Youth Concussion Laws across the Nation: Implications for the Traveling Team Physician

Lauren M. Simon, MD, MPH, FACSM[1,2] and Cory N. Mitchell, MD[2]

Abstract

There are an estimated 1.6 to 3.8 million sports and recreation-related concussions annually in the United States, with an average annual increase in incidence of 15.5% from 1998 to 2007. From 2009 to 2014, all 50 states enacted youth concussion legislation. This study clarifies core elements common to state concussion legislation and State Interscholastic Athletic Association (SIAA) implementation. A concussion literature, legislative, and SIAA concussion bylaw review was performed for all 50 U.S. states. Mandated concussion education varies in the frequency of certification and method of education. Student athletes and their parents/guardians in a majority of states are required to sign annual educational information sheets. Forty-nine states specifically mandate removal from play. Return-to-play protocols vary with regard to the timeline, content, and health care professional that can provide written clearance. In conclusion, it is important for sports medicine clinicians to stay abreast of current and revised concussion legislation in the jurisdictions in which they provide care.

Introduction

Approximately 1.6 to 3.8 million sports and recreation-related concussions occur annually in the United States (18). Although concussions can occur in numerous sports and across all ages of sport participation, the highest percentage of sports-related concussions occur in persons 15 to 24 yr old (8,21).

According to the U.S. Centers for Disease Control and Prevention (CDC) analysis of the National Electronic Injury Surveillance System — All Injury Program, between 2001 and 2005, approximately 207,830 emergency department (ED) visits for concussion and other sports and recreational-related activities were reported annually, with 65% of the traumatic brain injuries (TBIs) occurring in persons aged 5 to 18 yr (8). There were 173,285 persons aged 19 yr or younger who were treated in EDs annually for sports and recreation-related nonfatal TBIs. During 2001 to 2009, the number of ED evaluations for sports-related TBI increased 62% (from 153,375 to 248,418), with the highest rates in men aged 10 to 19 yr (13). The rate of sports-related injuries with diagnosis of TBI or concussion alone or in combination with other injuries increased 57% among persons 19 yr or younger (8). A review of concussion research shows studies vary in the athlete exposure (AE) denominator used. AE is equal to the athlete participation in one practice or one competition. According to one study by Marar et al. (21) from 2008 to 2010, high school athletes in 20 sports reported 1,936 concussions from 7,780,064 AEs, with an overall injury rate of 2.5/10,000 AEs. The majority of the concussions (47.1%) occurred in football (n = 912), with the second most common (8.2%) occurring in girls' soccer (n = 159). In gender comparable sports such as soccer and basketball, girls had a higher concussion rate than boys (11,12,21).

In another study from 1997 to 2008, which included 158,430 athletes in 12 sports, Lincoln et al. (19) found an overall incidence rate of concussion of 0.24 per 1,000 AEs. The overall concussion rate increased from 0.12 per 1,000 AEs in 1998 to 0.49 in 2008, with an average annual increase of concussions of 15.5%. It is unclear if the increased sports-related concussion rates were due to increased numbers of participants, stricter sports injury reporting parameters, or increased awareness of concussion signs and symptoms.

According to the National Federation of State High School Associations (NFHS) data for high school athletics participation in the 2014 to 2015 school year, over 7.8 million high school students in the United States participated in organized sports. Compared with adults, children and adolescents are at increased risk for TBIs with increased severity and prolonged recovery (8,25). Resolution of clinical and cognitive symptoms of concussion occurs in less than 10 d in 80% to 90% of people who experience a concussion; however, youth athletes are more likely to have a

[1]Primary Care Sports Medicine, Family Medicine, Loma Linda University, Loma Linda, CA; [2]Family Medicine, Loma Linda University, Loma Linda, CA

Address for correspondence: Lauren M. Simon, MD, MPH, FACSM, Primary Care Sports Medicine, Family Medicine, Loma Linda University, 25455 Barton Road, Suite 209B, Loma Linda, CA 92354; E-mail: lsimon@llu.edu.

1537-890X/1503/161–167
Current Sports Medicine Reports

prolonged recovery beyond 10 d (22). With the large numbers of youth participating in sports across the United States and the risk for sports-related concussion, primary and secondary prevention strategies have been mandated through state legislation to reduce the public health risk of youth sports-related concussions.

