
Requiring Athletes to Acknowledge Receipt of Concussion-Related Information and Responsibility to Report Symptoms: A Study of the Prevalence, Variation, and Possible Improvements

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Introduction

Scientific evidence increasingly confirms that concussions from contact sports and other sources can lead to a myriad of negative biomedical, social, and behavioral outcomes. In the days and weeks after injury, concussions have been linked to cognitive deficits, sleep disturbances, depression, irritability, difficulty concentrating, difficulty remembering, and in some cases suicidal thoughts or behaviors.¹ Studies have shown that exposure to head impacts, even without a recognized concussion, can result in changes in the blood brain barrier,² structural changes in the brain's white matter,³ and functional impairment.⁴ Additional long-term deficits resulting from repetitive concussions and subconcussive hits include cognitive dysfunction,⁵ depression,⁶ and executive dysfunction.⁷ Perhaps most troublingly, repetitive head impacts, including those sustained in high school, college, and professional sports, have been linked to neurodegenerative diseases,⁸ including chronic traumatic encephalopathy.⁹

Over 44 million individuals under age 18 participate in sports in the United States.¹⁰ Research utilizing helmet sensors indicates that high school and collegiate

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athletes may receive hundreds of hits that transmit force to the head each season.¹¹ Among individuals aged 5-18, 65% of emergency visits are due to sports- and recreation-related brain injury.¹² Unfortunately, many of these injuries still go unrecognized and unreported.¹³ Exposure to additional head impacts while the brain is still healing from an initial concussion can lead to more severe and longer lasting neurological consequences.¹⁴ Removing athletes from the field of play immediately after they sustain, or are suspected to have sustained, brain trauma is necessary to prevent potential catastrophic outcomes. Athletes play a crucial role in this identification and removal from play process because many symptoms of a concussion are “invisible” to untrained observers.¹⁵

In response to the increased scientific understanding of traumatic brain injuries from sport, states have adopted laws and sports leagues across the competitive spectrum (e.g., National Football League, Pop Warner Football, National Collegiate Athletic Association) have adopted policies and guidelines intended to protect athletes.¹⁶ To date, all states have passed a law related to youth traumatic brain injury from sport.¹⁷ Mississippi was the last state to pass a concussion-related law; it passed legislation in early 2014 that took effect on July 1, 2014. These laws often, but not always, apply to school-affiliated sport and recreational activities. Some laws target a broader population including: any youth athletic activity, group, or organization that uses property or facilities owned by a school district, state, or local parks and recreation department. The laws tend to be modeled after Washington State’s Zachary Lystedt law,¹⁸ and often require that athletes be provided with pre-participation information about concussions, be removed from play if they are suspected to have sustained a concussion, and obtain medical clearance before returning to play.¹⁹ Additionally, many of these laws require the athlete and/or his/her parent or guardian to provide written acknowledgement of having received information on the signs and symptoms of concussion. In this paper we additionally examine the National Collegiate Athletic Association (NCAA) as an example of one sports league that has adopted concussion management policies. Similar to the state mandates that often pertain to students 18 years of age and under, the NCAA has a policy requiring that collegiate athletes (typically aged 18-23) be provided with information about concussions, and that the athletes must provide acknowledgement that they received this information.²⁰ However, unlike the state policies, the NCAA policy additionally requires that athletes acknowledge

their responsibility to report concussion symptoms to their sports medicine provider.²¹

Despite the prevalence of these types of regulatory measures, not all dimensions have been subject to a systematic review and comparison. Hosea Harvey provides a description of the provisions of the respective state laws.²² We build on this work by focusing our analysis on common aspects of these laws: the requirement that concussion-related information be provided to athletes and the requirement that athletes and/or their parent/guardian provide acknowledgement of information receipt. The present study addresses this gap in the literature in two ways. First, we conduct a structured review and analysis of all United States laws pertaining to pre-season concussion-information provision and acknowledgement of information receipt and/or risk by youth athletes. To assess the implementation of the laws, this review is accompanied by an examination of the concussion information and acknowledgement sheets used in each state. Second, we present pilot data from an in-person survey-based research study of a sample of ten NCAA Division 1 football teams. Athletes in this study were asked to recall whether they had completed the mandated pre-participation concussion education and symptom reporting acknowledgement. Results are discussed with reference to legal and educational theory and precedents. Improvements for existing concussion laws are suggested, and information provision mandates and pre-participation waivers are discussed.

Part I: State Law and Concussion Information Sheet Review

Methods

Lexis Nexis and individual state government databases were searched for state concussion laws through February 1, 2014. Concussion information and acknowledgement sheets were then obtained through the state’s respective high school athletic association and/or department of education websites. To evaluate content variation in the state information provision requirements, state laws were analyzed using a positivist qualitative paradigm and structural coding methods.²³ More details about these methods can be found in Appendix 1. A comprehensive list of content areas and delivery methods were developed based on *a priori* categories and inductive codes created after a review of the state laws and concussion information and acknowledgement sheets. Two independent coders from the research team reviewed the state laws on a line-by-line basis. They categorized each state’s law and each state’s concussion information and acknowledgement sheet in terms of information content,

delivery, and parental/athlete requirements with very high inter-coder reliability. All points of divergence were resolved by a third member of the research team.

