Journal of Adolescent Health 62 (2018) 255–264

ELSEVIER

JOURNAL OF ADOLESCENT HEALTH

www.jahonline.org

Original article

# Consistency and Variation in School-Level Youth Sports Traumatic Brain Injury Policy Content

Kathryn Coxe, M.S.W. [a,b], Kelsey Hamilton, M.P.A. [c], Hosea H. Harvey, J.D., Ph.D. [d], Joe Xiang [a,e], Marizen R. Ramirez, Ph.D., M.P.H. [f], and Jingzhen Yang, Ph.D., M.P.H. [a,g,*]

[a] *Center for Injury Research and Policy, Nationwide Children's Hospital, Columbus, Ohio*
[b] *Department of Quality, Planning, and Research, The Ohio Department of Mental Health and Addiction Services, Columbus, Ohio*
[c] *College of Public Health, Kent State University, Kent, Ohio*
[d] *Beasley School of Law, Temple University, Philadelphia, Pennsylvania*
[e] *Center for Intervention Research in Schools, Ohio University, Athens, Ohio*
[f] *Division of Environmental Health Sciences, School of Public Health, University of Minnesota, Minneapolis, Minnesota*
[g] *Department of Pediatrics, College of Medicine, The Ohio State University, Columbus, Ohio*

*Article history:* Received February 22, 2017; Accepted July 8, 2017
*Keywords:* TBI; Content analysis; Written policy; High school

**See Related Editorial p. 249**

A B S T R A C T

**Purpose:** The purpose of the study was to examine the consistency and variation in content of high school written traumatic brain injury (TBI) policies in relation to the three key tenets of youth sports TBI laws.

**Methods:** A content analysis was conducted on written TBI policies retrieved from 71 high schools currently participating in High School Reporting Information Online. Each policy was independently analyzed by two trained coders. The number and percent of the policies reflecting the three key tenets of state youth sports TBI laws were described and compared on policy enforcement (i.e., strictness of language), policy description (i.e., details and definitions of the requirements), and policy implementation steps (i.e., specific steps for implementing the requirements). Direct quotes were identified to support quantitative findings.

**Results:** All 71 high school TBI policies contained at least two of the three main TBI law tenets, where 98.6% (n = 70) included the return to play tenet, 83.1% (n = 59) included the removal from play tenet, and 59.2% (n = 42) specified the distribution of TBI information sheets to student-athletes and their parents. Nearly half of the policies (49.3%, n = 35) required parents' signature while only 39.4% (n = 28) required students' signature on the TBI information sheet. The language exhibited wide variance across the 71 TBI policies regarding policy enforcement, policy description, and policy implementation specifications.

**Conclusions:** All 71 TBI policies covered at least two of the three youth sports TBI law tenets, but with considerable variation. Future research should assess variations by schools within the same state and their impact on TBI rates in school athletics.



**IMPLICATIONS AND CONTRIBUTION**

This study contributes to scientific literature on the profile of sports-related traumatic brain injury (TBI) school policies and provides insight into the translation of state-level TBI laws to school-level policy. TBI policies with stricter enforcement language and clear-cut implementation steps will help ensure successful implementation of the state TBI laws at high schools.

**Conflicts of Interest:** The authors have no conflicts of interest to disclose.
Pursuant to the IRB and RIO agreements, schools were not named throughout this manuscript to provide anonymity to study participants.

* Address correspondence to: Jingzhen Yang, Ph.D., M.P.H., Center for Injury Research and Policy, Nationwide Children's Hospital, 700 Children's Drive, Columbus, OH 43215.
*E-mail address:* Ginger.Yang@nationwidechildrens.org (J. Yang).

