**Sports-Related Head Injury**

Updated July 2011

**Incidence**

The U.S. Consumer Product Safety Commission (CPSC) tracks product-related injuries through its National Electronic Injury Surveillance System (NEISS). According to this lay analysis utilizing CPSC data, there were an estimated 463,745 sports-related head injuries treated at U.S. hospital emergency rooms in 2010. This number represents an increase of nearly 17,000 head injuries from the prior year. While quite a few top 20 categories posted decreases, sports that exhibited statistically significant increases from 2009 to 2010 included: football – 46,948 to 58,956, winter sports – 16,948 to 23,369, basketball – 34,692 to 40,864, fitness/exercise/health club – 18,012 to 21,877, and trampolines – 5,919 to 8,945. Wrestling moved into the top 20 category in 2010, posting an increase of 1,414 head injuries.

The actual incidence of head injuries may potentially be much higher for two primary reasons. 1). In the 2010 report, the CPSC excluded estimates for product categories that yielded 1,200 injuries or less, those that had very small sample counts, or those that were limited to a small geographic area of the country; 2). Many less severe head injuries are treated at physician's offices, immediate care centers, or self-treated.

Included in these statistics are not only the sports/recreational activities, but also the equipment and apparel used in these activities. For example, swimming-related injuries include the activity as well as diving boards, equipment, flotation devices, pools, and water slides.

The following 20 sports/recreational activities represent the categories contributing to the highest number of estimated head injuries treated in U.S. hospital emergency rooms in 2010.

Cycling: 83,202
Football: 58,956
Basketball: 40,864
Baseball and Softball: 33,617
Powered Recreational Vehicles (ATVs, Dune Buggies, Go-Carts, Mini bikes, Off-road): 26,661
Water Sports (Diving, Scuba Diving, Surfing, Swimming, Water Polo, Water Skiing, Water Tubing): 26,420
Soccer: 24,426
Winter Sports (Skiing, Sledding, Snowboarding, Snowmobiling): 23,369
Fitness/Exercise/Health Club: 21,877
Skateboards/Scooters: 20,973
Horseback Riding: 12,020
Gymnastics/Dance/Cheerleading: 10,542
Hockey: 9,673
Trampolines: 8,945
Golf: 8,260
Rugby/Lacrosse: 7,362
Wrestling: 5,129
Other Ball Sports, unspecified: 4,899
Ice Skating: 4,096

The top 10 sports-related head injury categories among children ages 14 and younger:

Cycling: 39,293
Football: 28,653
Basketball: 19,533

Baseball and Softball: 17,380
Water Sports: 14,167
Skateboards/Scooters: 12,558
Soccer: 10,845
Winter Sports: 9,661
Trampolines: 8,167
Powered Recreational Vehicles: 6,589

**Additional Sports Facts**

**Baseball/Softball**

The National Center for Catastrophic Sport Injury Research tracks a number of head injury statistics related to baseball:

- The most recent statistics indicate that at the high school level annually, there are 421,000 male baseball players and 900 female baseball players; 315,000 female softball players and 1,159 male softball players.
- From 1983-2009, high school baseball was associated with 52 direct catastrophic injuries.
- In 2009, a 17-year-old male baseball player was hit in the head by a baseball in a batting cage. He was not wearing a helmet at the time. His recovery was incomplete at the time of the Spring NCCSI 2009 Annual Report.
- In 2009, a 16-year-old high school male baseball player was hit by a pitch. He was wearing a batting helmet, but the ball struck him in the back of the head below the helmet (brainstem). He was taken off of life support and died three days after sustaining the injury.

**Boxing**

Over time, professional boxers can suffer permanent brain damage. The force of a professional boxer's fist is equivalent to being hit with a 13-pound bowling ball traveling 20 miles per hour, or about 52 g's.

According to the *Journal of Combative Sport*, from the 1960s through 2007, there have been 421 boxing-related deaths. They attribute 80 percent of these deaths to head, brain or neck injuries.

According to a recent study by the National Athletic Trainers Association, mixed martial arts (MMA) fighters suffer concussions at more than twice the rate of hockey players.