Results and Discussion

State Laws: All 50 states and the District of Columbia have enacted laws²⁴ related to youth concussion. Presently, all but four states (Colorado, Connecticut, Mississippi, and New Hampshire) have laws that require information be provided directly to athletes about concussions. Mississippi state law requires each school to create a concussion policy and that parents or guardians receive and sign a copy of the concussion policy, but says nothing about providing information to the athlete. New Hampshire school districts are “encouraged” to provide information about concussions, but not required to do so. The Wyoming state superintendent for education is required to assist local school districts in developing “model protocols for addressing risks associated with concussions”²⁵; although districts are required to provide students and parents with information about concussions, they are not required to adopt the model protocol. Colorado and Connecticut require school districts to provide concussion information to coaches but do not require it to be provided to athletes directly.

Among the state laws requiring that concussion-related information is provided to athletes, the information required varies. Complete information regarding specific concussion educational content required by state law is provided in Table 1. Five states’ laws (California, Delaware, Missouri, North Dakota, and Wyoming) require that information is provided but give no guidance about the content. Among other states’ laws, the specific content areas required most frequently are the nature and/or definition of a concussion (34 states) and the risks and/or dangers of concussions (33 states). Twenty-four states require that information provided includes the risk of continued play/participation after a suspected concussion or brain injury. Six states’ laws explicitly require the inclusion of information about actions that students should take in response to sustaining a concussion. Only New York state law requires that information about return-to-school guidelines be provided, and only five states (Massachusetts, Maine, North Carolina, Tennessee, and Virginia) explicitly require that information about the short- and long-term consequences of concussions be provided.

Forty-seven states require that information is provided to athletes in writing. Three states (New York, Pennsylvania, and South Carolina) require that, in addition to a written information delivered directly to athletes, information be posted on an accessible

website. Irrespective of the content or mode of delivery of the education, most states (35, plus the District of Columbia) require that both youth athletes and a parent/guardian sign a form to indicate that they have received information about concussions. In eight states (Kentucky, Minnesota, Mississippi, Missouri, New York, Ohio, Oregon, and Utah), only the parent is required to sign. Eighteen states require that the concussion information sheet itself is signed and returned. Delivery and signature requirement details can be found in Table 2.

In all states and in the District of Columbia, the concussion laws apply to high school athletes (ages 14-18). Forty-nine state laws apply to middle school and high school athletes. Forty-two state laws apply to youth (younger than middle school), middle school, and high school athletes. For example, the language in some states’ laws specifies that it applies to all athletes under age 19. All states’ and the District of Columbia’s laws apply to school-run sports leagues. Additionally, 20 states’ laws apply to non-school youth/adolescent sports leagues (e.g., Pop Warner Football). Two states explicitly apply these statutes to public recreational facilities: Illinois encourages park districts to provide concussion information and Georgia requires recreational facilities hosting organized youth athletic events to provide information about concussion to the athlete’s parent or guardian.

Implementation and Enforcement of State Concussion Laws

The requirements of state law can be implemented in many different ways. The previous section detailed the variation between state concussion laws; this section examines how these laws have been operationalized. To understand how the educational and acknowledgement components of state concussion laws were being operationalized by organizations within states that are responsible for implementation, concussion information and/or acknowledgement sheets were obtained from state interscholastic athletic associations and/or departments of education. Understanding how the laws have been interpreted and then implemented is a critical step toward ensuring efficacy. Complete details regarding states’ information/acknowledgement sheets are broken down by state in Table 3. States’ laws often provide broad guidance that allows for interpretation at the district and/or school level.

Concussion educational content provided to parents and/or athletes varied. Forty-eight states provide information regarding signs and symptoms of concussion, though only 15 states provide information about prevalence of concussions. More states (44) provide information about the short-term consequences of

Table I

State Law Concussion Information Content Requirements

State	Nature/ Definition	Signs and Symptoms	Short- and Long-Term Consequences	Biology of Concussion/How They Occur	Risk/Dangers of Concussion	Risk of Play After Concussion	Athlete's Response After Concussion	Management/ Return to Play Guidelines	Return to School Guidelines	Prevention
AL	X	-	-	-	X	X	-	-	-	-
AK	X	-	-	-	X	-	-	-	-	-
AZ	X	-	-	-	X	X	-	-	-	-
AR	X	-	-	-	X	X	-	-	-	-
CA**	-	-	-	-	-	-	-	-	-	-
CO*	-	-	-	-	-	-	-	-	-	-
CT*	-	-	-	-	-	-	-	-	-	-
DE**	-	-	-	-	-	-	-	-	-	-
DC	X	-	-	-	X	-	-	-	-	-
FL	X	-	-	-	X	X	-	-	-	-
GA	X	-	-	-	X	-	-	-	-	-
HI	-	X	-	-	-	-	-	X	-	-
ID	X	X	-	-	X	-	-	-	-	-
IL	X	-	-	-	X	X	-	-	-	-
IN	X	-	-	-	X	X	-	-	-	-
IA	-	X	-	-	X	X	X	-	-	-
KS	X	-	-	-	X	X	-	-	-	-
KY	X	-	-	-	X	X	-	-	-	-
LA	X	-	-	-	X	X	-	-	-	-
ME	-	X	X	-	-	-	-	-	-	-
MD	X	-	-	-	X	-	-	X	-	-
MA	-	X	X	X	-	-	-	X	-	-
MI	X	-	-	-	X	X	-	X	-	-
MN	X	X	-	-	X	-	X	X	-	-
MS	-	-	-	-	-	-	-	-	-	-
MO**	-	-	-	-	-	-	-	-	-	-
MT	X	X	-	-	X	X	X	X	-	-
NE	-	X	-	-	X	-	X	-	-	-
NV	X	-	-	-	X	X	-	-	-	-
NH***	X	-	-	-	X	X	-	-	-	-