1054-139X/
http://dx.doi.org/10.1016/j.jadohealth.2017.07.003

Sports-related traumatic brain injuries (TBIs) affect approximately 300,000 high school athletes each year in the United States, second only to car crashes among individuals aged 15–24 years [1]. In 2009, TBI experts and government officials in Washington State collaborated to develop a youth sports TBI law in response to the long-term health consequences incurred by a middle school football player, Zackery Lystedt, who suffered a catastrophic brain injury during a football game after returning to play following an initial TBI that was not properly diagnosed [2]. By 2014, all 50 states and the District of Columbia (DC) had enacted similar youth sports TBI laws [3]. The laws generally include three tenets of Washington's Lystedt Law: (1) mandatory removal from play following an actual or suspected TBI, (2) permission to return to play (RTP) approved by a licensed health professional, and (3) education regarding TBI signs and symptoms [4,5]. However, the Lystedt law was not modeled on a particular scientific framework [5], and therefore, the three tenets do not necessarily conform to or integrate broad scientific consensus about youth TBI prevention, management, or best practices [6–8].

Following enactment of such laws, schools engaged in policy implementation efforts. Several states delegated the authority to create and distribute state TBI education requirements to either a state agency or local school board [5–9]. However, prior studies examining the content, structure, and implementation of TBI laws were mainly focused on implementation efforts at the state level [3,5,10–12]. The results of those studies showed that variations exist in the content and implementation of TBI laws across states, which could mitigate the effectiveness of the laws [10,12,13]. No prior study has examined the content and legal consistency of school TBI policies, which could directly affect how schools interpret, implement, and exercise their state TBI laws. The aims of this study were to (1) analyze the content of written high school TBI policies in relation to the three key tenets of TBI laws and (2) evaluate three dimensions of written school policy language specificity including policy enforcement, policy description, and policy implementation steps. Results of this study provide insight into how to improve TBI policies to ensure more efficacious implementation of state TBI laws at the school level.

## Methods

### *Study participants and data*

Electronic copies of 71 concussion policies (one per high school) were collected from certified athletic trainers (ATs) or athletic directors from schools that participated in High School Reporting Information Online (RIO). High School RIO is a prospective, longitudinal Internet-based surveillance system established in 2005 that collects sports-related injury data, including TBI data, among a nationally representative sample of high schools [14]. An invitation was first sent via the listserv to 240 RIO schools active in the 2014–2015 academic year and again to 203 RIO schools active in the 2015–2016 academic year, with many schools overlapping between years. The first 71 respondents (the ATs or athletic director), including 39 from the first round of recruitment and 32 from the second round, who agreed to participate in the study and completed a phone interview as part of the TBI law evaluation study were asked to provide electronic copies of their school's TBI policies. This study was approved by the institutional review board of the authors' institutions.

### *Instrument and measurement*

A high school TBI policy content analysis codebook was developed based on the Public Health Law Research (Youth Sports Traumatic Brain Injury Laws Codebook [15], existing literature on TBI laws [5,9,11,16], and methodology for policy content analysis [17,18]). Public health law experts and TBI researchers examined the codebook over six iterations until finalized. To establish reliability in coding, two authors independently coded the same five policies using the initial codebook. The research team reviewed the coded policies, discussed discrepancies, and revised the initial codebook accordingly after consensus was reached. Next, the two coders independently coded an additional five policies using the updated codebook and discussed discrepancies to reach consensus. The review and revision process was repeated until consensus from all authors was achieved.

The final codebook included 15 dichotomous variables organized according to the three key tenets of youth sports TBI laws, with two variables on the "removal from play" tenet, three variables on the "return to play" tenet, six variables on the "concussion education" tenet, and four variables related to additional requirements, including liability specifications, a five-step RTP protocol, standardized testing, or return-to-learn requirements. For variables receiving "yes" responses, additional coding was used across the three policy dimensions: (1) policy enforcement, which measured the strength and specificity of written language regarding policy enforcement; (2) policy description, which measured details and descriptions of the policy content and requirement; and (3) policy implementation steps, which measured "who," "what," "when," "where," and "how" the policy is implemented. Detailed descriptions of coding scheme are listed in Table 1.

### *Data coding procedure*

Two authors independently analyzed the content of each of the 71 high school TBI policies. The written language corresponding to each variable was coded into numeric scores for the three policy dimensions (e.g., policy enforcement, policy description, and policy implementation steps) based on the descriptions listed in Table 1. Common and/or distinctive policy provisions for each of the 15 dichotomous variables were identified and recorded throughout the examinations for further analysis of similarities or differences among the written policies. Direct quote(s) that support the three policy dimensions of each study variable were selected and recorded. The research team met weekly to discuss the coding, and consensus was reached for any discrepancies between the two coders. The coding process and consensus continued for all 71 policies.