In the past decade, there has been increased media and film attention focused on youth, collegiate, and professional sports-related concussions and their sequela. Between 2009 and 2014, concussion legislation was enacted in each of the 50 U.S. states and the District of Columbia. Starting with Washington state's index legislation, the level of concussion education and compliance, the strictness of statute for removal from play, the medical professionals who make the return-to-play (RTP) decision, and the scope of coverage has become increasingly diverse. Legal inclusions vary by age, grade level, public or private school, and nonschool sports. In addition, the members of the State Interscholastic Athletic Association (SIAA) differ in how they implement these legislative mandates state to state. For traveling sports medicine health care professionals, it is important to be aware of how individual states have implemented concussion legislation (28).

Definition of Concussion

A concussion is a traumatically induced brain injury, which is defined as "a complex pathophysiological process affecting the brain, induced by biomechanical forces" in the 2012 Zurich consensus statement (22). A concussion occurs when a direct blow to the head, neck, face, or elsewhere on the body produces biomechanical forces transmitted to the brain. It is a subtype of mild TBI (MTBI), which typically results in rapid onset of signs and symptoms of neurologic impairment that are usually self-limited. In some cases, there may be delay in onset of signs and symptoms over minutes to hours. Concussion is theorized to be a functional disturbance from a traumatically induced complex metabolic cascade in the brain rather than a structural injury, and thus, no structural abnormality is typically seen on standard neuroimaging studies (1,6,14,15,22,23,28).

Background to Zackery Lystedt Index Concussion Legislation

The first state to enact concussion legislation was Washington, which passed what is now known as the Zackery Lystedt Law. In 2006, Zackery Lystedt played football for a middle school outside of Seattle, WA. Just before half-time, he landed with the back of his head hitting the ground (2,3). There was no loss of consciousness, but he was seen on the ground holding his helmet. After a referee injury timeout, he was able to walk off the field on his own. At that time, league rules only required an athlete to sit out for one play. Lystedt sat out for two plays until half-time, then resumed playing offense and defense throughout the second half. He complained to his teammates of symptoms such as headache and nausea, and it was later reported that he developed unusual behavior on the field during the second half (2,3). At the end of the game, Lystedt collapsed while walking off the field and was airlifted to a local trauma center where he underwent emergency brain surgery for intracranial hemorrhages. He was comatose for weeks and required months of life-sustaining therapies. Although he has made progress, he has persistent physical and cognitive impairment requiring extensive supportive care.

Concussion Education Promotion in Washington State

Although Zackery Lystedt sustained a structural brain injury in the form of a cerebral bleed as part of his TBI, his story includes RTP while experiencing symptoms of a brain injury. This case helped propel discussions about youth sports-related concussions and head injuries into public consciousness. The CDC produced educational materials for athletes, parents, coaches, and clinicians about recognition and response to concussions such as the "HEADS UP" concussion program (7). The CDC also partnered with clinicians, the Brain Injury Association of Washington, and other professional groups to provide concussion education in Washington state that could be shared nationally (2,3). The Seattle Seahawks, a professional football team in the National Football League, provided manpower and financial support for the educational campaign to inform coaches, athletes, schools, health care workers, and the broader public about risks and identification of concussions in youth athletes.

Legislation

In Washington state, the concussion coalition of advocacy groups, physicians, health care and academic institutions, youth sports groups, and other stakeholders began the legislative process to address consistency in practice for youth sports concussion prevention and management. In 2008, the Lystedt family elected to publicly share their story about his experience to help gain support for legislation in an effort to prevent other children and families from sustaining potential tragic consequences of sports-related TBIs, particularly regarding the risks of premature RTP after head injury. His family and the coalition shared his story with legislators as the Engrossed House Bill 1824 moved through the legislative process (17). Washington state's Zackery Lystedt Law was signed into law on May 14, 2009. This law became model legislation for other states' youth concussion legislation. By the end of 2014, all 50 states and the District of Columbia had passed initial youth sports concussion legislation, many of which included the core elements of education, removal from play, and written medical clearance found in Washington's state law (28):

> Education: School districts are to work with the (Washington State) Interscholastic Activities Association to develop guidelines and pertinent information and forms on educating coaches, youth athletes, and their parents and/or guardians of the nature and risk of concussion and head injury including continuing to play after concussion or head injury. All student athletes and their parents and/or guardians must *sign* an information sheet about concussion and head injury *before* the youth athlete may initiate practice or competition.
>
> Removal from Play: A youth athlete who is suspected of sustaining a concussion or head injury in a practice or game shall be removed from [play] at that

time. In the CDC concussion materials, this element is referred to as "when in doubt, sit them out" (7).