Table I (continued)

State Law Concussion Information Content Requirements

State	Nature/ Definition	Signs and Symptoms	Short- and Long-Term Consequences	Biology of Concussion/How They Occur	Risk/Dangers of Concussion	Risk of Play After Concussion	Athlete's Response After Concussion	Management/ Return to Play Guidelines	Return to School Guidelines	Prevention
NJ	X	-	-	-	X	-	-	X	-	-
NM	X	X	-	-	X	-	-	-	-	-
NY	X	X	-	X	-	-	-	-	X	-
NC	X	X	X	X	-	-	-	X	-	-
ND**	-	-	-	-	-	-	-	-	-	-
OH	-	X	-	-	-	X	-	X	-	-
OK	X	-	-	-	X	X	-	-	-	-
OR	-	X	-	-	-	-	-	-	-	-
PA	X	-	-	-	X	X	-	-	-	-
RI	X	-	-	-	X	X	-	-	-	-
SC	X	-	-	-	X	X	-	-	-	-
SD	X	X	-	-	X	X	X	X	-	-
TN	X	X	X	X	X	X	-	X	-	-
TX	-	X	-	-	-	-	-	X	-	X
UT	X	X	-	-	-	-	-	-	-	-
VT	X	-	-	-	X	X	X	X	-	X
VA	-	-	X	-	-	-	-	-	-	-
WA	X	-	-	-	X	X	-	-	-	-
WV	X	-	-	-	X	X	-	-	-	-
WI	X	-	-	-	X	-	-	-	-	-
WY**	-	-	-	-	-	-	-	-	-	-
Total (%)	34 (66.7)	17 (33.3)	5 (9.8)	4 (7.8)	33 (64.7)	24 (47.1)	6 (11.8)	13 (25.5)	1 (2.0)	2 (3.9)

*Colorado, Connecticut, and Mississippi do not require information be provided.

**California, Delaware, Missouri, North Dakota, and Wyoming require information be provided, but do not provide any guidance on content.

***In New Hampshire information provision is encouraged but not required.

concussions than long-term consequences of concussion (42). Forty-five states provide return to play guidelines, while only 24 states have return to school guidelines. Twenty-five states include ways to prevent concussions (e.g., “follow their coaches’ rules”; “wear the right protective equipment for each activity”; “even with a helmet...avoid hits to the head”).

Signature requirements across states varied both in terms of who was required to sign (parent and/or athlete) and whether the signature was required on the informational sheet. Forty-four states require a parent’s signature; of those, 40 also require athlete signatures. Eighteen states provide information on the same sheet that is required to be signed and returned

by parents and/or athletes, indicating that complying with the state policy means that educational materials cannot be retained as readily.

It is important to note that state concussion laws provide a minimum standard of what is required. In

Possible Rationales for Inclusion of Acknowledgement Provisions

Many state laws and sports league policies require athlete acknowledgement of concussion-related information. There are several possible rationales for the

By providing athletes with concussion-related information and requiring their express acknowledgement of the inherent risk of concussion as a part of the sport prior to participation, schools/coaches/leagues may be limiting their liability in that area. However, this does not mean that the leagues can completely disregard the risk of concussion. Even if concussion is a risk inherent in these sports, under the primary assumption of risk doctrine there is still the duty not to increase the risk. However, the assumption of risk doctrine may provide a disincentive for relevant stakeholders to work toward reducing the risk of concussion.

several instances, this examination of how the educational and acknowledgement portions of these laws were implemented revealed that states and school districts were going above and beyond these minimum requirements. For example, although New York is the only state with a law that requires return-to-school information be provided, there were 23 other states that included information about returning to school in their concussion education materials.

National Collegiate Athletic Association

For collegiate athletes, NCAA policy states that athletes must receive “informational material about concussions,”²⁶ but does not specify the content of that material or how it is to be delivered. The NCAA also specifies that institutions must have a mechanism through which athletes acknowledge the receipt of this information and their responsibility to report signs/symptoms of concussion to relevant sports medicine personnel.²⁷ A recent study examined how the educational component of the NCAA’s concussion policy was implemented in a cohort of six men’s collegiate ice hockey teams. The study found that under this general directive most teams received symptom identification-focused educational materials, delivered in formats ranging from email to written handouts to lectures to a video.²⁸ Only one team received concussion education that increased concussion knowledge.

inclusion of acknowledgement provisions. For example, providing concussion-related information and requiring acknowledgement may be seen as an effort to inform parents and/or athletes about an area of risk inherent in contact sports. Frequently, the parent/athlete acknowledgement is required in parallel with the provision of concussion-related information. By providing the athlete and/or his parent with information related to an area of risk inherent in contact sports, the league/school/state can claim that the athlete is knowingly assuming the risks inherent in the activity.