### *Data analysis*

Descriptive analyses were conducted to describe the number and percentage of the 71 high schools whose written TBI policies included the three key tenets of youth sports TBI laws (Table 2). All 71 TBI policies were analyzed by the three policy dimensions (e.g., policy enforcement, policy description, and policy implementation steps; Table 3), and in relation to the three tenets of the TBI laws including similarity or differences in the content across the high schools. In addition, a sample of direct quotes supporting the three dimensions of written policies were presented in Table 4.

**Table 1**
Coding scheme used to code written school TBI policies

| Dimension | Measurement | Score = 3 | Score = 2 | Score = 1 |
|---|---|---|---|---|
| Policy enforcement | The strength and specificity of written language regarding policy enforcement | Clear, restrictive language, using words such as "will," "shall," or "must; " or the intent is obvious and direct; or the language is clear and unequivocal | Moderate enforcement language, including words such as "should" or "may" | The language is vague or open to interpretation. |
| Policy description | Details and descriptions of the policy content and requirement | Excellent policy detail and description where enough detail is provided so that no questions exist on the definition, explanation, or process of the policy | Moderate description, but details including integral explanations or process steps are missing | No description or detail is provided to explain the policy |
| Policy implementation steps | "Who," "what," "when," "where," and "how" the policy is implemented | Implementation steps are clearly specified for "who," "what," "when," "where," and "how" policies are applied for action to be implemented | Some, but not all, of the implementation steps are specified, or that crucial factors (such as "when" or "who") are missing from part of the description | No implementation process or steps are specified |

## Results

### *High school demographics*

Seventy-one high schools from 26 states and the DC were included in the study sample (Table 2). Of these, nine states had one school, six states had two schools, and six states had three and 4+ schools, respectively. The earliest law effective date in this sample was 2009, while the latest was 2014. Of the 71 high schools, the majority (91.5%) were public schools. Over half (54.9%) of the schools had student enrollment greater than or equal to 1000. The majority of schools (88.8%) included more than 15 sports, with an average of 10 male sports and 10 female sports. All 71 schools employed at least one certified AT, and about one-third (n = 24, 33.8%) employed at least one additional AT. Approximately one-third of policies (n = 23, 32.4%) included the date the policy was created or updated and the majority of these (n = 18, 78.3%) had the latest date after their state law first went into effect.

### *Removal from play tenet*

Of the 71 written TBI policies, 59 policies (83.1%) included the removal from play tenet. Of these 59 policies, 89.8% (53/59) demonstrated strong policy enforcement, utilizing language such as "will," "must," or "shall" remove (Table 3). Despite strong enforcement language for removal from play, only 32.2% (19/59) of the policies described clear implementation steps specifying a specific individual (or individuals) responsible for removing an athlete with a suspected TBI from play. For example, a school in Connecticut demonstrated language specificity on the removal from play, with a score of "3":

> "State law requires that a coach MUST immediately remove a student-athlete from participating in any intramural or interscholastic athletic activity…"

However, vague language was used in one school in Maine on removal from play, with a score of "2":

> "It is the responsibility of staff members involved in a school activity...to act in accordance with this policy …"

Forty-five policies (63.4%) in this study required parental notification if the student-athlete sustained a TBI. Of these policies, more than half (53.3%, 24/45) did not identify who was responsible for notifying the parent(s) nor by what method.

### *Return to play tenet*

Seventy policies (98.6%) required student-athletes to be seen by a certified health professional before the athlete's RTP. Specific types of health professionals permitted to provide RTP clearance were clearly specified in 82.9% (58/71) of policies. For example,

