness of the required evaluation.

A parent may request an IEE if he or she disagrees with the evaluation provided by the school district (at the expense of the school district). IEP accommodations may include:

- Reduced test lengths, extra time for tests or altered format (e.g., oral instead of written)
- Highlighted books or notes in advance of class
- Altered presentation of course material (reformat from lecture to interactive, etc.)
- Modified schedule
- Peer tutoring

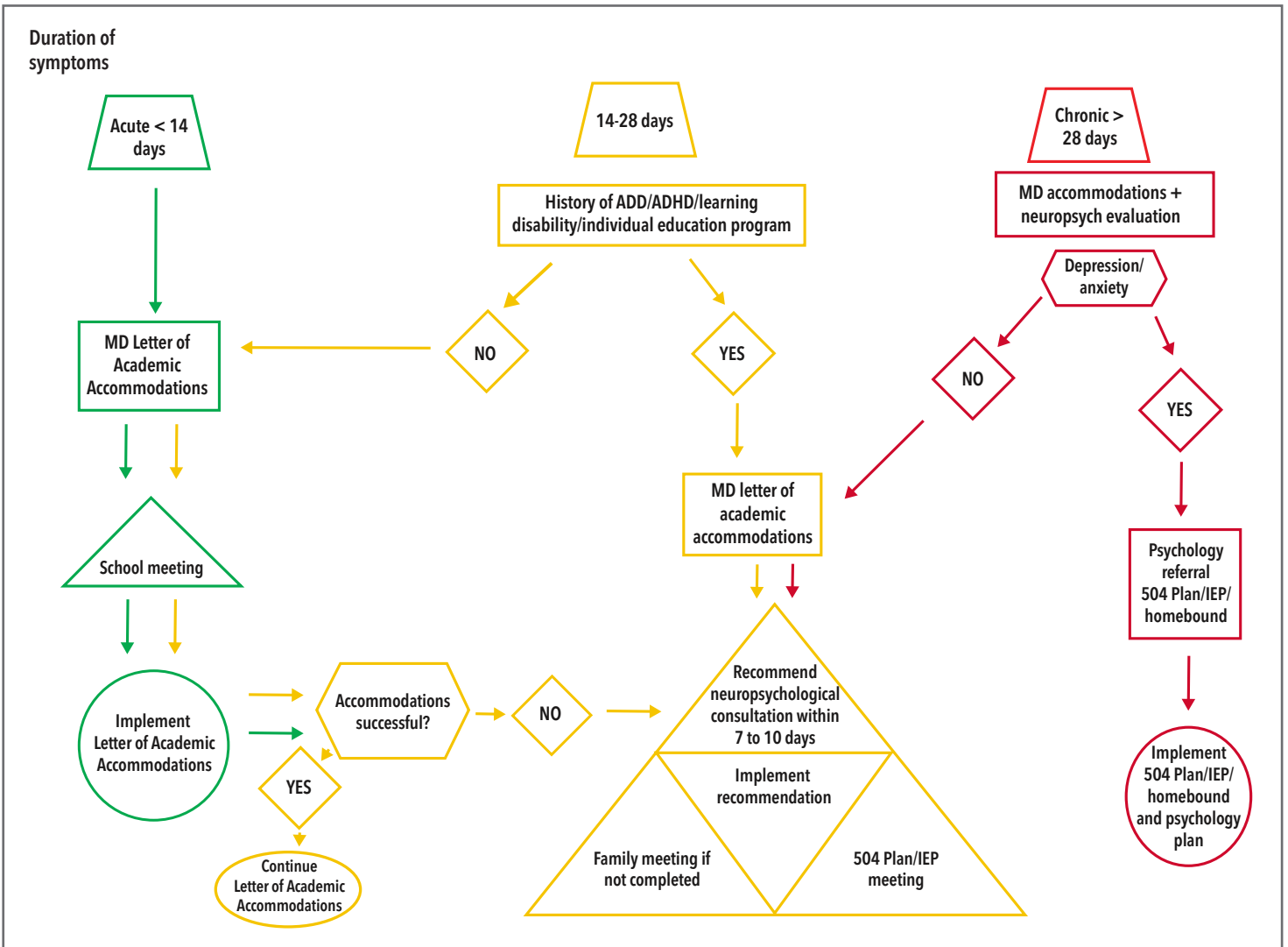
Chronic (Days 28+)

If a student is still symptomatic from his or her concussion for more than 28 days after injury and has persistent academic difficulties, the treating healthcare provider should take an aggressive, multidisciplinary approach. Healthcare providers should:

- Consider co-morbid conditions that may be preventing recovery. These most frequently include anxiety and depression.
- Refer patient to a psychologist, sports psychologist or psychiatrist.