The legal concept of “primary assumption of risk” has most often been applied in cases involving sports,²⁹ but has more recently been applied in cases of participation in other risky activities.³⁰ Often, disputes regarding assumption of risk revolve around individual understanding of the risks inherent in an activity.³¹ Courts have taken different approaches to determining what risks are apparent or well-known.³² One way to eliminate disputes regarding risks inherent in an activity is to provide participants with information regarding the risks and require their express (written) acknowledgement of the risks. By providing athletes with concussion-related information and requiring their express acknowledgement of the inherent risk of concussion as a part of the sport prior to participation, schools/coaches/leagues may be limiting their liability in that area. However, this does not mean that the leagues can completely disregard the risk of concussion. Even if concussion is a risk inherent in these sports, under the primary assumption of risk doctrine

Table 2

State Law Acknowledgement Requirements

State	Info. Sheet Required	Signature Required from:		Signature Is Required:			Law Applies to:		
		Parent	Child	Annually	Before Participation	Before Each Season	Youth	Middle School	High School
AL	X	X	X	X	-	-	X	X	X
AK	X	X	X	X	-	-	X	X	X
AZ	X	X	X	X	-	-	X	X	X
AR	X	X	X	X	-	-	X	X	X
CA	X	X	X	X	-	-	X	X	X
CO	-	-	-	-	-	-	X	X	X
CT	-	-	-	-	-	-	X	X	X
DE	X	X	X	X	-	-	-	X	X
DC	X	X	X	-	X	-	X	X	X
FL	X	X	X	X	-	-	X	X	X
GA	X	-	-	-	-	-	X	X	X
HI	X	X	X	X	-	-	-	-	X
ID	X	-	-	-	-	-	X	X	X
IL	X	X	X	-	X	-	X	X	X
IN	X	X	X	X	-	-	-	-	X
IA	X	X	X	X	-	-	-	X	X
KS	X	X	X	X	-	-	-	X	X
KY	X	X	-	X	-	-	X	X	X
LA	X	X	X	-	-	X	X	X	X
ME	X	X	X	X	-	-	X	X	X
MD	X	X	X	-	X	-	X	X	X
MA	X	X	X	-	-	X	X	X	X
MI	X	X	X	-	X	-	X	X	X
MN	X	X	-	X	-	-	X	X	X
MS*	X	X	-	X	-	-	-	X	X
MO	X	X	-	X	-	-	X	X	X
MT	X	X	X	X	-	-	X	X	X
NE	X	-	-	-	-	-	X	X	X
NV	X	X	X	X	-	-	X	X	X
NH	-	-	-	-	-	-	X	X	X
NJ	X	X	X	X	-	-	X	X	X
NM	X	X	X	X	-	-	-	X	X

State	Info. Sheet Required	Signature Required from:		Signature Is Required:			Law Applies to:		
		Parent	Child	Annually	Before Participation	Before Each Season	Youth	Middle School	High School
NY	X	X	-	X	-	-	X	X	X
NC	X	X	X	X	-	-	-	X	X
ND	X	X	X	-	X	-	X	X	X
OH	X	X	-	X**	-	-	X	X	X
OK	X	X	X	X	-	-	X	X	X
OR	X	X	-	X	-	-	X	X	X
PA	X	X	X	X	-	-	X	X	X
RI	X	X	X***	-	-	X	X	X	X
SC	X	X	X	X	-	-	X	X	X
SD	X	X	X	X	-	-	X	X	X
TN	X	X	X	X	-	-	X	X	X
TX	X	X	X	-	X	-	X	X	X
UT	X	X	-	-	X	-	X	X	X
VT	X	X	X	X	-	-	X	X	X
VA	X	X	X	X	-	-	X	X	X
WA	X	X	X	X	-	-	X	X	X
WV	X	X	X	X	-	-	-	X	X
WI	X	X	X	-	-	X	X	X	X
WY	-	-	-	-	-	-	X****	X****	X****
Total (%)	47 (92.2)	44 (86.3)	36 (70.6)	33 (64.7)	7 (13.7)	4 (7.8)	42 (82.4)	49 (96.1)	51 (100)

*The Mississippi Youth Concussion Law goes into effect July 1, 2014

**Requires a parent's signature annually for each sport played

***Parent signature is required before each sport's season, but both parent and youth athlete signature is required prior to youth athlete's return.

****Wyoming's law does not include specific language about the populations the law applies to, but indicates that "all school districts" must comply.

there is still the duty not to increase the risk.³³ However, the assumption of risk doctrine may provide a disincentive for relevant stakeholders to work toward reducing the risk of concussion.³⁴

Harvey previously coded state laws based on explicit limitations to liability in four categories: potential liability, liability of schools, liability of healthcare providers, and liability of volunteers.³⁵ Harvey details the limitations on liability as well as the exculpatory provisions within some states' laws. We are building upon Harvey's work and suggesting that in addition to these explicit limitations on liability included in some states' laws, that the parent and/or athlete acknowledgement

provision may have the potential to limit the liability of schools and/or coaches through an express assumption of risk. Given the existing litigation surrounding sport-concussion,³⁶ institutions have motivation to limit their liability in this area, and athlete acknowledgement may be one attempt to do so.

Another possibility is that the process of providing acknowledgement is not intended to reduce liability, but rather to ensure receipt of information and improve compliance with the actionable aspects of the information provided (e.g., athlete reporting symptoms of a concussion). Controlled experimental and longitudinal research in other domains finds that

the act of signing a contract increases the likelihood of compliance with its specifications.³⁷ Others suggest that signing a document can prime self-identity, with individuals often trying to make future actions congruent with this sense of identity.³⁸ In their recent position statement, the National Athletic Trainers' Association asserted that one way to "educate athletes about the dangers of concussion and continuing to play while still symptomatic is to require them to read and sign a standard acknowledgment form."³⁹ Future controlled experimental research is warranted to explore whether the act of signing a pre-season concussion-related form influences concussion reporting.