Written Medical Clearance for RTP: Youth athletes who have been removed from play for a suspected concussion must receive *written* medical clearance before returning to play, from a *licensed health care provider trained* in the evaluation and management of concussion.

One additional element of Washington's state law that has been less commonly adopted by other states is the provision that in addition to public high schools (5), private, nonprofit youth athletic programs wanting to use *publically owned playing fields* must provide a statement of compliance with the policies for the management of concussion and head injury found in the Zackery Lystedt Law. This provision helps Washington state expand the reach of the law beyond public schools to include private schools (if they use public land), some youth sport club teams, and other youth sport associations.

Methods

The National Center for Biotechnology Information (PubMed), Google Scholar, and Lexis-Nexis were searched for terms "concussion," "traumatic brain injury," and "legislation." Concussion legislation passed before December 31, 2015, in all 50 states was reviewed via Lexis-Nexis. An online search for the concussion bylaws and protocols of the 50 members of the SIAA was performed. The National Collegiate Athletic Association, CDC, and NFHS concussion recommendations were reviewed.

Results

Education

As part of the foundational Zackery Lystedt Law in 2009, yearly concussion education for parents and student athletes was mandated in most states. Throughout the country, a majority of state legislation and SIAA bylaws include the definition of a concussion, risks of head injury, removal from play indications, and proper RTP precautions. Annual parent and student athlete education has been generally implemented in the form of a dually signed information sheet (4). These are required before an athlete's participation in athletics and commonly submitted during the preparticipation physical evaluation (PPE). Of note, Kentucky uses its general parental consent signed during the yearly PPE to satisfy its educational requirements. However, in most states, a separate signed document is required. For New York student athletes, this document remains part of their permanent health record. Beyond mostly standardized information sheets, some states require additional online or in-person education. In Massachusetts, parents are required to complete a 20-min online lecture with proof of completion in addition to an annual signed information sheet.

Concussion education resources are more available today in large part due to the CDC, NFHS, and Zurich International Conference on Concussion in Sport. These three entities have provided a framework for comprehensive concussion training for health care providers and non-health care athletic staff alike. However, legislation and implementation of coach, official, volunteer, and licensed/certified athletic trainer (ATC) concussion education vary dramatically in both content and frequency of completion. Five states recommend coach education but do not have specific requirements for ongoing instruction or proof of completion. Thirty states mandate yearly formal education with the remaining 15 states ranging from one-time certification to every 3 yr. In regard to educational content, Washington and Alabama's legislation defers to local school districts to implement educational specifics for coaches and officials. Washington's SIAA requires an annual online concussion course for both paid and volunteer coaches. Arizona has created "Brainbook," an online training platform whose completion is required for participation in interscholastic athletic activities for both coaches and student athletes. California requires a first-aid component in their concussion training. Commonly, states rely on NFHS and CDC's published concussion education materials to meet their state requirements (7). Eleven states require a CDC or NFHS video or lecture series with proof of completion as their coach education. In contrast, states like Colorado have released their own robust educational materials for parents, coaches, teachers, and health care providers following the Jake Snakenberg Youth Concussion Act. Although the use of these specific educational materials is not legally mandated, extensive resources for the development of a concussion management team have been released. In Texas, however, this concussion management team is the primary focus of state legislation and implements education accordingly.

Removal From Play

The second component of the Zackery Lystedt Law includes specifics on removal from play for suspected concussion or concussion-like symptoms. Forty-nine states include some variation of verbiage requiring immediate removal from play for any athlete suspected of having sustained a concussion. Wyoming remains the only state without a specific mandate for removal from play (16). After removal, states include provisions for notifying parents, urgent evaluation in the first 24 h, and initiation of a concussion management team or protocol.