Educational accommodations algorithm



Popoli DM, Burns TG, Meehan WP 3rd, Reisner A. "CHOA Concussion Consensus: Establishing a Uniform Policy for Academic Accommodations." Clinical Pediatrics (Phila). 2013 Aug 19.



Physical rest: Seven-step return-to-play program

As the student's symptoms improve, he will be able to begin the seven-step return-to-play program.

The seven-step program begins with complete rest until the symptoms subside. As the student's symptoms improve and he is able to increase the amount of time in school without symptoms worsening, he then may progress through the next steps, which include a gradual increase in physical demands, sports-specific activities and eventually physical contact. The final stage is clearance to return to play.

The seven steps involved in the return-to-play protocol are:

1. No activity; complete rest
2. Light aerobic activity—10 to 15 minutes or walking or stationary bike
3. Moderate aerobic activity—20 to 30 minutes of jogging; light resistance training
4. Intense aerobic activity—40 to 60 minutes of jogging/running sport-specific drills
5. Controlled contact training drills
6. Full contact practice
7. Return to play

Note: Each step should take a minimum of 24 hours. If symptoms return at any stage, the student should drop back to the previous level and progress after 24 hours of symptom-free rest.

Return-to-school and activities guidelines can be found in the appendix.

No athlete shall return to play until they are:

- Completely symptom free
- Remain symptom free after resuming a full school day
- Remain symptom free after progressing through steps 1 through 6 of the return-to-play program
- Receive written clearance from a qualified healthcare provider to return to play

Neurocognitive testing (ImPACT)

Neurocognitive testing or neuropsychological testing in athletes began in the 1980s and has expanded in the last decade with the availability of computerized testing. Some studies indicate persistent neurologic impairment may exist even though symptoms resolve. Therefore, neurocognitive testing is a tool that can identify subtle cognitive impairment and aid in documenting an athlete's recovery from a concussion. Neurocognitive testing should not function as the sole determinant that a concussion has occurred or that a concussion has resolved. It is simply a concussion management tool and its role in concussion management is still debated among professionals in the field.



Our consensus on the role of computerized cognitive testing in the management of concussed patients is as follows:

1. The role of computerized cognitive tests in the management of concussions has not been fully established.
2. These tests may be used as a method to assess the degree of cognitive impairment following a concussion.
3. These tests may be used as a method to monitor progression (improvement or deterioration) following a concussion.
4. Computerized cognitive tests are most commonly used in athletes, especially when baseline testing was done prior to the concussion.
5. These tests are **NOT** mandatory for managing patients who have sustained a concussion.
6. These tests are **NOT** a substitute for the initial or subsequent clinical evaluations of patients who has sustained a concussion.

The most widely used neurocognitive evaluation in the U.S. for athletes is ImPACT or Immediate Post-Concussive Assessment and Cognitive Testing. It is a computer-based test that requires an internet connection and takes about 30 minutes to complete. It measures an athlete's:

- Symptom inventory
- Nonverbal problem solving
- Verbal and visual memory
- Processing speed
- Attention span
- Reaction time

The results can be saved in a PDF format for e-mailing to doctors, coaches or other members of the concussion management team. The test can be administered by a certified athletic trainer, a school nurse, athletic director, team doctor or psychologist. It is recommended that test administrators complete training in giving and interpreting the test.

The ImPACT evaluation can be given to an athlete before the season begins or before he receives a head injury. This is called a baseline test. Some schools recommend baseline testing for all athletes age 12 and above while others recommend baseline testing only for those participating in high-risk sports. It is recommended that baseline testing be completed every other year. The baseline testing can be especially useful for students who have pre-existing conditions that can cause cognitive scores to be lower than would be expected. Some of these conditions that may affect the results include psychiatric disorders, emotional problems, attention deficit hyperactivity disorder (ADHD), learning disabilities, dyslexia and previous head injuries. One weakness of baseline neurocognitive testing is that an honest answer is not required when the athlete takes the test. Some athletes deliberately try to make a low score in order to make it more likely he will be able to "pass" the test in the event of a concussion during the season.