Part II: Pilot Study in NCAA Football Players

Background

As discussed in Part I of this paper, concussion education and acknowledgement provisions have been widely included in state concussion laws and sports league concussion policies. However, there has been little evaluation of how these provisions are actually implemented. Given the number of possible rationales for the inclusion of acknowledgement requirements, ranging from reinforcing concussion education and increasing concussion symptom reporting to limiting institutional liability, understanding the

Given the number of possible rationales for the inclusion of acknowledgement requirements, ranging from reinforcing concussion education and increasing concussion symptom reporting to limiting institutional liability, understanding the extent to which acknowledgement requirements are implemented and their effects on athletes is critical. Part II of this paper presents pilot data from a larger study of college football players to illustrate variable implementation and to evaluate the potential effects of concussion acknowledgement provisions within the college sporting environment. The NCAA is one of many sports leagues that has the ability to create rules governing athlete health and welfare, and this information is presented as an illustrative case-study.

One difficulty with interpreting the acknowledgement as solely an educational mechanism is that, in many instances, parent and/or athlete signature is located on the sheet providing educational information. In some instances, this signature placement is mandatory. For example, California law requires that the concussion and head injury information sheet itself be signed and returned by the athlete and parent/guardian each year. Thus, when the acknowledgement forms are returned the signees no longer have access to the concussion-related information that was deemed by the state/league to be important. It should also be noted that the requirement and provision of athlete and/or parental signatures does not necessarily mean that the information provided has been read or understood. Parent and athlete acknowledgement requirements are most often located within seemingly-educational tenets of concussion statutes. Insofar as it is possible, acknowledgement requirements should be used to increase the efficacy of concussion education and volitional aspects of concussion reporting.

extent to which acknowledgement requirements are implemented and their effects on athletes is critical. Part II of this paper presents pilot data from a larger study of college football players to illustrate variable implementation of concussion acknowledgement provisions within the college sporting environment. The NCAA is one of many sports leagues that has the ability to create rules governing athlete health and welfare, and this information is presented as an illustrative case-study.

Methods

734 male collegiate athletes from ten Division 1 Football Championship Subdivision (FCS, one of the most competitive levels of collegiate football) teams participated in a survey-based observational study of concussion knowledge, attitudes, history, and behavior. Coaches and/or athletic trainers were contacted prior to the 2013 football season, and the teams whose athletic trainers and/or coaches were willing to participate were included in the study. More detailed sample characteristics and information on the overall study are available elsewhere.⁴⁰ Research activities

Table 3

Concussion Information and Acknowledgement Content by State

State	Prevalence	Signs and Symptoms	Short-Term Consequences	Long-Term Consequences	Risk of Play After Concussion	Return to Play Guidelines	Return to School Guidelines	Prevention	Parent Signature Required	Athlete Signature Required	Signature Required by Law	Form Required by Law	Signature on Same Page as Info
AL*	-	X	-	X	X	X	X	-	X	X	X	X	X
AK	X	X	X	X	X	X	X	-	X	-	X	X	-
AZ	-	X	X	X	X	X	-	X	X	X	X	X	-
AR	-	X	-	-	-	X	X	-	X	X	X	X	-
CA	-	X	X	-	X	X	-	-	X	X	X	X	X
CO	X	X	X	X	X	X	X	X	-	-	-	-	-
CT	-	X	-	-	X	X	-	-	X	X	-	-	X
DE	-	X	X	X	X	X	-	-	X	X	X	X	-
DC	X	X	X	X	X	X	X	-	X	X	X	X	-
FL	-	X	X	X	X	X	-	-	X	X	X	X	X
GA	-	X	X	X	X	X	-	-	X	X	-	X	X
HI	X	X	X	X	X	X	X	-	X	X	X	X	-
ID	-	X	X	X	X	X	-	X	-	-	-	X	-
IL	-	X	X	X	X	X	-	-	X	X	X	X	X
IN*	-	X	X	X	X	X	-	X	X	-	X	X	-
IA	-	X	-	-	-	X	-	X	X	X	X	X	X
KS	-	X	X	X	X	X	-	-	X	X	X	X	X
KY	-	X	X	X	X	X	-	X	X	X	X	X	-
LA	X	X	X	X	X	X	X	X	X	X	X	X	-
ME	-	X	X	X	X	X	X	-	X	X	X	X	-
MD	X	X	X	X	X	X	X	X	X	X	X	X	-
MA	X	X	X	X	X	X	X	X	X	X	X	X	-
MI	-	X	X	X	X	X	X	-	X	X	X	X	-
MN	X	X	X	X	-	X	X	X	X	X	X	X	X
MS	-	X	X	X	X	X	-	-	X	X	X	X	X
MO	-	X	X	X	X	X	X	X	X	X	X	X	-
MT	-	X	X	X	X	X	-	X	X	X	X	X	-
NE	X	X	X	X	X	X	X	X	-	-	-	X	-
NV	X	X	X	X	X	X	X	X	X	X	X	X	-
NH	X	X	X	X	X	X	X	X	-	-	-	-	-

Table 3 (continued)