There are boxers with minimal involvement and those that are so severely affected that they require institutional care. There are some boxers with varying degrees of speech difficulty, stiffness, unsteadiness, memory loss, and inappropriate behavior. In several studies, 15-40 percent of ex-boxers have been found to have symptoms of chronic brain injury. Most of these boxers have mild symptoms. Recent studies have shown that most professional boxers (even those without symptoms) have some degree of brain damage.

A 2009 article, “Neuropsychological Consequences of Boxing and Recommendations to Improve Safety: A National Academy of Neuropsychology Education Paper” published in the *Archives of Clinical Neuropsychology*, analyzed the potential neuropsychological consequences of boxing.

- The frequency of acute, transient neurologic injuries in professional boxers is estimated to be 0.8 brain injuries per 10 rounds and 2.9 brain injuries per 10 boxers.
- Neurological trauma from boxing has three primary manifestations: 1. Acute neurologic injuries; 2. Persistent groggy states and the post-concussion syndrome; 3. Chronic traumatic encephalopathy (CTE), commonly referred to as “punchdrunk syndrome” or “dementia pugilistica.”

- At present, it is unknown exactly how many fights, punches, KOs/TKOs, and years of boxing a boxer can withstand before developing signs and symptoms portending the development of CTE. Yet, evidence suggests that the longer one engages in a boxing career, the greater the risk for incurring permanent brain damage from concussive or multiple subconcussive head blows.
- Under rare circumstances, some individuals can sustain a single brain injury that leaves them with permanent postconcussive symptoms and neurocognitive deficits that prohibit a return to contact sports. Others may sustain multiple low-grade concussions without any obvious permanent sequelae.
- Although there is no universal consensus on when a boxer's career should end, there is general agreement that an athlete who continues to experience post-concussive symptoms at rest or provoked by exertional exercise should not return to a contact sport.

**Cheerleading**

Cheerleading has changed drastically in the last 20 years, with increasingly difficult acrobatic stunts being performed. A number of schools at the high school and college level have limited the types of stunts that can be attempted by their cheerleaders. Rules and safety guidelines now apply to both practice and competition.

The National Center for Catastrophic Sport Injury Research tracked injuries related to cheerleading, from 1983-2008. Select head injury cases from 2005-2008 are noted below:

- A female cheerleader was practicing a new stunt with her squad, standing in an extension on her partner's arm when she fell and landed on her head. She suffered a fractured skull and was on a ventilator for 12 hours. Full recovery was expected.
- A 14-year-old female high school cheerleader suffered a fractured skull when her teammates did not catch her during a stunt. She has recovered.
- A female high school cheerleader fractured her skull during a basket toss in the school cafeteria. She landed on her head and was taken to the hospital. She has recovered.

A 2009 study by the Center for Injury Research and Policy of The Research Institute at Nationwide Children's Hospital yielded the following head injury statistics:

- The majority (96 percent) of the reported concussions and closed-head injuries were preceded by the cheerleader performing a stunt.
- Nearly 90 percent of the most serious fall-related injuries were sustained while the cheerleaders were performing on artificial turf, grass, traditional foam floors or wood floors.

**Cycling**

Every year, more than 500,000 people visit emergency rooms in the United States with bicycle-related injuries. Of those, more than 83,000 were head injuries in 2010. There are about 600 deaths a year, with two-thirds being attributed to TBI. It is estimated that up to 85 percent of head injuries can be prevented through proper usage of SNELL, American National Standards Institute (ANSI) or American Society for Testing and Materials (ASTM)-approved helmets. It is essential that the helmet fit properly so that it doesn't fall off while riding or if you take a fall.

The following facts/statistics are from Safe Kids USA:

- Head injury is the leading cause of wheeled sports-related death and the most important determinant of permanent disability after a crash.

- Without proper protection, a fall of as little as two feet can result in a skull fracture or other TBI.
- About 50 percent of US children ages 5 to 14 own a helmet, but only 25 percent report always wearing it while bicycling.
- Children whose helmets fit poorly are twice as likely to sustain a head injury in a bicycle crash as children whose helmets fit properly.
- A helmet that is worn too far back on the head is 52 percent less effective.
- If 85 percent of all child cyclists wore helmets in one year, the lifetime medical cost savings would total $197 to $256 million.