If baseline testing is not available in a concussed athlete, then age-matched norms are used to determine what the "normal" scores are for that individual student. Age-matched norms were found by testing a large number of individuals who did not have a concussion prior to taking the test.



Concussion management team roles

Concussion management in the student-athlete requires a coordinated effort among school personnel along with parents and athletes. This process starts with forming a concussion recovery team (CRT). CRT members should advocate for academic and physical accommodations to reduce delays in the student's return to full, unrestricted academic and athletic activities.

Potential members of the CRT should be identified at the beginning of the school year in preparation that a student-athlete will suffer a concussion. This way, members will be aware of their role in concussion management and facilitate a smooth transition back into the classroom and the playing field.

CRT members may include but are not necessarily limited to:

- Students
- Parents/guardians
- School administrator or guidance counselor
- Teachers
- School nurse
- Certified athletic trainer
- Physician

Students

The Return to Play Act of 2013 requires students be made aware of the risk of concussions. Encourage students to report symptoms to their coach, certified athletic trainer, school nurse, parents or other school personnel.

This should be emphasized at preseason team meetings as well as continuously throughout the season. It is recommended that students:

- Be aware of the risk of severe injury, permanent disability and even death that can occur if a second concussion is sustained before completely recovering from a concussion.
- Be aware of the signs and symptoms associated with concussions and the importance of reporting them to the coach, certified athletic trainer, school nurse or parent.
- Participate in the "buddy system" which encourages them to report concussion signs or symptoms to teammates.
- Follow instructions from their team physician or private physician.
- Be encouraged to inform teachers if they're having difficulty in the classroom.

- Participate in creating an environment on the field and the locker room where reporting signs and symptoms of a concussion is encouraged.

Parents/guardians

Parents/guardians play a vital role in managing their child's concussion. They must communicate with both the medical team and school personnel and often function as the primary advocate for their child. They may need to pick up their child from school during the day if he has symptoms as well as transport him to and from doctor's visits. It is recommended that parents/guardians:

- Familiarize themselves with the signs and symptoms of concussion.
- Understand that the Return to Play Act of 2013 requires them to immediately remove an athlete from play if he shows signs and symptoms of a concussion.
- Communicate appropriate medical information from the physician to school personnel.
- Create a home environment conducive for concussion recovery.
- Communicate with the school staff if the child is experiencing concussion symptoms at the end of the school day.
- Follow medical provider recommendations for return to activities at home and school.

School administrators/guidance counselors

The role of school administrators is to follow the district's policies on concussion management. They should:

- Review the district's concussion policy with all staff.
- Arrange in-service training sessions for all staff and parents regarding concussion management in the school setting.
- Provide a written emergency action plan and communication devices for all school activities.
- Encourage members of the academic recovery team about their role in the management of the concussed student-athlete.
- Encourage open communication with the private physician, team physician, parents and school personnel.
- Encourage parents to participate in determining their child's needs at school.



Teachers

Teachers can assist concussed students by creating an environment and developing modified curricula that allows students to return to the classroom and minimize aggravating stimuli. They should:

- Be aware of the emotional and academic issues students with concussions face.
- Report academic issues to other members of the academic recovery team.
- Encourage students to report their classroom symptoms.
- Provide classroom academic support with assignment modification.
- Create a classroom environment free of distractions.
- Encourage open communication between the physician and parents.

School nurses

The school nurse is a team member who communicates with the physician, parents and school staff. He or she will collect documentation and orders from the medical provider and see that orders are implemented. The school nurse will also be an integral part of ongoing assessments during the academic recovery period. The school nurse should:

- Assess students who suffered an injury at school for signs and symptoms of a concussion. He or she must provide an area of observation and refer as appropriate.
- Communicate with parents regarding their child's status and recommend referral to physician if appropriate.
- Provide parents of students believed to have sustained a concussion with written and oral instructions for observation and criteria for seeking immediate emergency care.
- Assist in the implementation of medical providers' instructions for academic accommodations.
- Monitor the student's return-to-school activities, provide feedback to the medical provider and implement changes as necessary.
- Assist in developing a 504 Plan if appropriate.
- Maintain records of school assessments and all written communication from the medical provider, including letters for return-to-play clearance.
- Perform post-concussive assessments including symptom inventory checklists as well as administering computerized neurocognitive testing of students.
- Participate in the education of staff members in concussion recognition and management.



