

LESSONS FROM THE PLAYING FIELD: Addressing Youth Sports-Related Concussions

Consistent with the national picture of increasing sports-related pediatric traumatic brain injuries (TBIs), Ohio has seen dramatic rises in these types of injuries. Ohio emergency room visits for pediatric TBIs increased from 2,970 visits in 2002 to 5,167 visits in 2010 (Ohio Department of Health, 2012). As a result of increased awareness and concern for Ohio's children, legislation was introduced to improve safety precautions for student athletes. This legislation, House Bill 143 (HB 143), was passed in December 2012 (H.B. 143, 2012). This policy brief highlights some recent TBI data, discusses best practices for preventing and treating child and adolescent sports-related concussions, and reviews HB 143 and related policy efforts, including implications for parents, coaches and other key stakeholders.

Annually, 1.7 million people will sustain a traumatic brain injury in the United States (Centers for Disease Control, 2011; Centers for Disease Control(a), 2012). Adolescents between the ages of 15 to 19 are one of the most common age groups to have this type of injury, and approximately 70% of sports- and recreation-related TBI emergency room visits were among young people aged 10-19 years. Between 2001 and 2009 the number of emergency

room visits for sports-related TBIs for children under the age of 19 increased by about 62%. This increase is most likely due to heightened awareness of these injuries. There are a number of risk factors contributing to youth TBIs, but sports-related injuries remain one of the leading causes of emergency room visits for concussions.

TBIs occur when a bump or jolt to the head disrupts normal brain functioning. Concussions are a specific type of TBI, and can arise even if an athlete doesn't specifically hit his or her head directly. For example, if an athlete receives a hit that causes neck whiplash or that shakes their head violently, this movement to the head and brain can cause a concussion (Centers for Disease Control(b), 2012). Common signs of concussions include headaches, diminished alertness and sensitivity to light or noise. Recognition and treatment of concussions during sports play is especially important due to the risk of second impact syndrome, a catastrophic swelling of the brain that occurs when a person suffers a second concussion before the symptoms of the first concussion have subsided (Halstead, Walter, & The Council on Sports Medicine and Fitness, 2010).

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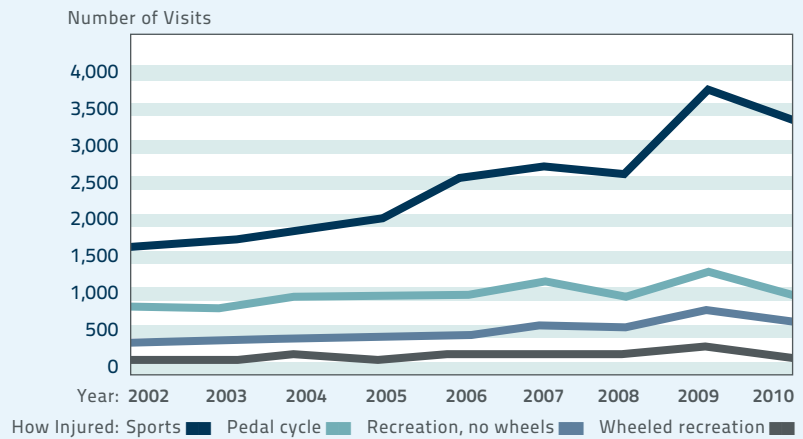
lessons from the playing field continued >

Sports-related concussions can occur across a wide variety of sports, and concussion rates can vary by sex, sport and type of contact (Marar, McIlvain, Fields, & Comstock, 2012). High school football has the highest rate of concussions followed by girls soccer and boys lacrosse (Halstead, Walter, & The Council on Sports Medicine and Fitness, 2010). Some studies have also suggested that girls are more prone to concussions than boys. This may be due to girls focusing less on head and neck muscles during strength training, or they may be more willing to report concussion symptoms than boys (Marar, McIlvain, Fields, & Comstock, 2012). Also, few statistics are available on concussion rates for younger athletes. On the whole there is a lack of research on the epidemiology and prevalence of pediatric sports-related TBIs. More research is needed to further investigate how and why concussion rates differ by sport, age and sex.

TBIs, and specifically concussions, have become a growing national public health issue due to new evidence that suggests TBIs in childhood can have long-term implications for healthy development.

Research has shown that brain functioning related to attention is worse in adolescents with a history of concussions. Other long-term health consequences can include persistent headaches, memory loss, seizures and exacerbated emotional symptoms (Apps, Walter & Doescher, 2012; Broglio, Pontifex, O'Connor & Hillman, 2009).