**Football**

The National Center for Catastrophic Sport Injury Research tracks a number of head injury statistics related to football annually:

- The most recent statistics indicate 1,500,000 players participating in junior and senior high school football and 75,000 in college football, annually.
- There were five fatalities directly related to football during the 2010 football season. Four of the five cases were associated with brain injury.
- During the 2010 football season there were four brain injuries that resulted in incomplete recovery, with all four at the high school level.
- The annual incidence of football-related concussion in the United States is estimated at 300,000.
- At the high school level, studies show that while 10 to 15 percent of athletes playing contact sports sustain concussions each year, only a fraction receive proper treatment.
- An 11-year-old sandlot player died two days after suffering a concussion in a game. The fatal injury occurred when he hit his head at school during recess while playing by the football sleds. The cause of death was likely second impact syndrome.
- A 17-year-old high school football player was injured in a game and died the next day. He collapsed on the sideline and was diagnosed with a subdural hematoma. The autopsy report showed that an injury incurred nearly a month before had been misdiagnosed as a concussion and was a subdural hematoma that re-bled and led to the fatal injury. His physician had cleared him to return to play the day he suffered the fatal re-bleed.
- An 18-year-old college defensive lineman suffered a brain injury when being blocked by an offensive lineman that landed on top of him. He died two days after incurring this injury.
- A 21-year-old college player was injured while making a tackle and taking a blow to the head. He suffered an acute subdural hematoma, walked off the field and began vomiting on the sideline. He died later at the hospital.
- A high school tackler was injured while participating in a tackling drill. He remembers a first hit to the head and then the next hit sending a shock to his head. He suffered a subdural hematoma, underwent emergency surgery, and recovery was incomplete.
- A 17-year-old high school running back suffered a subdural hematoma during a game after experiencing helmet-to-helmet contact with the tackler. He underwent a five-hour surgery and recovery was incomplete.
- A 16-year-old high school defensive back suffered a serious brain injury during a JV game. He collapsed on the field, was vomiting and suffering a headache. He was in a coma for two weeks. The circumstances of the actual incident are unknown and recovery is incomplete.
- A high school running back lost consciousness on the sideline during a game. He had been thrown to the ground twice by a tackler who grabbed his face mask. He had surgery to relieve pressure on his brain and has made a full recovery.

**Hockey**

A groundbreaking November 2010 *Neurosurgical Focus* study on Canadian junior ice hockey uncovered alarming head injury/concussion data and trends that raise many questions about the safety and wellbeing of teenagers and young adults who participate in this popular sport. Noted lead author Paul S. Echlin, MD, "The reluctance to report concussion symptoms may result from cultural factors, as expressed in several of the case studies – athletes demonstrate perceived toughness to their parents, coaches, team mates and peers by playing through an injury; and the belief of the athlete that he or she is invincible, so winning overrides any consideration of the effect of the injury upon long-term health. It is imperative to bring about a cultural and philosophical change in this regard through stepped-up education efforts and enforcement of concussion protocols."

Among the findings:

- The incidence of game-related concussions (per 100 athlete exposures) in fourth-tier junior ice hockey players was 7 times higher than previously reported in the literature.
- Seventeen players suffered a total of 21 concussions during the 52 physician-observed games.
- Twenty-nine percent (5/17) of the HCEP players suffered a second or recurrent concussion during the study period.
- Eighty-eight percent (15/17) of the players with a diagnosed concussion admitted to having suffered at least one concussion in the past. Two of the seventeen players who suffered a concussion during the study admitted that they had concealed a concussion sustained during the current season in order to keep playing.
- The forward position suffered 71 percent of the concussions; defensemen 29 percent; and no concussions were incurred by goalies.
- Twenty-four percent (5/21) of the HCEP concussions occurred in players who were directly involved in a fight immediately prior to their diagnosis.
- The mean clinical return-to-play duration in 15 players was 12.8 days.

**National Hockey League (NHL) 2010/2011 Season Study**

- Of the 80 reported concussions sustained by NHL players in the 2010/2011 season, 44 percent resulted from legal checks.
- Twenty-six percent of the concussions occurred when players were struck accidentally, either colliding with another player, being struck by the puck or tripping or falling and making head contact with the ice surface or boards.
- Seventeen percent of the concussions were the result of either illegal hits to the head or illegal body checks.
- Eight percent of the concussions were caused by fighting.
- Five percent of the concussions were not defined because the incidents were not taped.