Concussion Information and Acknowledgement Content by State

State	Prevalence	Signs and Symptoms	Short-Term Consequences	Long-Term Consequences	Risk of Play After Concussion	Return to Play Guidelines	Return to School Guidelines	Prevention	Parent Signature Required	Athlete Signature Required	Signature Required by Law	Form Required by Law	Signature on Same Page as Info
NJ	X	X	X	X	X	X	X	-	X	X	X	X	X
NM	-	X	X	X	X	-	-	-	X	X	X	X	-
NY	X	X	X	-	X	X	X	X	X	X	X	X	-
NC	-	X	X	X	X	X	-	-	X	X	X	X	-
ND	-	X	X	X	X	-	-	X	X	X	X	X	X
OH	-	X	X	X	X	X	X	-	X	X	X	X	-
OK	-	X	X	X	X	-	-	X	X	X	X	X	-
OR	X	X	X	X	X	X	X	X	-	-	X	X	-
PA	-	X	X	X	X	X	-	X	X	X	X	X	X
RI	X	X	X	X	X	X	X	-	X	X	X	X	X
SC	**	**	**	**	**	**	**	**	**	**	X	X	**
SD	-	X	X	X	X	X	-	X	X	X	X	X	X
TN	-	X	X	X	X	X	-	X	X	X	X	X	-
TX	-	X	-	-	-	X	-	X	X	X	X	X	X
UT	-	X	X	X	X	X	X	X	X	X	X	X	X
VT*	-	X	X	X	X	X	X	-	X	-	X	X	-
VA	-	-	X	X	-	-	-	-	X	X	X	X	-
WA	-	X	X	X	X	X	-	-	X	X	X	X	X
WV	-	X	X	X	X	X	-	X	X	X	X	X	-
WI*	-	X	X	-	-	X	X	-	X	-	X	X	-
WY	-	-	-	-	-	-	-	-	-	-	-	-	-
Total (%)	15 (29.4)	48 (94.1)	44 (86.3)	42 (82.4)	43 (84.3)	45 (88.2)	24 (47.1)	25 (49.0)	44 (86.3)	40 (78.4)	44 (86.3)	47 (92.2)	18 (35.3)

*AK, IN, VT, and WI provide two separate information sheets: a guide for students and a guide for parents. The data shown represents the parent information sheet as it is the more comprehensive of the two.

**South Carolina Concussion Information and Consent Sheets vary by each school or school district.

were approved by the Boston University Medical Center Institutional Review Board. All athletes provided informed consent prior to participation.

As part of the broader written survey, athletes were asked whether they had received educational information about concussions from their school this year

(yes or no). Athletes who answered yes were also asked: "Were you required to acknowledge that you have received information about concussion signs and symptoms and that you have a responsibility to report concussion symptoms to medical personnel?" Participants were provided with three response options: Yes,

No, or Not Sure. The respective team athletic trainers were asked whether or not their athletes had, in fact, completed a pre-participation acknowledgement. Athletes also reported demographic information including their standardized college admission test score (SAT or ACT), age, and race.

Athletes who recalled receiving concussion education this year from their college and who were on teams where athletic trainers indicated that athlete acknowledgement occurred were included in the present sample (n=513). Those included in these analyses averaged 19.81 years old (+/- 1.487), and the majority of athletes reported that they were white (62.3%) or black (27.7%). They reported scoring, on average, in the 64.1 (+/-22.53) percentile on standardized college admission tests (ACT/SAT).

The analysis of the present data had three aims: (1) Determine whether the NCAA-required athlete acknowledgement policy has been uniformly enacted at member schools; (2) Determine the rate at which athletes recall having signed the acknowledgement form; and (3) Evaluate whether there are significant differences between teams in this rate of recall. See Appendix 2 for additional details on the analytic methods.

Results

Athletic trainers from eight out of the ten participating football teams indicated that they required their athletes to sign a pre-participation form in which they acknowledge receipt of concussion information and their role in reporting concussion symptoms. 513 athletes from the eight teams that required athlete acknowledgement were asked whether they were required to complete a pre-participation acknowledgement. Of athletes asked, 305 (59.5%) reported that this was, in fact, required of them, 30 (5.8%) reported that it was not required, 170 (33.1%) were unsure, and 8 (1.6%) did not respond. There were significant between-team differences in whether or not athletes recalled that acknowledgement was required of them ($\chi^2(7,505)=35.337, p<0.001$). A model examining the effects of team membership and date of survey on acknowledgement recall was significant overall (omnibus $p<0.001$). Both team membership ($p=0.004$) and date of survey administration ($p=0.009$) were significant, with those completing their survey later in the season less likely to recall providing acknowledgement ($B=-0.139$).

Teams had a significantly different average age ($F(7,503)=2.88, p=0.006$) and average score on the ACT or SAT as a percentile ($F(7,467)=15.88, p<0.001$). There were not significant between-team differences in racial composition. However, none of the demo-

graphic variables (age, percentile ACT or SAT score, race/ethnicity) were independently associated with whether or not an athlete recalled providing pre-season acknowledgement.

Discussion

The present findings indicate that the required acknowledgement component of the NCAA's concussion policy is being inconsistently implemented at member institutions. Only eight of the ten schools included in the broader study required that athletes acknowledge receipt of concussion-related information and responsibility for reporting concussion symptoms, and approximately 40% of the athletes who provided acknowledgement according to athletic trainers did not recall having done so. Although between-team differences in recall of acknowledgement were largely explained by the date of survey completion, this diminution of athlete recall over time is nonetheless problematic. There is a risk of concussions across the entire competitive season, which for Division 1 FCS football teams starts in August and often lasts through December. To the extent that the acknowledgement mechanism is intended to encourage honest and timely reporting of concussion symptoms across the entire season, it should also be recalled across the entire season. Strategies to increase athlete recall of acknowledgement may include having a copy of the form athletes signed posted in team locker rooms or athletic training room as a reminder. These kinds of reminders have been useful in other types of behavior-change interventions.⁴¹ This approach may also be beneficial from the perspective of reinforcing safe team norms about concussion reporting; perceived concussion reporting norms have been found to be an important predictor of future concussion reporting behavior for male collegiate athletes.⁴²