FIG 1. NUMBER OF OHIO EMERGENCY DEPARTMENT VISITS FOR SPORTS-OR RECREATION-RELATED TBI, 18 YEARS OLD AND YOUNGER 2002-2010



Source: Ohio Department of Health. (2012). *Sports/Recreation related traumatic brain injury among ohio youth*. Columbus, OH.

YOUTH SPORTS-RELATED TBI IN OHIO

The number of Ohio children who suffer from TBIs and concussions has grown substantially in recent years. The Department of Sports Medicine at UH Rainbow Babies and Children's Hospital reports that the number of new patient pediatric visits for concussions increased dramatically from 19 children in 2009 to 228 children in 2012 (Briskin, S., personal communication, December 12, 2012). Figure 1 indicates that emergency department visits for sports-related TBIs among youth in Ohio increased by 110% between 2002 and 2010. Although there is an unexplained decrease in emergency department visits for all sports and recreation-related TBIs between 2009 and 2010, the overall trend shows that youth sports-related TBIs had the largest increase. Also, male teens experienced three times more sports-related TBIs than females during this time period (Ohio Department of Health, 2012). It is important to note that these statistics are most likely an underrepresentation of

the actual prevalence of sports-related TBIs in Ohio since they are only based on children who went to the emergency room. They do not include children who sought care from their pediatrician or another health care provider (Ohio Department of Health, 2012).

PREVENTATIVE MEASURES

While no foolproof method exists, there are a number of precautions parents and coaches can take to reduce or prevent sports-related TBIs, including enforcing the rules of the game and encouraging helmet and face mask use across a range of sports (McCrory et al., 2009; Logan, 2010). **However, most of the attention on youth sports-related TBIs focuses on how to handle the injuries once they have occurred, rather than on prevention efforts.** No existing legislative efforts specifically address prevention of these types of injuries, and there are currently a number of debates about how best to prevent TBIs. Robert Cantu, one of the leading experts on youth concussions,

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argues that children under the age of 14 should be prevented from playing tackle football, heading soccer balls or body-checking in ice hockey (Toporek, 2012). Many people think that these recommendations are extreme, but he reasons that children under the age of 14 are skeletally immature, and thus these injuries can have significant and permanent effects on their cognitive development. Pop Warner, an organization that manages youth football teams nationwide, incorporates limited full-body contact in practices in order to prevent injuries. While private organizations are making these changes voluntarily, there is nothing that has been proposed to legally mandate these safety and prevention measures (Clark, 2012).

DIAGNOSIS AND TREATMENT

On-the-field diagnoses are the first step in identifying whether a TBI is present and if a student athlete can return to play.

Pediatric concussion specialists urge that a comprehensive and individualized approach be used to make on-the-field diagnoses. On-the-field assessments should include a primary survey to check the athlete's breathing, consciousness and spinal stability. After the athlete has been removed from the field, a secondary survey should be conducted that includes a physical exam, a neurological exam and cognitive testing. **A concussion should be diagnosed even if there is only one symptom present, because adolescent athletes typically experience a worsening of their symptoms in the first 48 hours.** If signs of worsening mental status, such as worsening headache, weakness, unsteady gait, seizures or unusual or irritable behavior, do appear, the student athlete should be taken to a hospital for further evaluation (Briskin & Weiss Kelly, 2012). These recommendations for on-the-field diagnosis are considered best practices for diagnosing pediatric TBIs, but they are not necessarily the practices that take place on sports fields across the country. These recommendations also assume the presence of a team physician or athletic

trainer at all youth sporting events. This may not be the case, and raises questions about how to better train coaches and referees to accurately and effectively conduct on-the-field diagnoses when a trained physician is not present.

Treatment of sports-related concussions includes immediate removal of an athlete from play and encourages rest and sleep.

The majority of patients will recover from concussion symptoms within three weeks, but the younger the athlete, the longer the recovery time. Physicians also encourage both physical and cognitive rest during the recovery period. Cognitive rest can be especially difficult for students who must immediately return to school. The level of mental exertion needed to pay attention in school and complete homework assignments can be very high and impede a student's recovery or lead to worsening symptoms. Physicians urge parents to be advocates for their children during this recovery period by educating teachers and school administrators about how to accommodate students who have suffered a TBI (Burton, 2012; Thomas, 2012; Logan, 2010).