RTP

RTP is the most discussed core element for the majority of concussion legislation. RTP decisions are important determinations because adolescents are at increased risk for repeat concussion, prolonged recovery, and possible long-term sequela. States' legislation varies in terms of when RTP can occur, whether specific RTP guidelines are legislated and which RTP criteria are used. States also differ in the specificity of same-day RTP exclusion. Forty-two states explicitly do not allow same-day RTP, and most require a minimum of a 24-h period of removal. Montana does not provide specifics on when clearance may occur and if same-day RTP is possible. Seven states' legislation does not specifically prohibit same-day RTP. Most states use a graduated RTP protocol, which takes an athlete through a stepwise progression only when the athlete is free of concussion symptoms at rest and is back to preinjury baseline. These steps include increased physical demands, sport-specific activities, and finally physical contact. Each step usually lasts

at least 24 h with progression permitted if the athlete remains asymptomatic at that stage. Of the states that legislated or implemented specific RTP guidelines, the minimum time required to fulfill a graded RTP program was 4 to 7 d. The most commonly used protocols were the Zurich guidelines and the NFHS suggested guidelines, which mirrored the Zurich 2012 protocol (9,22,24). These consisted of six steps, each requiring a minimum of 24 h to completion if asymptomatic. Other states that did not specify RTP guidelines in their legislation deferred to their SIAA, local school districts, or Department of Education to develop RTP protocols, most of which included four to seven steps of graded RTP with written clearance for full progression to contact practice and competition. Some states revised their legislation to be more specific. For example, California's updated legislation (AB 2127), effective January 2015, created a more stringent RTP timeline that prohibits an athlete from returning sooner than 7 d after evaluation by a physician who has made the diagnosis of concussion. To comply with the law, the California Interscholastic Federation (CIF) developed a protocol that requires a minimum of two full, symptom-free days after evaluation by a physician before starting a graded protocol (10). For a side-by-side comparison of the CIF and Zurich/SCAT-3 protocols, see Table 1.

In all 50 states, if a concussion diagnosis is made, a written RTP clearance is required. However, the specific health care professional that can perform this RTP clearance differs greatly both at the legislative level and per individual SIAA requirements. Forty-eight SIAA concussion bylaws and protocols were available online (excluding Maine and Hawaii). This review noted variation in the professionals allowed to provide written RTP clearance. In 11 states, a "licensed health care provider/professional" with appropriate concussion training may provide written clearance. Fifteen states specifically require a licensed physician (medical doctor (MD)/doctor of osteopathy (DO)) to provide written clearance. Some states are more inclusive with the personnel permitted to provide written RTP clearance. In addition to physicians, alternative providers include nurse practitioners (NP), physician assistants (PA), ATC, chiropractors, neuropsychologists, physical therapists (PT) and, in two states, a school nurse. For a detailed breakdown of who can provide written clearance, see Table 2.

TABLE 1.
Side-by-side comparison of the CIF and Zurich/SCAT-3 protocols.

Zurich/SCAT-3 Graded RTP Protocol	CIF Graded RTP Protocol
Step I	Step I
No activity	No physical activity for *at least two full symptom-free days AFTER* seeing a physician
Step II	Step II-A
Light aerobic exercise	Light aerobic activity
Step III	Step II-B
Sport-specific exercise	Moderate aerobic activity
Step IV	Step II-C
Noncontact training drills	Strenuous aerobic activity
Step V	Step II-D
Full contact practice	Noncontact training with sport-specific drills
Step VI	Step III
RTP (competition)	Limited contact practice, then
	Full contact practice
	Step IV
	RTP (competition)

To Whom Laws Apply

All states, whether implied or explicitly indicated, incorporate public high school interscholastic athletic activities into their legislation. However, many states make provisions for middle or junior high school, elementary school, private or parochial schools, and even "recreational athletic organizations," particularly if they use public lands for competition. Six states apply legislation only to grades 9 to 12. Five states include junior high school (grades 7 to 12). Ten states also include grade 6 (middle school). Seven states include both elementary and secondary schools in their laws. Fifteen states apply their legislation to all athletic competitions, with a majority of participants younger than 18 or 19 yr. Finally, seven states do not designate a specific age group or population (Figure). The definition of the term "interscholastic athletic activity" varies state to state. For most states, this applies to competition between schools and the practices that are used to prepare for the said activity. Of note, in New Jersey and North Carolina, this particularly includes cheerleading.

Discussion

Clinicians, sports medicine staff, and sports administrative personnel need to be familiar with the legislation in each specific state in which they are caring for athletes in order to understand the required elements of concussion education, removal from play, and applicable rules for clearance for athlete RTP.