At the same time that the study results were released, the NHL announced its plan for a more stringent concussion protocol that includes the following:

- Players will no longer be allowed to be evaluated by the trainer on the bench after showing signs of a possible concussion. It will be mandatory that the player in question be moved to a quiet place and be evaluated by a team physician before he can return to action.
- Thorough examination of ways to modify player equipment to make it safer, including the removal of any seamless glass surrounding all NHL rinks by the time the 2011/2012 season begins.

**Horseback Riding**

While head injuries comprise about 18 percent of all horseback riding injuries, they are the number one reason for hospital admission. A 2007 study by the Centers for Disease Control and Prevention found that horseback riding resulted in 11.7 percent of all traumatic brain injuries in recreational sports from 2001 to 2005, the highest of any athletic activity. Of the estimated 14,446 horseback-related head injuries treated in 2009, 3,798 were serious enough to require hospitalization. There were an estimated 4,958 concussions and 97 skull fractures. Subdural hematomas and brain hemorrhages comprised many of the serious injuries. According to the Equestrian Medical Safety Association, head injuries account for an estimated 60 percent of deaths resulting from equestrian accidents.

There are factors that may increase the risk of falling, such as a green horse, slippery footing, or bareback riding, but it is the height from which the rider falls that most significantly impacts the severity of the injury. According to the Ontario Equestrian Federation, a rider sitting on a horse is elevated eight feet or more above the ground, and a fall from just two feet can cause permanent brain damage. Riders ages 10-14 are most likely to be involved in an accident with a horse.

**Helmet Usage**

While serious head injury can occur while wearing a helmet, the data very clearly shows that the severity of the head injury can be decreased through helmet wear. While helmets are required in equestrian sports that involve jumping, including eventing and show jumping, in high level dressage competitions, the riders generally wear top hats, which provide no protection. Accidents are less common in competitive dressage, but accidents can occur. While most dressage riders do not wear helmets even when practicing, they are allowed both during practice and competition.

The United States Equestrian Federation strongly encourages all riders while riding anywhere on the competition grounds, to wear protective headgear with harness secured which passes or surpasses ASTM (American Society for Testing and Materials)/SEI (Safety Equipment Institute) standards for equestrian use and carries the SEI tag. While there are different style helmets for recreational riding, schooling, and showing, the safety standards are the same. The helmet should stay put when you move your head and the strap should keep it in place.

**Snow Skiing/Snowboarding**

Severe head trauma accounts for about 15 percent of all skiing and snowboarding related injuries, but is the most frequent cause of death and severe disability.

According to the National Ski Areas Association (NSAA), during the 2009/2010 season, 38 fatalities occurred out of the 59.8 million skier/snowboarder days reported for the season. Twenty-five of the fatalities were skiers (18 male, 7 female) and 13 of the fatalities were snowboarders, (12 male, 1 female). Among the fatalities, 19 of the victims were reported to be wearing a helmet at the time of the incident. The rate of fatality translates to .64 per million skier/snowboarder visits.

**Helmet Usage**

There are no state laws mandating helmets for skiing or any winter sports. Aspen ski resorts mandate that skiers under age 12 wear helmets. Other ski resorts are trying to institute such mandates, and in Michigan, statewide. Following the high-profile skiing-related deaths of Michael Kennedy in December 1997, Sony Bono in January 1998, an increase in the number of skiers wearing helmets was noted in several studies. The highly publicized skiing-related death of actress Natasha Richardson in March 2009 may have impacted helmet usage.

The annual NSAA National Demographic Study is compiled from more than 130,000 interviews of skiers and snowboarders nationwide. According to the 2009/2010 NSAA National Demographic Study:

- Fifty-seven percent of U.S. skiers and snowboarders wore helmets, up from 48 percent the year before. Comparatively, in the 2002/03 season, only 25 percent of skiers and boarders wore helmets.
- Eighty-six percent of children age 9 and younger wore ski/snowboard helmets.
- Seventy-five percent of children ages 10 to 14 wore ski/snowboard helmets.
- Seventy-one percent of adults ages 65 and older wore ski helmets.
- Helmet usage by skiers and boarders ages 18 to 24 is currently 43 percent, representing a 139 percent increase in usage for this age group since the 2002/03 season, when only 18 percent wore helmets.
- Notably, helmet usage increases with the skier's ability level. Twenty-six percent of beginners wore helmets, 38 percent of intermediates wore helmets, while 55 percent of advanced skiers and riders wore helmets.