Certified athletic trainers

The certified athletic trainer (ATC) is often the only healthcare provider present at games and practices so he or she must be comfortable with the acute recognition and early management of concussions. ATCs receive training in concussion recognition and management during their education and certification process. Because of this, the Return to Play Act of 2013 recognizes ATCs as a qualified medical professionals trained in the management of concussions. The ATC should:

- Oversee athletes taking a baseline neurocognitive test if directed by local policy.
- Educate student-athletes on the importance of recognizing and reporting signs and symptoms of concussion.
- Evaluate athletes on the field or in the training room who are suspected of having sustained a concussion and observe and refer as appropriate.
- Evaluate athletes and be able to determine if signs and symptoms warrant emergency referral to a medical facility.
- Provide parents and guardians with verbal and written instructions on observing the athlete for complications that warrant emergency care.
- Play a role in assisting the team or private physician request for accommodations.
- Monitor, with the school nurse, the student's return-to-school and physical activities, communicating each step with other members of the concussion management team.
- Oversee the athlete's seven-step return-to-play program and communicate progress to other members of the concussion management team.



Team physicians

The team physician or private physician plays an important role in the management of the concussed student-athlete. He or she will be involved in the initial assessment and establish the diagnosis of a concussion after an office appointment. After this visit, the physician must communicate information on the diagnosis and recommendations to the rest of the concussion recovery team (CRT). The physician must be aware of the Health Information Portability and Accountability Act (HIPAA) laws that govern confidentiality of medical information. Therefore, the physician must receive consent from the parent or guardian to communicate medical information to school personnel.

The physician should:

- Oversee and approve educational programs for school personnel.
- Confirm the diagnosis of concussion.
- Provide a Letter of Academic Accommodations outlining academic and physical restrictions to members of the CRT.
- Provide weekly updates to the CRT in writing on the student-athlete's progress and modification of academic and physical restrictions.
- Interpret cognitive function tests if administered at school.
- Provide written clearance for return to full academic and athletic activities when appropriate.



Concussion management team roles

Children's concussion team roles

Concussion Nurse Coordinator

At Children's, the concussion nurse coordinator plays an important role in the management of concussions. The nurse coordinator advises parents, patients and community healthcare providers. Our nurse coordinator follows up with all patients seen in the Children's Emergency Departments or Urgent Care Centers who have sustained a concussion to answer questions and helps ensure they are on the path to recovery. Community healthcare providers may use the nurse coordinator to determine which specialist is right for their patient. The nurse will also help answer questions about concussion treatment including the Children's return-to-school and activities guidelines.

Call:

404-785-KIDS (5437)

Make a referral:

choa.org/concussionreferral

Emergency Departments and Urgent Care Centers

The Emergency Departments and Urgent Care Centers at Children's play an important role in identifying concussed patients soon after they sustain an injury. Our team helps diagnose concussion patients and provides them with guidance on initial management, including guidelines for returning to school and activities. The emergency medicine and urgent care physicians can also help recommend other specialists if needed.

Neurology

The neurologist may play a role in evaluating concussed patients. It is especially important if the patient has pre-existing neurological conditions, or if a patient without a history of neurological issues has lingering symptoms of concussion such as headache. Additionally, a primary referral to a neurologist should be considered if the patient has suffered multiple concussions. A primary care physician may refer a patient to a neurologist if there is:

- A history of seizures
- Chronic headaches—lasting more than four weeks
- Persistent neurological symptoms (e.g., balance issues, neurological findings on exam)
- Acute concussions

Neuropsychology

The neuropsychologist plays a role in managing concussed patients if there are lingering cognitive issues post-concussion. The neuropsychologists have access to in-depth cognitive testing and work with schools to help create a plan for school re-entry. A neuropsychologist will help patients with cognitive issues such as memory and attention, as well as reaction time and fatigue, while working with the school to modify assignments or help determine if a Student Support Team (SST) or 504 Plan is needed. A primary care physician should consider a referral to a neuropsychologist if the patient has:

- Difficulty returning to school or play due to issues with cognitive functioning after four weeks
- Problems with mood or stress that continue after the concussion
- Pre-existing issues related to learning disabilities, attention deficit hyperactivity disorder (ADHD), depression or anxiety
- Acute concussions
- Questions related to effort or possible secondary gain



Neurosurgery

The neurosurgeon primarily plays a role in managing concussed patients if there are any associated injuries that may require surgical treatment. These problems are usually evident initially, but may manifest only days or weeks later. These injuries are fortunately not common but can be life threatening if left untreated.