Education

Implementation of concussion education remains the most diverse of the four primary elements of the index Zackery Lystedt Law. Kane (16), in the *Journal of Law and Health*, identifies one of the many nuances with the example of Massachusetts and Rhode Island education. Similar CDC materials are used in each state, but in Rhode Island, they are *required* by law to be posted on State Department of Education websites compared with a *suggested* availability in Massachusetts (27). Furthermore, a majority of legislation applies only to public schools. Washington state requires compliance from all organized youth athletic organizations using school property or other public lands.

Because initial concussion legislation has passed, 20 states have revised their laws to become more specific or inclusive to whom concussion legislation applies. Eleven states identify private and charter schools in their laws. Indiana and Virginia include provisions for "sports organizations using school

TABLE 2.
Breakdown of who can provide written clearance.

State	SIAA RTP	State	SIAA RTP	State	SIAA RTP	State	SIAA RTP	State	SIAA RTP
AL	MD/DO	HI	MD/DO, NP, PA, neuropsychologist, ATC	MA	MD/DO, NP, PA, ATC, neuropsychologist	NM	MD/DO, NP, PA, ATC, psychologist	SD	"Health care provider" recognized by law to provide medical treatment with training in evaluation, management, and care of concussions
AK	MD/DO, NP, PA, RN, neuropsychologist, DC	ID	MD/DO, NP, PA, ATC, PT	MI	MD/DO, NP, PA	NY	MD/DO	TN	MD/DO, neuropsychologist
AZ	MD/DO, NP, PA, ATC	IL	MD/DO, ATC	MN	"Appropriate health care provider" (not a parent)	NC	MD/DO, NP, PA, ATC, neuropsychologist	TX	MD/DO, "concussion oversight team"
AR	MD/DO, NP, PA, ATC, neuropsychologist	IN	MD/DO	MS	"Licensed, qualified medical professional working within their scope of practice"	ND	"Licensed health care provider acting within the provider's scope of practice, trained in the evaluation and management of concussion"	UT	"Qualified health care professional" who "is licensed and has within 3 yr completed continuing education course in evaluation and management of concussion"
CA	MD/DO	IA	MD/DO, NP, PA, RN, PT, ATC, neuropsychologist, DC	MO	MD/DO, NP, PA, ATC, neuropsychologist	OH	MD/DO, "health care provider" who consults or collaborates with or is supervised by an MD/DO	VT	MD/DO, NP, PA, ATC
CO	MD/DO, NP, PA neuropsychologist	KS	MD/DO	MT	"Licensed health care professional"	OK	"Licensed health care provider trained in the evaluation and management of concussions"	VA	MD/DO, NP, PA, ATC, neuropsychologist
CT	MD/DO, NP, PA, ATC	KY	MD/DO	NE	MD/DO, ATC, neuropsychologist	OR	MD/DO, NP, PA, psychologist	WA	MD/DO, NP, PA, ATC
DE	MD/DO	LA	MD/DO	NV	MD/DO, ATC, PT	PA	MD/DO	WV	MD/DO, NP, PA, ATC, DC
FL	MD/DO	ME	"Licensed health care provider trained in concussion management"	NH	"Appropriate health care professional"	RI	MD/DO	WI	"Appropriate health care provider"
GA	MD/DO, NP, PA, ATC	MD	MD/DO, NP, PA, ATC, neuropsychologist	NJ	MD/DO	SC	MD/DO	WY	"Appropriate health care provider" determined by school district

DC, Doctor of Chiropractic.

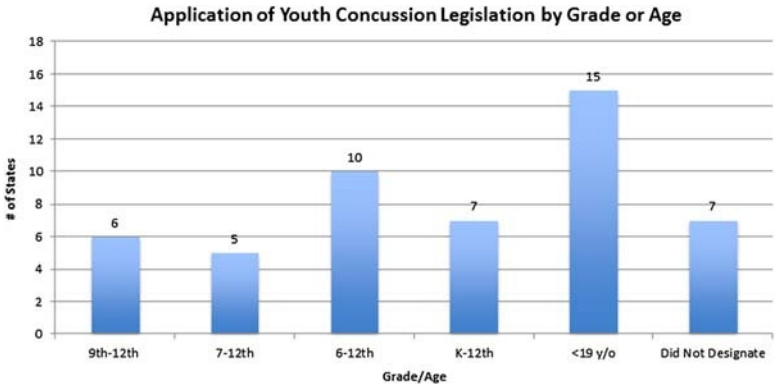

Figure: Application of youth concussion legislation by grade or age.

property" (20). Maryland and Nevada include verbiage for "recreational athletic organizations." Additional provisions include limitations to full contact practices and athlete training in the proper technique to avoid head injury. Initial legislation across the nation was aimed at secondary prevention of concussion and its sequela. Identification and management of concussion remained the center of the laws. However, as states begin to make revisions, primary prevention of concussion and closed head injury is becoming more prominent as additional research and best practices become available (20).