**Table 2**
Number of participating schools per state

| Law effective date | State | Number of schools | %[a] |
|---|---|---|---|
| 6/7/2013 | SC | 1 | 1.4 |
| 7/1/2012 | NE | 1 | 1.4 |
| 7/1/2012 | NY | 1 | 1.4 |
| 10/20/2011 | D.C. | 1 | 1.4 |
| 9/1/2011 | MN | 1 | 1.4 |
| 7/1/2011 | KS | 1 | 1.4 |
| 7/1/2011 | VA | 1 | 1.4 |
| 7/26/2009 | WA | 1 | 1.4 |
| 7/1/2009 | OR | 1 | 1.4 |
| 3/28/2013 | MI | 2 | 2.8 |
| 8/1/2012 | DE | 2 | 2.8 |
| 7/1/2012 | FL | 2 | 2.8 |
| 1/1/2012 | CA | 2 | 2.8 |
| 7/1/2011 | IN | 2 | 2.8 |
| 7/1/2011 | MD | 2 | 2.8 |
| 1/1/2014 | GA | 3 | 4.2 |
| 8/30/2012 | ME | 3 | 4.2 |
| 8/1/2012 | KY | 3 | 4.2 |
| 4/17/2012 | WI | 3 | 4.2 |
| 12/7/2010 | NJ | 3 | 4.2 |
| 7/18/2010 | MA | 3 | 4.2 |
| 6/17/2011 | TX | 4 | 5.6 |
| 6/16/2011 | NC | 4 | 5.6 |
| 7/28/2011 | IL | 5 | 7.0 |
| 3/27/2013 | OH | 6 | 8.5 |
| 5/18/2010 | CT | 6 | 8.5 |
| 7/1/2012 | PA | 7 | 9.9 |
| Total | 27 | 71 | 100.0% |

[a] Due to rounding, percentages may not add to 100%.

**Table 3**
High school TBI policy enforcement, policy description, and policy implementation steps scores

| Tenant | | Policy includes tenet | | Policy enforcement | | | | Policy description | | | | Policy implementation steps | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | N | % | Score 1 (%) | Score 2 (%) | Score 3 (%) | Mean | Score 1 (%) | Score 2 (%) | Score 3 (%) | Mean | Score 1 (%) | Score 2 (%) | Score 3 (%) | Mean |
| Removal from play tenet | | | | | | | | | | | | | | | |
| 1 | Removal from play when a TBI is suspected | 59 | 83.1 | 5.1 | 5.1 | 89.8 | 2.8 | 5.1 | 8.5 | 86.4 | 2.8 | 11.9 | 55.9 | 32.2 | 2.2 |
| 2 | Parental notification regarding removal from play | 45 | 63.4 | 0.0 | 4.4 | 95.6 | 3.0 | 0.0 | 11.1 | 88.9 | 2.9 | 20.0 | 33.3 | 46.7 | 2.3 |
| Return to play tenet | | | | | | | | | | | | | | | |
| 3 | Health professional clearance requirement for return to play | 70 | 98.6 | 0.0 | 0.0 | 100.0 | 3.0 | 0.0 | 4.3 | 95.7 | 3.0 | 2.9 | 14.3 | 82.9 | 2.8 |
| 4 | Health professional providing clearance is trained in TBI management | 28 | 39.4 | 0.0 | 3.6 | 96.4 | 3.0 | 0.0 | 0.0 | 100.0 | 3.0 | N/A | N/A | N/A | N/A |
| 5 | Clearance is required to be a written document | 55 | 77.5 | 0.0 | 0.0 | 100.0 | 3.0 | 0.0 | 7.3 | 92.7 | 2.9 | 1.8 | 63.6 | 34.5 | 2.4 |
| TBI education tenet | | | | | | | | | | | | | | | |
| 6 | Coaches receive TBI training | 24 | 33.8 | 0.0 | 0.0 | 100.0 | 3.0 | 0.0 | 8.3 | 91.7 | 3.0 | 0.0 | 8.3 | 91.7 | 3.0 |
| 7 | TBI information sheet is distributed to parents and athletes | 42 | 59.2 | 9.5 | 11.9 | 78.6 | 2.8 | 4.8 | 23.8 | 71.4 | 2.7 | 26.2 | 45.2 | 28.6 | 2.0 |
| 8 | Parents must sign TBI information sheet | 35 | 49.3 | 2.9 | 0.0 | 97.1 | 2.9 | 2.9 | 2.9 | 94.3 | 2.9 | 8.6 | 28.6 | 62.9 | 2.5 |
| 9 | Students must sign TBI information sheet | 28 | 39.4 | 3.6 | 3.6 | 92.9 | 2.9 | 3.6 | 0.0 | 96.4 | 2.9 | 3.6 | 21.4 | 75.0 | 2.7 |
| 10 | TBI information sheet is updated | 8 | 11.3 | 0.0 | 25.0 | 75.0 | 2.8 | 0.0 | 12.5 | 87.5 | 2.9 | 0.0 | 12.5 | 87.5 | 2.9 |
| 11 | Policy addresses frequency of TBI information sheet distributed to parents and athletes | 23 | 32.4 | 0.0 | 8.7 | 91.3 | 2.9 | 0.0 | 8.7 | 91.3 | 2.9 | 13.0 | 13.0 | 73.9 | 2.7 |
| Other | | | | | | | | | | | | | | | |
| 12 | A 5-step return to play protocol is implemented for TBIs | 56 | 78.9 | 0.0 | 3.6 | 96.4 | 3.0 | 1.8 | 7.1 | 91.1 | 2.91 | 12.5 | 35.7 | 51.8 | 2.40 |
| 13 | Standardized testing is used to address TBIs | 49 | 69.0 | 0.0 | 14.3 | 85.7 | 2.9 | 0.0 | 18.4 | 81.6 | 2.81 | 0.0 | 18.4 | 81.6 | 2.81 |
| 14 | A return-to-learn policy is implemented for TBIs | 35 | 49.3 | 2.9 | 8.6 | 88.6 | 2.9 | 8.6 | 17.1 | 74.3 | 2.68 | 11.4 | 45.7 | 42.9 | 2.36 |
| 15 | Policy addresses potential liability | 7 | 9.9 | 0.0 | 14.3 | 85.7 | 2.8 | 14.3 | 42.9 | 42.9 | 2.29 | 0.0 | 42.9 | 57.1 | 2.50 |