**Soccer**

Protection against head injuries in soccer is complicated by the fact that heading is an established part of the game, and any attempt to protect against head injuries must allow the game to be played without modification. Several head guards have been developed to reduce the risk of head injuries in soccer. One independent research study found that none of the products on the market provided substantial benefits against minor impacts, such as heading with a soccer ball.

A McGill University study found that more than 60 percent of college-level soccer players reported symptoms of concussion during a single season. Although the percentage at other levels of play may be different, these data indicate that head injuries in soccer are more frequent than most presume.

According to CPSC statistics, 40 percent of soccer concussions are attributed to head to player contact; 10.3 percent are head to ground, goal post, wall, etc.; 12.6 percent are head to soccer ball, including accidents; and 37 percent are not specified.

The National Institute of Health cites that 4-8 percent of soccer players report suffering concussions, but theorize that 90 percent of concussions go unreported or unrecognized so the actual incidence may be closer to 40 percent.

According to Inside Minnesota Soccer, the following activities can lead to soccer head injuries:

- Elbow to head and head-to-head contact when two or more players are contesting for ball in the air (most common).
- Goalkeepers getting kicked or getting a knee to the head or hitting head on goalpost.
- Body-to-body contact without direct contact to the head in which the head accelerates or decelerates violently.
- Getting hit in the head unexpectedly with the ball and hitting head on ground after falling.
- Deliberately heading the ball (least common).

**Types of Head Injuries**

**Concussions**

Cerebral concussions frequently affect athletes in both contact and non-contact sports. Cerebral concussions are considered diffuse brain injuries and can be defined as traumatically induced alterations of

mental status. A concussion results from shaking the brain within the skull and, if severe can cause shearing injuries to nerve fibers and neurons.

Grading the concussion is a helpful tool in the management of the injury (see Cantu below) and depends on: 1) Presence or absence of loss of consciousness, 2) Duration of loss of consciousness, 3) Duration of posttraumatic memory loss, and 4) Persistence of symptoms, including headache, dizziness, lack of concentration, etc.

Some team physicians and trainers evaluate an athlete's mental status by using a five-minute series of questions and physical exercises known as the Standardized Assessment of Concussion (SAC). This method, however, may not be comprehensive enough to pick up subtle changes. More recently, teams have employed ImPACT, a 25-minute computer based testing program specifically designed for the management of sports-related concussion. A player who has sustained a concussion is three to six times more likely to sustain another one. While the decision on when an athlete is ready to return to play isn't straightforward, every player should receive baseline neurological testing before the season so that the results can be used for comparison in the event the athlete receives a blow to the head.

According to the Cantu Guidelines, Grade I concussions are not associated with loss of consciousness, and posttraumatic amnesia is absent or is less than 30 minutes in duration. Athletes may return to play if no symptoms are present for one week.

Players who sustain a Grade II concussion lose consciousness for less than five minutes or exhibit posttraumatic amnesia between 30 minutes and 24 hours in duration. They may also return to play after one week of being asymptomatic.

Grade III concussions involve posttraumatic amnesia for more than 24 hours or unconsciousness for more than five minutes. Players who sustain this grade of brain injury should be sidelined for at least one month, after which they can return to play if they are asymptomatic for one week.

Following repeated concussions, a player should be sidelined for longer periods of time and possibly not allowed to play for the remainder of the season.

Second Impact Syndrome results from acute, sometimes fatal brain swelling that occurs when a second concussion is sustained before complete recovery from a previous concussion. This causes vascular congestion and increased intracranial pressure, which may be difficult or impossible to control. The risk for second impact syndrome is higher for sports such as boxing, football, ice or roller hockey, soccer, baseball, basketball, and snow skiing.