Penalties

In addition, as states begin to include more specific guidelines within their concussion legislation, some states have begun to designate penalties for concussion guideline infractions. These punishments range from fines to forfeiture of a competitive event and disqualification from state tournaments. North Carolina mandates a $500 fine for coaches who have not completed their concussion education requirements. Michigan implemented a two-strike rule. The first offense requires forfeiture of the game played by the ineligible player and probation of the program for the remainder of the season. A second offense extends the probation and institutes a Michigan High School Athletic Association state tournament ban for the next season.

Federal Legislation

Currently, each of the 50 states and the District of Columbia have individual concussion legislation, but there is no federal legislation regarding youth sport concussions. The variations in the core elements of each state's concussion law are due in part to the political climate in each legislature at the time of bill passage. Some consistency in legislation may occur in the future if federal concussion legislation is enacted. In January 2015, federal legislation HR 582 known as the "Concussion Treatment and Care Tools Act of 2015" was assigned to a committee. If passed, it would amend Title III of the Public Health Service Act to provide for the establishment and implementation of guidelines on best practices for diagnosis, treatment, and management of MTBIs in school-aged children. In the absence of federal legislation, team physicians are held to the standards of state law.

Even military preparatory schools that fall under the Department of Defense follow applicable state laws regarding youth concussions. For national recreational and youth sports organizations that consist of significant interstate travel competition, health care providers should be aware of the applicable state laws, particularly as legislation becomes more inclusive with youth athletics outside of a school setting. At the time of publication, current state concussion legislation is noted in Appendix A (http://links.lww.com/CSMR/A7) (26).

Health Care Disparities

Depending on the specifics outlined in each state's concussion law and the implementation by the SIAA, there is the potential for health care disparities to play a role in RTP decisions. If the law or the SIAA rules specify only MD or DO may clear an athlete for RTP, then athletes in some rural communities or other medical shortage areas with poor access or availability of physicians may not be able to obtain timely clearance determinations.

Conclusion

Concussion legislation was rapidly incorporated nationwide, starting with Washington state's index legislation. Since that time, some states have continued to update their laws to be more inclusive and more specific regarding concussion protocol and management. Primary prevention is a burgeoning focus in ongoing legislation as additional research and best practice become available. Team physicians need to be aware of updates in legislation as well as SIAA implementation of concussion management and prevention in the locations in which they are caring for athletes until such time as federal legislation provides consistency and uniformity about concussion management across the nation.

The authors declare no conflict of interest and do not have any financial disclosures.

References

1. AAN Concussion Position Statement. American Academy of Neurology. Available from: https://www.aan.com/concussion/. Accessed December 8, 2015.
2. Adler RH. Youth sports and concussions: preventing preventable brain injuries. One client, one cause, and a new law. *Phys. Med. Rehabil. Clin. N. Am.* 2011; 22:721–8.

3. Adler RH, Herring SA. Changing the culture of concussion: education meets legislation. *PM R*. 2011; 3:S472–4.

4. Baugh CM, Kroshus E, Bourlas AP, Perry KI. Requiring athletes to acknowledge receipt of concussion-related information and responsibility to report symptoms: a study of the prevalence, variation, and possible improvements. *J. Law Med. Ethics*. 2014; 42:297–313.

5. Bompadre V, Jinguji TM, Yanez ND, *et al*. Washington State's Lystedt Law in concussion documentation in Seattle public high schools. *J. Athl. Train.* 2014; 49:486–92.

6. Broglio SP, Cantu RC, Gioia GA, *et al*. National Athletic Trainers' Association Position Statement: management of sport concussion. *J. Athl. Train*. 2014; 49:245–65.