Conversations between the first author and athletic trainers at participating schools were useful for contextualizing and providing insight into the present findings. The athlete acknowledgement process occurred between the time athletes returned to campus at the end of the summer and the official start of the football season. During this time, athletes move into new housing, go through required pre-participation physical exam, and are provided with education on a variety of topics (e.g., concussion education, academic resources, sickle cell anemia). Many of the athletic trainers of the teams participating in this research study expressed the opinion that athletes were being bombarded with so much information that retention of this information may be low. This may explain, at least in part, why approximately 40% of athletes who provided written acknowledgement did

not recall having done so. Several athletic trainers also described an acknowledgement process in which the paper form being signed and returned was also the sheet of paper on which concussion information was listed for the athletes' review. This is consistent with practices occurring in some states at the state athletic association level. However, this logistical oversight may mean that by complying with one facet of the NCAA concussion policy (acknowledgement of information receipt), some institutions may be partially compromising the educational facet of the mandate.

There are multiple limitations to this pilot analysis, most centrally related to generalizability. The use of a convenience sampling method and the inclusion of only male collegiate football players from a highly competitive division mean that it may not be possible to generalize these results to non-participating schools, female athletes, other ages, sports, and levels of competition. Effects of acknowledgement on young adult collegiate athletes may differ from the effects of acknowledgement on youth and adolescent athletes. Future research is needed to explore the extent to which female athletes and athletes of different ages recall the completion of a pre-season concussion-related waiver. Additionally, the use of self-report survey methods introduces the possibility of inaccurate responses from athletes and/or athletic trainers due to reasons such as social desirability bias or recall bias. Prospective study is needed to more fully explore the extent to which acknowledgement, and recall of acknowledgement, predicts future concussion reporting behavior. Research is also encouraged to determine whether it is possible to design pre-season waivers in such a way that their content is understood and retained throughout the season.

Conclusion

Although providing concussion-related information to athletes and/or their parent/guardian, and requiring them to acknowledge receipt of this information in writing is included in a majority of state laws and league rules, there is relatively widespread variation in the ways in which these mandates are structured and implemented. Most states and sports leagues have very general concussion education and acknowledgement mandates. Where guidelines about the content and delivery are provided, they are often very limited in specificity. Few states require the delivery of educational programs with proven efficacy. Existing data suggests that general mandates about concussion information provision among collegiate athletes can be variably implemented and largely ineffective in changing concussion knowledge or concussion reporting behavior.⁴³ The structure of the state-level

concussion laws raises the possibility that many K-12 athletes are similarly receiving ineffective concussion education.

The results of the pilot NCAA football study discussed herein suggest that although acknowledgement provisions are widely mandated, they may not yet be systematically implemented. Although additional studies in other populations are warranted, the findings of the present study indicate that pre-season acknowledgement of concussion information and responsibility to report symptoms is not something that all athletes understand is happening. To the extent that athlete acknowledgement is intended to function as an educational strategy to promote safety behavior, the athlete's internalization of the material is critical. In this regard, the fact that approximately 40% of athletes in this study did not recall having provided acknowledgement is problematic. Although a document does not have to be read or remembered in order to be enforceable⁴⁴ as long as it is a contractual document,⁴⁵ it is possible that the inconsistent implementation of concussion education and acknowledgement and the low rate of athlete recall may make courts more cautious about asserting that athletes had made an express assumption of risk by signing the acknowledgement form. Furthermore, insofar as athletes are mandated to sign the acknowledgement form prior to participation and have no power to negotiate terms in their interest, the courts may interpret this as an unconscionable contract of adhesion and refuse to enforce it. However, the oldest of these concussion statutes was enacted five years ago and there have been no lawsuits to-date involving athlete acknowledgement forms, so these suggested possible implications should be interpreted with extreme caution.

State laws and sport-league policies have the potential to play an important role in reducing the public health burden of concussions from sport. Although acknowledgement provisions can be seen as a tool for limiting liability, they have the potential to do more than just that. To the extent possible, the acknowledgement provisions within state concussion laws and sport-league policies should be utilized to improve health outcomes through mechanisms such as reinforcing concussion education, ensuring athletes are receiving this education, and encouraging concussion reporting behaviors. However, the current structure and implementation of state laws and league policies makes it unlikely that these goals are being reliably achieved. The concussion-related information provided to athletes is not consistent, comprehensive, nor has it been shown to have meaningful effects on concussion-reporting behaviors. Consequently, even to the extent athletes are reliably provided with educa-

tional materials and recall receipt of these materials, the design and delivery of the materials themselves may limit the efficacy of the entire exercise.