TBI = traumatic brain injury.

**Table 4**
Examples of high school TBI policy enforcement, policy description, and policy implementation steps scores

| Tenet | Metric | Sample quotations and scoring outcomes |
|---|---|---|
| Removal from play tenet | | |
| Removal from play when a TBI is suspected | PE | "Any player who shows signs, symptoms or behaviors associated with a concussion must be removed from the game or practice…"(3, IN) |
| | | "Any athlete even suspected of suffering a concussion should be removed from the game or practice immediately."(2, KS) |
| | PD | "Athletes with the signs and symptoms of concussion should be removed from play immediately. Continuing to play with the signs and symptoms of a concussion leaves the young athlete especially vulnerable to greater injury."(3, MD) |
| | PI | "State law requires that a coach MUST immediately remove a student-athlete from participating in any intramural or interscholastic athletic activity…"(3, CT) |
| | | "It is the responsibility of staff members involved in a school activity...to act in accordance with this policy…"(2, ME) |
| Parental notification regarding removal from play | PE | "The school shall notify the parent…"(3, NE) |
| | | "The parent(s) should be called and informed of their child's condition."(2, IL) |
| | PD | "All coaches are required to report any circumstances in which the student was removed form play for suspected head injury, suspected concussion, or loss of consciousness and the nature of the suspected injury to the student's parent in person by telephone immediately after the competition or practice."(3, MA) |
| | | "The athletic trainer will conduct a concussion evaluation and contact the athlete's parent/guardian."(2, GA) |
| | PI | "The Certified Athletic Traineris responsible for contacting the student-athlete's parent or guardian. Contact should be done in person if possible. The athletic trainer will adviseparents on the student-athlete's condition verbally, along with distributing the Concussion Information Sheet for the parent/guardian to take home."(3, CA) |
| | | "The student and his/her parent(s) will be informed of the need for an evaluation for brain injury before the student will be allowed to return to the sport or activity."(1, ME) |
| Return to play tenet | | |
| Health professional clearance requirement for return to play | PE | "All decisions on return to play following a concussion will only be made by a physician. The Athletic Trainer will not return student-athlete to playing before a physician approves in writing." (3, KY) |
| | PD | "If the athlete's concussion is too severe for them to return to the game, s/he will be kept out of activity until the following criteria have been met… 3. Doctor's clearance is obtained." (2, MI) |
| | PI | "No athlete may return to activity after an apparent head injury or concussion, regardless of how mild it seems or how quickly symptoms clear, without medical clearance from a Medical Doctor (MD) or Doctor of Osteopathic Medicine (DO)." (3, KY) |
| | | "…athlete…may not return to play until the athlete is evaluated by a licensed heath care provider…" (1, WA) |
| Health professional providing clearance is trained in TBI management | PE | "The student athlete cannot return to play or practice until the student athlete is evaluated and cleared for return to participation in writing by an appropriate medical professional...with training in the evaluation and management of concussion." (3, PA) |
| | | "Any student…prohibited from further participation in school-sponsored activities until he/she has been evaluated and received written medical clearance preferably from a licensed health care provider who is qualified and trained in concussion management." (2, ME) |
| | PD | "If a concussion is confirmed, the student is not permitted to return to full participation in any school activities until medically cleared to do so by a licensed health care provider trained in concussion management. More than one evaluation by the student's health care provider may be necessary before the student is cleared for full participation." (3, ME) |
| | PI | N/A |
| Clearance is required to be a written document | PE | "The athlete must meet all of the following criteria in order to progress to activity… C. Have written clearance from primary care physician or specialist…" (3, NC) |
| | PD | "In the event a student athlete presents a physician's note for return to play that does not comply with the [XX, City School District] concussion policy and return to play guidelines, then the [XX, City School District] physician will have final say in the return to play decision." (2, NJ) |
| | PI | "…A written note sanctioned by the NCHSAA must be presented and an appropriate return to play protocol must be followed." (3, NC) |
| | | "All student-athletes that have been removed from activity by a physician must be cleared by a physician, in writing, to return to that activity." (1, KY) |
| TBI education tenet | | |