7. Centers for Disease Control and Prevention. Heads Up: Concussion. August 30, 2010. Available from: www.cdc.gov/concussion/headsup. Accessed January 15, 2012.

8. Centers for Disease Control and Prevention. Nonfatal traumatic brain injuries related to sports and recreation activities among persons aged ≤19 years — United States, 2001–2009. *MMWR Morb. Mortal. Wkly. Rep*. 2011; 60: 1137–342.

9. Child SCAT3. *Br. J. Sports Med*. 2013; 47:263.

10. CIF Concussion Return to Play (RTP) Protocol. Available from: http://static.psbin.com/h/2/y6wjqu3pkqbm70/CIF_Concussion_Return_to_Play_Protocol.pdf. Last accessed on December 29, 2015.

11. Clay MB, Glover KL, Lowe DT. Epidemiology of concussion in sport: a literature review. *J. Chiropr. Med*. 2013; 12:230–51.

12. Daneshvar DH, Nowinski CJ, McKee AC, Cantu RC. The epidemiology of sport-related concussion. *Clin. Sports Med.* 2011; 30:1–17.

13. Hanson HR, Pomerantz WJ, Gittelman M. ED utilization trends in sports-related traumatic brain injury. *Pediatrics*. 2013; 132:e859–64.

14. Harmon KG, Drezner JA, Gammons M, *et al*. American Medical Society for Sports Medicine Position Statement: concussion in sport. *Br. J. Sports Med*. 2013; 47:15–26.

15. Herring SA, Cantu RC, Guskiewicz KM, *et al*. Concussion (mild traumatic brain injury) and the team physician: a consensus statement — 2011 update. *Med. Sci. Sports Exerc*. 2011; 43:2412–22.

16. Kane AJ. An incomplete pass: inadequacies in Ohio's youth concussion legislation and the ongoing risk for players. *J. Law Health*. 2015; 28:201–46.

17. Laker SR, Herring SA, Adler RH. The legislative agenda. *The Oxford Handbook of Sports-Related Concussion* (*Forthcoming*) [Oxford Handbooks Online]. Online Publication Date: Nov 2014. Available from: http://www.oxfordhandbooks.com/view/10.1093/oxfordhb/9780199896585.001.0001/oxfordhb-9780199896585-e-9.

18. Langlois JA, Rutland-Brown W, Wald MM. The epidemiology and impact of traumatic brain injury: a brief overview. *J. Head Trauma Rehabil*. 2006; 21:375–8.

19. Lincoln AE, Caswell SV, Almquist JL, *et al*. Trends in concussion incidence in high school sports: a prospective 11-year study. *Am. J. Sports Med*. 2011; 39:958–63.

20. Lowrey KM. State laws addressing youth sports-related traumatic brain injury and the future of concussion law and policy. *J. Bus & Tech. Law*. 2015; 10:61–72.

21. Marar M, McIlvain NM, Fields SK, Comstock RD. Epidemiology of concussions among United States high school athletes in 20 sports. *Am. J. Sports Med*. 2012; 40:747–55.

22. McCrory P, Meeuwisse WH, Aubry M, *et al*. Consensus statement on concussion in sport: the 4th International Conference on Concussion in Sport held in Zurich, November 2012. *Br. J. Sports Med*. 2013; 47:250–8.

23. NCAA Concussion Guidelines: Diagnosis and Management of Sport-Related Concussion Guidelines. Available from http://www.ncaa.org/health-and-safety/concussion-guidelines. Accessed on November 17, 2015.

24. SCAT3. *Br. J. Sports Med*. 2013; 47:259.

25. Selassie AW, Wilson DA, Pickelsimer EE, *et al*. Incidence of sport-related traumatic brain injury and risk factors of severity: a population-based epidemiologic study. *Ann. Epidemiol*. 2013; 23:750–6.

26. Waryasz GR, Tambone R, Kriz P. Update on concussion management for the Rhode Island clinician. *R. I. Med. J. (2013)*. 2014; 98:31–5.

27. Weinberger BC, Briskin SM. Sports-related concussion. *Clin. Pediatr. Emerg. Med*. 2013; 14:246–54.

28. Zackery Lystedt Law: Washington Revised Code 28A.600.190 (2009 House Bill 1824). Available from: http://apps.leg.wa.gov/RCW/default.aspx?cite=28A.600.190. Accessed January 3, 2016.