**Chronic Traumatic Encephalopathy (CTE)**

Chronic traumatic encephalopathy (CTE), originally described in boxers as "dementia pugilistica," or in lay terms, "punch drunk" in 1928, is a degenerative brain disease believed to result from repetitive, often minor head trauma, including concussions. It first appeared in medical literature under the term CTE in 1969. Yet from 1928 through 2009, there were only 49 cases described in all medical literature, 39 of which were in boxers. That changed when Pittsburgh medical examiner Bennet Omalu identified CTE in two former Pittsburgh Steelers players who died under his watch in 2002 and 2005. His published findings drew the attention of Sports Legacy Institute (SLI) co-founders Chris Nowinski, former collegiate football player and professional wrestler and neurosurgeon Robert Cantu, MD. The first case confirmed by SLI was in professional wrestler Chris Benoit. In 2008, SLI partnered with Boston University School of Medicine to create the Center for the Study of Traumatic Encephalopathy (CSTE), the world's first center dedicated to studying CTE.

The repetitive head trauma that leads to CTE triggers progressive degeneration of the brain tissue, including the build-up of an abnormal protein called tau. This protein builds up in clumps or tangles in areas of the brain, disrupting its function. The degenerative changes in the brain can begin months, years, or decades after the last concussion or end of active athletic involvement.

The clinical symptoms associated with CTE vary in severity depending on the clinical stage of the disease. Initial symptoms may include the following:

- Deterioration in attention, concentration, memory
- Disorientation
- Confusion
- Dizziness
- Headaches
- Lack of insight
- Paranoia
- Poor judgment
- Overt dementia
- Slowed muscular movements
- Staggered gait
- Impeded speech
- Tremors
- Vertigo
- Deafness

The first stage of the disease may include affective disturbances and psychotic symptoms. As the disease progresses to stage two, the individual may suffer from social instability, erratic behavior, memory loss, and the initial symptoms of Parkinson's disease. The final stage consists of a progressive deterioration to dementia, and may include speech difficulties, gait abnormalities, dysarthria (speech disorder characterized by neuromuscular weakness or lack of control of facial muscles), dysphagia (difficulty swallowing), and ptosis (drooping eyelid).

**Diagnosis**

Currently, there are no specific markers or tests to detect CTE in a living athlete and it is diagnosed through studying brain tissue under a microscope after death. More than 300 former and current athletes have agreed to donate their brains to the Center for the Study of Traumatic Encephalopathy (CSTE) to further research efforts. Among the confirmed CTE cases of deceased professional athletes:

- Andre Waters, retired NFL defensive back (deceased 2006, age 44)
- Chris Benoit, professional wrestler (deceased 2007, age 40)
- John Grimsley, retired NFL lineman (deceased 2008, age 45)
- Reggie Fleming, retired NHL defenseman and left wing (deceased 2009, age 73)
- Lou Creekmur, retired NFL offensive tackle/guard (deceased 2009, age 82)
- Chris Henry, Cincinnati Bengals wide receiver (deceased 2009, age 26)
- Bob Probert, retired NHL forward (deceased 2010, age 45)
- Dave Duerson, retired NFL safety (deceased 2011, age 50)

**Coma**

The word coma refers to a state of unconsciousness. The unconscious state has variability and may be very deep, where no amount of stimulation will cause the person to respond or, in other cases, a person who is

in a coma may move, make noise, or respond to pain but is unable to obey simple, one-step commands, such as "hold up two fingers," or "stick out your tongue." The process of recovery from coma is a continuum along which a person gradually regains consciousness.

For people who sustain severe injury to the brain and are comatose, recovery is variable. The more severe the injury, the more likely the result will include permanent impairment.

The Glasgow Coma Scale is usually administered upon admission to establish a base line of level of consciousness, motor function and eye findings. Frequent evaluations of the patient are imperative to help assess neurologic improvement or deterioration.

Brain imaging technologies, particularly computerized axial tomography (CT or CAT scan) can offer important immediate information about a person's status. The purpose of performing an emergency CT scan is to rule out a large mass lesion (hematoma) compressing the brain that requires immediate surgical removal. Magnetic Resonance Imaging (MRI) is used in a more elective setting to image subtle changes that are not picked up by CT.