In the youth, high school, and college sports environments, there are many incentives to keep an athlete in play even when he/she has sustained an injury, including a concussion. For example, athletes themselves often want to remain in play as to not let down their teammates or coach.⁴⁶ Coaches aim to win, and sometimes their employment is dependent upon it. Parents want to see their children in the game and

In order to reduce the public health burden of concussions, we need to ensure that populations affected by concussions are well-educated about the risks. Implementing population-specific concussion education programs that build on relevant behavior change theory, incorporate information beyond acute signs and symptoms, and utilize more effective delivery mechanisms are necessary steps toward achieving this goal.

playing. State laws and league policies are one way we can work to counteract these competing motivations. Thus, we suggest the following improvements to existing state concussion laws and sport-league concussion policies:

Concussion education mandates both within state laws and sport-league policies should provide greater specificity, including evidence-based guidelines for content and delivery. Evidence increasingly suggests that concussion education programs should target cognitions that are most strongly predictive of safety behavior.⁴⁷ Where specified, existing educational mandates most often focus on acute concussion signs and symptoms and short-term consequences of concussion. However, a growing body of evidence suggests this type of concussion knowledge does not always predict symptom reporting behavior.⁴⁸ Recently, suggestions have been made about the potential efficacy of including information about other critical content areas, such as the possible long-term effects of concussions and athletic consequences of continued play with an undiagnosed concussion, in concussion education materials.⁴⁹ Other suggestions have been made about

the importance of moving beyond knowledge focused educational paradigms to provide information to target cognitions that are strongly associated with safety behaviors, such as perceived concussion reporting norms.⁵⁰ With respect to written acknowledgment, insofar as it continues to be required it should be implemented such that the parents and/or athletes are able to retain the concussion-related information rather than return it with the signature. Delivery methods for parent and athlete concussion education should be modified. Providing a sheet of paper with concussion-

related information does not ensure that the information is read, understood, or retained. Improvements to delivery such as in-person seminars or interactive web-based education tools utilizing multi-media delivery and quizzes to ensure compliance should be utilized. State laws and sport-league policies may also consider including some kind of “reminder” mechanism, such as posting a copy of the form that athletes signed in respective team locker rooms or requiring mid-season “refresher” sessions. Reporting concussion symptoms is important throughout the season, and to the extent that educational effects have limited duration, reminder mechanisms should be utilized to reinforce appropriate symptom reporting behavior. Although some may argue that this more robust concussion education puts too large a time burden on parents and/or athletes, we believe it is warranted by

potential health consequences of concussions and the number of athletes at risk. In short, in order to reduce the public health burden of concussions, we need to ensure that populations affected by concussions are well-educated about the risks. Implementing population-specific concussion education programs that build on relevant behavior change theory, incorporate information beyond acute signs and symptoms, and utilize more effective delivery mechanisms are necessary steps toward achieving this goal.

Existing concussion education and athlete-acknowledgement requirements should be enforced. Although state concussion laws and sports-league concussion policies have been widely adopted, the extent to which their requirements have been enacted is not well understood. The present analysis of a sample of collegiate football teams indicates that the NCAA-required athlete acknowledgement has not been uniformly enacted at NCAA member-schools. However, the current examination does not provide information to sufficiently understand the extent of the disparity at other NCAA member-schools, other sports, or other levels of competition. Although some state laws

require schools to report concussions to a department of public health or an interscholastic athletic association, where reporting information has been made public it has been incomplete and those who do not report do not face substantial consequences.⁵¹ Having an effective enforcement mechanism is as important as having an effective law or policy. Without appropriate enforcement, states and sports-leagues cannot be sure teams are following the policies and that those who do not follow are appropriately reprimanded. State laws and sports-league policies should require active report and/or proof of compliance with concussion education policies and should incorporate appropriate consequences for both individuals and schools who do not comply. For example, schools that do not provide required compliance-reporting materials could initially be provided with a “warning,” and, if non-compliance continues, they could be subject to a penalty such as being banned from competition. Although some states specify repercussions for non-compliance, specifically for coaches, these consequences are not uniform if they are present at all. Enforcement of existing state concussion laws and sports league policies will help ensure that the goals of the regulations are met.

As knowledge about the short- and long-term effects of concussions increase, so too does the need to minimize these risks and ensure that those involving themselves in sports where concussions can occur are aware of the possible consequences. The existence of state concussion laws and sport-league concussion policies is a positive step toward reducing the incidence and short- and long-term consequences of these injuries. However, these laws and policies must be effective and enforced if they are to protect the health of athletes. Several important changes, such as those recommended in this paper, are needed before these regulatory measures can function as effective tools for reducing the public health burden of concussions.

Appendix 1

The positivist qualitative paradigm employed for coding presumes that there is an objective truth that can be uncovered through observation, measurement and quantification.⁵² Structural coding methods are commonly employed for qualitative research with a positivist paradigm. Structural coding methods involve labeling sections of text as representing pre-selected concepts or categories that relate to the top of inquiry.⁵³ In the present analysis, a list of categories relevant to the content of concussion policies were developed (for example, “Info sheet required” “Signature from parent” “Signature from child”). Where labels were not self-explanatory, a code book was developed with a detailed description of what was meant by the label. The code book was utilized by the two independent coders and to assist in resolving any discrepancies.

Appendix 2

SPSS statistical package v.20 was used for all analyses and a standard alpha level of 0.05 was adopted. Differences in acknowledgement recall by team were initially examined using a chi-squared test of independence. In order to assess compositional differences between teams, a one-way ANOVA was conducted. For analyses examining differences affecting athletes’ acknowledgement recall, the categories of “no” and “unsure” were grouped and the acknowledgement question was treated at a binary variable and binary logistic regression analyses were used. Date of survey was examined using the linear variable of days since the beginning of the football preseason until survey administration. For analyses using ACT and SAT scores, raw scores were converted into standardized percentiles. When it is reported that athletes agree that they intend to report concussion symptoms, responses of 5, 6, and 7 on the Likert scale (slightly agree, agree, and strongly agree) are all included as agreeing.

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