Neurosurgeons will see patients with:

- An expanding brain bleed manifested by progressive loss of consciousness
- Brain edema or swelling after a seemingly minor head injury
- Concern for an associated spinal injury
- Skull fracture
- Cerebrospinal fluid leak from the ear (CSF otorrhoea) or nose (CSF rhinorrhoea)

Physiatry

The physiatrist plays a role in managing concussed patients if there are both physical and cognitive issues post-concussion. A physiatrist can prescribe additional treatment and support if physical therapy is needed in addition to the cognitive rehabilitation. A primary care physician should consider a referral to a physiatrist if the patient:

- Has acute physical and cognitive symptoms.
- Is not an athlete.
- Is an athlete younger than age 10.
- Has ongoing vestibular issues (e.g., dizziness, balance problems, sensitivity to light and noise).
- Has acute sports concussions.

Sports Medicine

The sports medicine physician plays a role in managing concussed patients who are athletes or for those who sustained their injury while playing a sport. Our sports medicine physicians have extensive knowledge of concussions as well as other sports-related injuries that may occur. Sports medicine physicians provide athletes with detailed information and instructions on how to return to their sport. A referral to a sports medicine physician should be considered if:

- The athlete is older than age 10 and the concussion was sustained while playing a sport.
- Symptoms have not lasted more than two weeks.



Children's Concussion Program

Comprehensive care

Several teams at Children's work together to treat concussion patients. This multidisciplinary approach helps make our program unique. Services include:

- Emergency
- Neurology
- Neuropsychology
- Neurosurgery
- Psychiatry (Physical medicine and rehabilitation)
- Sports medicine
- Urgent care

Coordinated care

Our dedicated concussion nurse helps coordinate each child's care and serves as a resource for healthcare professionals. Our team works with each child's primary care doctor to help develop the plan of care.

Concussion Program nurse coordinator can be reached at 404-785-KIDS (5437).

Acknowledgements

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Appendix



Concussion guidelines for your child's return to school, bookwork and studies

Stage of healing	Home activity	School activity	Physical activity
Stage 1— Your child still has many symptoms and problems	<ul style="list-style-type: none"> – Complete rest in a quiet room. – Allow as much sleep as possible. – Limit things that require your child to think, focus, reason or remember. – Remove any electronics and computers from your child's room. – Remove any activity planners and "to-do" lists from your child's room. – Give your child plenty of fluids to drink. – Feed small, frequent meals during the day and at bedtime. – Give your child plenty of carbohydrates to eat, such as whole grain breads and cereals, pasta and rice. 	<ul style="list-style-type: none"> – Your child may not go to school. 	See Stage 1 in next chart
Stage 2— Your child still has some symptoms and problems	<ul style="list-style-type: none"> – Stay in quiet rooms. – Allow as much sleep as possible. – Allow your child to use TV, video games, texting, social media and email for a short time—fewer than two hours a day. For examples, he might have 20 minutes of brain work followed by a two-hour brain break. – Help your child to not stress over missed school work. – Continue with fluids, small, frequent meals and carbohydrates, as in Stage 1. 	<ul style="list-style-type: none"> – Your child may return to school for half days. – Attend core classes only or have shortened class time. – Rest in nurse's office between classes and as needed. – Your child may not take tests or quizzes. – Use preprinted class notes. – Complete short homework assignments—work 20 minutes at a time with rest breaks in between. – Talk with school nurse or teacher about academic accommodations from your doctor. 	See Stage 2 in next chart
Stage 3— Your child's symptoms and problems have gone away	<ul style="list-style-type: none"> – Slowly return to watching TV, playing video games and texting. – Allow family interactions again. – Continue with fluids, small, frequent meals and carbohydrates, as in Stage 1. 	<ul style="list-style-type: none"> – Your child may return to a full day of classes. – He may have a gradual return to classwork, including make-up work, tests and quizzes. – May take one test or quiz a day with extra time as needed, to complete. – Tell the teacher or school nurse if any symptoms or problems return. 	See Stages 2-4 in next chart
Stage 4— Your child seems back to normal	<ul style="list-style-type: none"> – Your child may have normal home and social interactions. 	<ul style="list-style-type: none"> – Your child may have normal school work and studies. 	See Stages 5-7 in next chart