(*continued on next page*)

**Table 4**
Continued

| Tenet | Metric | Sample quotations and scoring outcomes |
|---|---|---|
| Coaches receive TBI training | PE | "All coaches shall annually, prior to coaching an athletic activity, complete…. the National Federation of State High School Associations [course]…." (3, PA) |
| | PD | "When renewing this permit, the coach will be required to complete an online concussion education course as stipulated in the section entitled Approved Online Concussion Education Course. This course is valid for three years and expires at the time the Pupil Activity Program/Coaching Permit expires." (3, OH) |
| | | "All coaches should become familiar with the signs and symptoms of concussion that are described above. 2. Annual training will occur for coaches of every sport (per Oregon State Law)." (2, OR) |
| | PI | "All coaches shall annually, prior to coaching an athletic activity complete…the National Federation of State High school Associations [course]…" (3, OH) |
| TBI information sheet is distributed to parents and athletes | PE | "…all students and parents of student who will be participating in school-sponsored athletic activities will be provided information…" (3, ME) |
| | PD | "…information regarding: A) The risk of concussion and other head injuries and the dangers associated with continuing to participate when a concussion or other head injury is suspected, B) The signs and symptoms of concussions and other head injuries; and C) The district's policy for 1) removal from the activity when a student is suspected of having sustained a concussion or other head injury, 2) evaluation, and 3) return to participation in the activity ("return to play")." (3, ME) |
| | | "The following information is meant to give parents and guardians tools to best help their children recover from a concussion. It also serves as a guide for what the student and family can expect from the school." (1, PA) |
| | PI | "Annually, during mandatory coaches evenings…." (3, ME) |
| Parents and student-athletes must sign TBI information sheet | PE | "All student-athletes and their parents/guardians will sign a statement ...including signs and symptoms of concussion. This statement will also acknowledge having received the above-mentioned educational handouts." (3, WI) |
| | PD | "Concussion and brain injury information…will be made available through handouts and on the [school] website. To ensure that this information is being disseminated and read, all parents or guardians will be required to sign a form indicating that they have received, read and understand the information that will be made available." (3, NE) |
| | | Signature line for parents provided at the end of the policy. (1, KY) |
| | PI | "Record of this will be tracked as a part of each students 'Sport Check Out.' Students will not be allowed to participate until this form has been signed and returned to the school." (3, NE) |
| | | Signature line for parents provided at the end of the policy. (1, KY) |
| TBI information sheet is updated | PE | "This protocol shall be reviewed…" (3, IL) |
| | | "This policy should be reviewed when generally accepted protocols change." (1, ME) |
| | PD | "Any changes or modifications will be reviewed and given to athletic department staff, including coaches, and other appropriate school personnel in writing." (3, WI) |
| | | "This policy should be reviewed when generally accepted protocols change." (1, ME) |
| | PI | "…reviewed annually by the athletic department of [school name]." (3, WI) |
| | | "…when generally accepted protocols change." (1, ME) |
| Any TBI information sheet is distributed | PE | "….student-athletes shall be presented with a discussion about concussions…" (3, WI) |
| | PD | "At the beginning of individual sport seasons, student-athletes shall be presented with a discussion about concussions and given a copy of the CDC's "Heads Up…" (3, WI) |
| | PI | "This information will be presented by the schools Licensed Athletic Trainer at the athletic code meetings with the cooperation and consultation of the supervising physician...At the beginning of individual sport seasons…." (3, WI) |
| | | "Line provided for signature and date; distribution is not explicitly stated, but it is reasonably assumed " (1, WA)[a] |
| Other requirements | | |
| A 5-step return to play protocol is implemented for TBIs | PE | "…athletes will be required to complete a progressive return-to-activity protocol…" (3, TX) |
| | | "Subsequent management of the student-athlete's concussion...may include the following...Direction of Return-to-Play protocol…" (1, WI) |
| | PD | "….Should the athlete become symptomatic during the progression, they should drop back to the previous asymptomatic level and try again to progress after a 24 hour period of rest has passed." (3, TX)[a] |
| | PI | "The athlete should be released from a physician, have a signed UIL approved return to play parent/athlete consent form, and be symptom free for 24 hours before beginning this progression." (3, TX) |
| | | "Return to play must follow a medically supervised stepwise process." (1, OH) |