ASSESSING WHEN ATHLETES MAY RETURN TO PLAY

While recognizing and treating concussions is important, there is increased discussion about how and when student athletes should be allowed to return to play. **Ohio HB 143 requires that students obtain medical clearance to play again, but clearance does not necessarily mean that they should jump right back into the game. Experts on youth concussions argue that a phased-in approach to returning to play is best.** The first step includes complete rest and no activity. Then an athlete can begin light aerobic exercise. If no symptoms return, the athlete can move on to sport-specific exercise and then non-contact drills. If symptoms have still not returned then the athlete can begin to practice contact drills followed by return to game play. The goal of this phased-in approach is to ensure that all symptoms are gone and that the student athlete is not at risk and therefore truly ready to return to play (Logan, 2010).

COMMON CONCUSSION SYMPTOMS MEDICAL ASSESSMENT SHEET

Headache
Nausea
Vomiting
Balance Problems
Dizziness
Fatigue
Trouble Falling Asleep
Sleeping More than Usual
Sleeping Less than Usual
Drowsiness
Sensitivity to Light
Sensitivity to Noise
Irritability
Sadness
Nervousness
Feeling More Emotional
Numbness or Tingling
Feeling Slowed Down
Feeling Mentally "Foggy"
Difficulty Concentrating
Difficulty Remembering

*Source: Lovell, M., et al. (2006).

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POLICY & PRACTICE IMPLICATIONS

State and Federal Policy Efforts

OHIO HB 143 SUMMARY

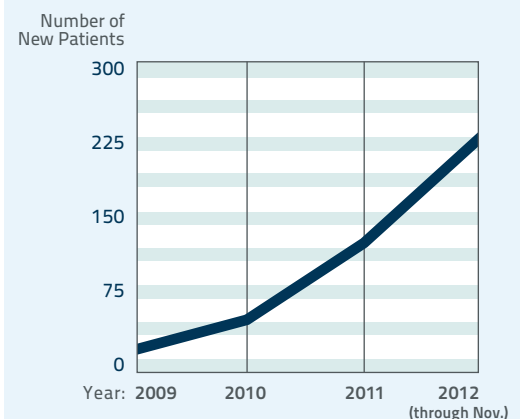
- Student athletes may not practice or compete until the student's parent or guardian submits a signed form, acknowledging that they have received and reviewed a concussion information sheet created by the Ohio Department of Health.
- All coaches and referees must complete a mandatory training program that focuses on identifying and treating concussions and TBIs.
- Coaches or referees are required to remove a student athlete from play if he or she is exhibiting signs or symptoms consistent with a TBI.
- Coaches or referees are prohibited from allowing a student to return to play until the student has been assessed and given written consent to return to play by a health care provider authorized by the school district or youth sports organization.

As the reality of the danger and possible long-term implications of child and adolescent TBIs becomes more evident, there is a growing push to legislate how these injuries are handled. In 2009, Washington passed one of the first concussion-related pieces of legislation named the Zachery Lystedt Law. Zachery was 13 years old when he suffered a concussion during the second quarter of a football game. He returned to the game after halftime, but by the end of the second half he had collapsed on the field and was taken to the hospital. As a result of returning to the game too soon Zack suffered permanent brain damage. Proponents of concussion legislation, including the National Football League, promote the Zachery Lystedt Law as model legislation for other states, with three core requirements: mandatory parental notice and signed acknowledgement of concussion injury information sheet; removal of all student athletes suspected of a concussion from game play; and, clearance by a medical professional before returning to play (Toporek, 2011). As noted earlier however, this model legislation does not include prevention measures.

Currently only four states have no legislation and six have pending legislation on youth sports-related concussions. There have also been efforts to legislate youth sports concussions on the national level. Modeled on the Zachery Lystedt Law, the federal "Protecting Student Athletes from Concussions Act" was introduced by Representative Timothy Bishop in 2010 and 2011, but has not passed out of committee (House Bill 469, 2012). This bill also stipulates that state educational agencies would not receive any federal funding until they met the requirements of the law (Toporek, 2011).