Concussion guidelines for your child's return to sports, play and activities

Stage of healing	Activity allowed	Examples of sports	Examples of other activities	Goal
1	<ul style="list-style-type: none"> No activity Complete cognitive and physical rest 	<ul style="list-style-type: none"> Complete physical rest 	<ul style="list-style-type: none"> Quiet time with rest Avoid groups, videos, reading, computers, video games, cell phones, and noisy places 	<ul style="list-style-type: none"> Brain rest and healing Become free of symptoms
2	<ul style="list-style-type: none"> Light aerobic activity 	<ul style="list-style-type: none"> 10 to 15 minutes of walking or stationary bike Light sweat on the brow Slight increase in breathing rate 	<ul style="list-style-type: none"> Walk in park or neighborhood Avoid group activities 	<ul style="list-style-type: none"> Increase heart rate to 30-40% at most
3	<ul style="list-style-type: none"> Moderate aerobic activity Light resistance training 	<ul style="list-style-type: none"> 20 to 30 minutes of jogging or stationary bike Arm curls, shoulder raises, leg lifts with weights that can be comfortably lifted One set of 10 repetitions for each activity 	<ul style="list-style-type: none"> Supervised play Low risk activities, such as dribbling a ball, playing catch, changing directions, jumping, side-to-side slides, chasing a ball or catching a ball on the run 	<ul style="list-style-type: none"> Increase heart rate to 40-60% at most Add resistance Use eyes to track objects
4	<ul style="list-style-type: none"> Intense aerobic activity Moderate resistance training Sport-specific exercise 	<ul style="list-style-type: none"> 40 to 60 minutes of running or stationary bike Same resistance exercises with weight for three sets of 10 reps Pre-competition warm-up such as passing a soccer ball, throwing a football or doing ladder drills 	<ul style="list-style-type: none"> Supervised play Moderate-risk activities, such as balance and agility drills No head contact activities Can sweat and breathe heavy 	<ul style="list-style-type: none"> Increase heart rate to 60-80% at most Increase resistance Mimic the sport
5	<ul style="list-style-type: none"> Controlled-contact training drills 	<ul style="list-style-type: none"> 60 to 90 minutes of time on the field, court or mat for specific drills Take part in normal practice session Contact that is normally part of the sport—only use items that “do not hit back” such as a sled in football Recheck for symptoms or problems often 	<ul style="list-style-type: none"> Free play Run and jump, as able Full return to physical education (PE) Recheck for symptoms or problems often 	<ul style="list-style-type: none"> Mimic the sport or free play without the risk of head injury
6	<ul style="list-style-type: none"> Full-contact practice 	<ul style="list-style-type: none"> After OK from the doctor, may take part in normal training activities 	<ul style="list-style-type: none"> With parent or adult supervision, may take part in normal activities 	<ul style="list-style-type: none"> Build confidence Assess skills
7	<ul style="list-style-type: none"> Return to play 	<ul style="list-style-type: none"> Normal game play 	<ul style="list-style-type: none"> Normal playtime and activities 	<ul style="list-style-type: none"> No restrictions

Maximum heart rate is determined by subtracting the athlete's age from 220 and multiplying by the percentage. For example:

- Your target or ideal heart rate for exercise during Stage 2 is usually 30 to 40 percent of your maximum heart rate.
- To find your maximum heart rate, subtract your age from 220.
- If you are 15 years old, subtract 15 from 220 = 205. Next, multiply that number by 30 and 40 percent. This will give you a target heart rate for exercise in Stage 2.
- 205 times 30 percent = 62 beats a minute. 205 times 40 percent = 82 beats a minute.
- This means that your target heart range for exercise in Stage 2 is between 62 and 82 beats a minute.

- Allow 24 hours between each activity stage in the chart. **This means that it will take at least seven days to return to full activity.**
- For your child to move from one stage to the next, he must be able to do an activity at 100 percent without symptoms or problems for 24 hours.
- If any symptoms return, it means his brain is not ready for the next stage and he should drop back to the previous stage.
- Once your child has no symptoms again for 24 hours, he can try the activities in that stage again.

Concussion Program adapted from the Zurich Concussion Conference November 2008, *Br J Sports Med* 2009; 43:i76-i84.

This is general information and is not specific medical advice. Always consult with a doctor or healthcare provider if you have any questions or concerns about the health of a child.



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