**Brain Injury Symptoms**

- Pain: Constant or recurring headache
- Motor Dysfunction: Inability to control or coordinate motor functions, or disturbance with balance
- Sensory: Changes in ability to hear, taste or see; dizziness; hypersensitivity to light or sound
- Cognitive: Shortened attention span; easily distracted; overstimulated by environment; difficulty staying focused on a task, following directions or understanding information; feeling of disorientation and confusion and other neuropsychological deficiencies.
- Speech: Difficulty finding the "right" word; difficulty expressing words or thoughts; dysarthric speech.

**Helmet Usage**

Buy and use helmets or protective headgear approved by the ASTM for specific sports 100 percent of the time. The ASTM has vigorous standards for testing helmets for many sports; helmets approved by the ASTM bear a sticker stating this. Helmets and headgear come in many sizes and styles for many sports and must properly fit to provide maximum protection against head injuries. In addition to other safety apparel or gear, helmets or headgear should be worn at all times for:

- Baseball and Softball (when batting)
- Cycling
- Football
- Hockey
- Horseback Riding
- Powered Recreational Vehicles
- Skateboards/Scooters
- Skiing
- Snowboarding
- Wrestling

Headgear is recommended by many sports safety experts for:

- Bull riding
- Martial Arts
- Pole Vaulting
- Soccer

- Vintage Motor Sports

**Bicycling Injury Prevention Tips**

- Buy and use a helmet approved by the American Society for Testing and Materials (ASTM) or Snell 100 percent of the time. The helmet must fit correctly and be worn properly to be effective.
- Obey all traffic signals and be aware of drivers.
- Do not text or talk on your cell phone while biking.
- Avoid uneven or unpaved surfaces.
- Wear bright colors when riding. If you must ride at dusk or night, wear clothing that reflects light. Install reflectors on the front and rear of your bike, and use a headlight.

**Water Sports Injury Prevention Tips**

- Provide adult supervision for younger children at all times.
- Check the depth – and check for debris in the water before diving.
- Do not dive in water less than 12 feet deep or in aboveground pools.
- Install properly locking gates and fences around backyard pools.
- Do not drink alcohol when participating in water sports.
- Don't run around the pool or push people into/under the water.
- Follow all rules and warning signs at water parks, swimming pools, and public beaches.

**Winter Sports Injury Prevention Tips**

- Buy and use helmets or protective head gear approved by the American Society for Testing and Materials (ASTM) for skiing, snowboarding, hockey, and snowmobiling 100 percent of the time. These must fit correctly and be worn properly to be effective.
- For hockey, in addition to head gear, protective gear includes a face shield, mouth guard, shoulder and elbow pads, shin guards, cup/supporter, and gloves. Goalies require additional protective gear.
- Do not participate in outdoor sports when weather conditions pose a serious hazard.
- Ice skate only in areas designated for skating, and be sure to check the ice for cracks and debris.
- Avoid overly aggressive behavior. Boarding, butt-ending, charging, clipping, contact to the head, cross-checking, elbowing, head-butting, high sticks, holding, kneeing, roughing, slashing, and spearing are all "illegal" moves that incur penalties in hockey.
- Use only sleds that can be steered, and never go down a slope head first.
- Follow all posted signs and warnings on ski slopes, sledding hills and ice skating rinks.

**General Sports Injury Prevention Tips**

- Supervise younger children at all times, and do not let them use sporting equipment or play sports unsuitable for their age.
- Wear appropriate clothing for the sport.
- Do not wear any clothing that can interfere with your vision.
- Do not participate in sports when you are ill or very tired.
- Obey all traffic signals, and be aware of drivers when cycling, skateboarding, or rollerblading.
- Avoid uneven or unpaved surfaces when cycling, skateboarding, or rollerblading.
- Perform regular safety checks of sports fields, playgrounds and equipment.
- Discard and replace sporting equipment or protective gear that is damaged.