As Figure 2 shows, the number of new patient visits for concussions at Rainbow Babies has rapidly risen in the past few years, indicating a need for concussion legislation in Ohio. Modeled on the Zachery Lystedt Law, Ohio HB 143 was approved by state legislators and signed by the governor in December 2012 with the aim of protecting child athletes who suffer concussions. It includes the three key requirements outlined in the model legislation, and will become effective on March 20, 2013. The law states that a coach or referee may not allow a student athlete to return to play on the same day that he or she has been removed from the game or practice, but there is no directive stating how many days a student must sit out before returning. **The key to returning to play is that the student must be assessed by a physician or licensed health care practitioner and receive a written clearance to play. Restricting return to play is especially important because the consequences of a second hit can be catastrophic and even lead to death** (Halstead, Walter, & The Council on Sports Medicine and Fitness, 2010).

FIG 2. NEW PATIENT CONCUSSION VISITS AT UH RAINBOW BABIES AND CHILDREN'S HOSPITAL



Source: Briskin, S., personal communication, December 12, 2012.

RESOURCES:

- **Ohio Violence and Injury Prevention Program (VIPP):** The goal of VIPP is to continue development of a comprehensive injury prevention program through the establishment and sustainment of a solid infrastructure for injury prevention that includes statewide injury surveillance to inform and evaluate public policy, as well as comprehensive injury prevention and control programs. <http://www.healthyohiprogram.org/vipp/injury.aspx>
- **Sports Medicine Program at UH Rainbow Babies and Children’s Hospital:** Pediatric sports injuries may need specialized care, because children’s joints and bones may not be fully developed yet. The team at the Pediatric Sports Medicine Program has the specialized training and experience to accurately diagnose and treat these types of injuries. The Sports Concussions team can help diagnose, treat and manage sports-related TBIs. They also offer pre-season baseline assessments to sports teams across Northeast Ohio. <http://www.uhhospitals.org/rainbow/services/orthopaedic-surgery/sports-medicine-program/sports-concussion-program>
- **Child Injury Action Group (CIAG):** Through the umbrella of the Ohio Injury Prevention Partnership and in coordination with the Ohio Chapter of the American Academy of Pediatrics, the VIPP oversees the CIAG. The function of the CIAG is to identify priorities and strategies to reduce child injury in Ohio. <http://www.healthyohiprogram.org/vipp/ciag/ciag.aspx>
- **Heads Up: Concussion in Youth Sports:** The CDC has created a national public health campaign that aims to help parents and coaches to prevent, recognize and respond to youth concussions. Their website provides fact sheets and posters regarding pediatric concussion symptoms as well as a free online training program for coaches and referees. <http://www.cdc.gov/concussion/HeadsUp/youth.html>

HB 143 will apply to all student athletes in public, charter and private schools, as well as participants in youth sports organizations including community, recreational and travel leagues. Other aspects of the law include requiring coaches and referees to complete a concussion education course every three years. Experts argue that this training is important because the signs and symptoms of concussions can be quite varied. Physicians are very supportive of the law because they believe it will help coaches make the right decision and ensure children seek appropriate treatment for head injuries (H.B. 143, 2012; Guillen, 2012).

While most states have passed or introduced similar legislation, not all of these laws are the same. For example, many states exempt little leagues and traveling teams from the legislation. Some legislation is more limited. For example,

Wyoming does not require students to be removed from game play nor does it require medical clearance before they return to play (Toporek, 2011). Ohio also faced some challenges in passing HB 143. For example, opponents took issue with the requirement that students must obtain medical clearance to return to play. Some medical professionals such as optometrists and physical therapists expressed concern about being excluded, and rural representatives argued that getting to a hospital or doctor could be impractical. As a result, the bill was revised to allow school districts and youth sports organizations the discretion to determine which medical professionals could make the return to play decision (Clark, 2012).

LOOKING FORWARD

Better epidemiological data is needed to assess differences in pediatric concussion rates across age, sex and type of sport. As mentioned, there is a gap in research

on the prevention of these injuries. More definitive research findings on the long-term affects and cognitive implications of sports-related TBIs could inform new rules and regulations to prevent future injuries. Further research is also needed to improve on-the-field diagnoses. Training coaches and referees how to accurately diagnose concussion symptoms could greatly improve the well-being of student athletes. Also, creating standard guidelines for returning to play should be considered. While medical professionals strongly recommend a measured return to play, current legislation efforts do not require this phased-in approach. Another factor to consider is cost, because families without health insurance may be burdened by the need to get medical clearance for their child to return to play. Finally, not all state laws apply to private sports organizations; a dialogue should be encouraged about how to protect youth athletes that participate in these groups.

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The **SCHUBERT CENTER FOR CHILD STUDIES** is generously supported by the Bondy, Brisky, Hamilton, Mann and Schubert Endowments and The George Gund Foundation.

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