Concussion in the Pediatric Population

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What is a concussion?

A concussion is a type of head injury caused by a bump to the head or a blow to a person's body.[1] This type of injury causes changes in the brain at a cellular level, and the changes are not identified by diagnostic tests such as a Magnetic Resonance Imaging (MRI), Computed Tomography (CT), or Radiograph (X-ray). A concussion causes an decrease in blood flow to the brain and molecular changes that are not completely understood by scientists and medical professionals at this time.[2]

Because children appear to be remarkably resilient, people may assume they will heal more easily or rapidly than an adult. However, the pediatric brain is still developing, making a concussion more dangerous than a concussion with similar brain injuries in the mature brain.[3]

What is my child feeling or what symptoms may they be experiencing?

Physical, cognitive, or emotional symptoms may be immediate, or may present within a few days. Your child may also experience changes in sleep patterns. Depending on your child's age, they may or may not be able to verbalize what they are feeling.

Possible symptoms reported by children

Headache (Prolonged*)
Nausea or vomiting
Decreased balance*
Dizziness
Sensitivities to light and/or noise
Sleeping less or more than normal
Irritability
More emotional
Problems with concentration or focus
"Fogginess" *
Visual disturbances

Symptoms sometimes observed by parents/teachers/coaches

Looks "out-of-it"
Slowness in responding verbally
Confusion about recent events
Forgetfulness
Decreased balance
Changes in personality
Increase in tiredness/fatigue
Moodiness
Increase in melt-downs
Loss of consciousness
Vomiting or decrease in appetite

*These symptoms are indicative of a more serious concussion.[4,5]

Concussion, now what?

You will want to have your child assessed by their Primary Care Physician (PCP), an Urgent Care Physician, or Emergency Room Physician depending on the severity of the concussion. If severe, you should expect the medical team to complete a CT or MRI. If less severe, physicians will likely not complete these tests. If the injury occurs at a school sporting activity, state and/or local education agency established protocols should be in place to evaluate severity of injury.

Your child should be placed on brain rest.[6] Brain rest is defined as decreased cognitive stimulation. You can provide this by decreasing lighting, noise, and other sensory stimulation. This includes visits from friends, use of electronics, and any other sensory provoking situations or settings. Physical activities should be limited for 24-48 hours, and then gradual return to exercise should be permitted.[6] Depending on severity, limitations may be incorporated at school. The plan of care should be coordinated by the child's primary physician or another health care provider who initially assesses the child and coordinates the follow up plan. Your child should remain out of any contact sport and avoid situations that may result in the chance of an additional concussion until they are fully symptom free.[7]

What should I expect for medical management and recovery?

Eighty to ninety percent of concussions will heal on their own within one month.[1] The remaining 10-20% of the time, children will be diagnosed with Post-Concussion Syndrome. Once diagnosed, your child will need to be assessed for vestibular symptoms by a physician, physical therapist, or trained medical professional. Older children may complain about any of the symptoms mentioned above (headache, dizziness, balance problems, sleep disturbances, etc). Younger children may continue to have increased melt downs, increased behavioral disturbances, and/or mood changes.

For assessment of children with Post-Concussion Syndrome:

If your child is 10-years old and older a physician or athletic trainer may complete the ImPACT test. The ImPACT test is a neuropsychological test that can be taken on a computer and requires interpretation by a trained professional.[8] Younger children will benefit from an assessment by a neuropsychologist to assist with determining appropriate limitations and behavior management.

Balance and visual assessments can be completed by a physical or occupational therapist trained in vestibular therapy and concussion management. Headache management can be completed by a neurologist or a physician.

How do physical therapists manage the return to school, play, and sports?

If having prolonged symptoms, your child will be followed by a team of medical professionals that may consist of: the primary care physician; a physical therapist, occupational therapist, and/or speech language pathologist; an athletic trainer; neurologist; neuropsychologist; or physiatrist to manage treatment. The physician should manage the return to all activities. The physical therapist should assist with the return to physical activity and sports using the Graduated Return to Play Protocol (see below).[4]

What does physical therapy consist of for concussion management?

Physical therapy for the management of concussion should be completed by a physical therapist who specializes in vestibular therapy. Vestibular problems can occur following a concussion, and symptoms of vestibular problems often present as increased dizziness, headaches, visual tracking concerns, balance impairments, and Post-Concussion Syndrome. Vestibular therapy addresses problems with the vestibular system located in the inner ear. This treatment is typically 3-6 months in duration. Therapy uses specific exercises for the head, body, and eyes to retrain the brain improving balance, reaction time and coordination. The physical therapist will work to resolve the balance and visual issues and reintegrate your child to physical activity. This should be completed following the Gradual Return to Play Protocol,[4] which should be tailored to the sport to which the child plans to return.

Table 1

Graduated return to play protocol

Rehabilitation stage	Functional exercise at each stage of rehabilitation	Objective of each stage
1. No activity	Symptom limited physical and cognitive rest	Recovery
2. Light aerobic exercise	Walking, swimming or stationary cycling keeping intensity <70% maximum permitted heart rate No resistance training	Increase HR
3. Sport-specific exercise	Skating drills in ice hockey, running drills in soccer. No head impact activities	Add movement
4. Non-contact training drills	Progression to more complex training drills, eg, passing drills in football and ice hockey May start progressive resistance training	Exercise, coordination and cognitive load
5. Full-contact practice	Following medical clearance participate in normal training activities	Restore confidence and assess functional skills by coaching staff
6. Return to play	Normal game play	

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It is important to follow all of the recommendations from the medical professionals who are assisting your child to full recovery. Please contact a healthcare provider or local physical therapist if you have additional questions about concussion management.

References:

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There are numerous Web sites and publications available on this subject; this list is not meant to be all inclusive. Many of the listed sites have links to additional resources.