**Major League Baseball 2011 Concussion Policy**

1. Mandatory baseline neuropsychological testing requirements for players and umpires during Spring Training, or when a player joins a club during the season, formalizing a process that most individual Clubs follow;
2. Protocols for evaluating players and umpires for a possible concussion, including during incidents typically associated with a high risk, such as being hit in the head by a pitched, batted or thrown ball or by a bat; being in a collision with a player, umpire or fixed object; or any time when the head or neck of a player or an umpire is forcibly rotated;
3. The establishment of a seven-day disabled list for concussions, which will aim to allow concussions to clear, prevent players from returning prematurely and give clubs a full complement of players in one's absence; any player on the seven-day DL for more than 14 days will automatically and retroactively be transferred to the 15-day DL, effective with the first day of the initial placement, and with the prior 14 days applying to the initial 15-day maximum term; implemented on a trial basis for the 2011 season;
4. Protocols for clearing a concussed player or umpire to return to activity; prior to the time that a concussed player is permitted to play in any game (including Major League, Minor League or extended Spring Training games), the Club must submit a "Return to Play" form to MLB's Medical Director; submission of the form is required irrespective of whether the player was placed on the disabled list.

**Rules Changes in High School Football to Address Concussions**

The National Federation of State High Schools released the following statement on February 23, 2010:

Effective with the 2010 high school football season, any player who shows signs, symptoms or behaviors associated with a concussion must be removed from the game and shall not return to play until cleared by an appropriate health-care professional. The new concussion language is being placed in all NFHS rules books for the 2010-2011 season as well as the “NFHS Suggested Guidelines for Management of Concussion”.

**Rule Changes in College Football to Prevent Head and Neck Injuries**

The National Athletic Trainers’ Association and the American Football Coaches Association (NATA/AFCA) Task Force, headed by Ron Courson, director of sports medicine for the University of Georgia, has focused on two primary problems associated with head contact.

- Head-down contact still occurs frequently in intercollegiate football
- Helmet-contact penalties are not adequately enforced.

Rule changes implemented by the NCAA related to head-down contact and spearing in collegiate football have been distributed to all coaches and officials throughout the country. The objective is to eliminate injuries resulting from a player using his helmet in an attempt to punish an opponent.

With the rule changes and more diligent enforcement of the rules, there is hope that a significant reduction in head and neck injuries will result.

The National Collegiate Athletic Association revised its 16 year-old guideline on treatment of concussion in the NCAA Sports Medicine Handbook to better provide member institutions with appropriate responses to concussion injuries and procedures for returning athletes to competition or practice. “It is essential that no athlete be allowed to return to participation when any symptoms persist, either at rest or exertion.” The guidelines details circumstances in which an athlete should be withheld from competition pending clearance by a physician.

**NFL Head, Neck and Spine Committee 2011 Sideline Concussion Assessment Protocol**

Building on the foundation of the Sideline Concussion Assessment Tool II developed by the Concussion in Sport group in Zurich, 2008 (McCrory, BJSM '09), the new protocol includes modifications specific to professional football. It includes a focused screening neurological examination to exclude cervical spine and intracranial bleeding, and assessments of orientation, immediate and delayed recall, concentration, as well as a balance evaluation. The performance of these tests can be compared with a pre-season evaluation to see if any decline in function is present. It does not replace more sophisticated tests, and does not replace the individualized assessment by the clinician of the athlete, but does provide the medical staff with a standardized protocol to evaluate for head injury.

**Football-Related Head and Neck Injury Prevention Tips**

- All players should receive preseason physical exams and those with a history of prior brain or spinal injuries, including concussions, should be identified.
- Football players should receive adequate preconditioning and strengthening of the head and neck muscles.
- Contact should always be made with the head up and never with the top of the head/helmet. Initial contact should never be made with the head/helmet or facemask.
- Coaches and officials should continue to teach and emphasize proper blocking and tackling techniques to help reduce head and neck fatalities. **KEEP THE HEAD OUT OF THE GAME.**
- Ball carriers should be taught to not lower their heads when making contact with the tackler to avoid helmet-to-helmet collisions.
- Coaches, physicians and trainers should ensure that the players' equipment is properly fitted, especially the helmet, and that straps are always locked.
- Coaches must be prepared for a possible catastrophic SCI. The entire staff must know what to do in such a case, because being prepared and well informed might make all the difference in preventing permanent disability.
- The rules prohibiting spearing should be enforced in practice and games. Game officials should call all illegal helmet contact in games. If this is done, the incidence of concussions and catastrophic injuries may be reduced. Coaches will no longer teach improper techniques and players will no longer use their helmeted heads if these penalties are enforced.

**Additional Sports-Related Head Injury Resources**

**MomsTeam**
**ThinkFirst National Injury Prevention Foundation**