**Table 4**
Continued

| Tenet | Metric | Sample quotations and scoring outcomes |
|---|---|---|
| Standardized testing is utilized for TBIs | PE | "[HS athletes] engaged in contact and collision sports will be required to undergo ImPACT Baseline test."(3, OH) |
| | | "Baseline testing should be considered for athletes competing in contact sports, especially football, ice hockey, soccer, wrestling, and basketball." (2, MN) |
| | PD | "The ImPACT computerized program is designed to measure specific brain functions that may be altered following a concussion. The program is designed in such a way as to allow athletes to be tested pre-season so that post-injury performance may be compared to the athlete's own baseline." (3, WI) |
| | PI | "Student/Athletes in grades 6 through 12 will have a baseline ImPACT done and then post-tested when a concussion is suspected." (3, ME) |
| | | "Accepted standard concussion assessment tools and evaluation (physical exam and neurocognitive testing) will be utilized…" (1, SC) |
| A return to learn policy is implemented for TBIs | PE | "These academic accommodations must be considered part of the medical care and treatment for this medical condition." (3, PA) |
| | | "Extra help to perform school-related activities may be necessary…"(1, NJ)[b] |
| | PD | "Post-Concussion: Effect—Attention/Concentration; Functional School Problem—Short focus on lecture, class work, homework; Accommodation/ Management Strategy—Shorter assignments, break down tasks, lighter work load…." (3, MD)[c] |
| | PI | "…student will then be referred to School Psychologist, [name], to begin academic accommodations specific to the student's individual needs." (3, IN) |
| | | "School personnel should be alert to cognitive and academic issues…" (1, ME) |
| Policy addresses potential liability | PE | "…the school district shall not be liable for the injury or death of a person due to the action or inaction of persons employed by, or under contract with, a youth sports team organization that operates on school grounds." (3, NJ) |
| | | "…to help to reduce risk of lawsuits charging negligence, this office suggests the inclusion in your athletic authorization forms of a warning message. CIAC has available sample warning statements which may be obtained upon request." (2, CT) |
| | PD | "Such volunteers shall not be liable for civil damages arising out of any act or omission relating to the requirements of law, unless such volunteer is willfully or intentionally negligent in his act or omission…" (2, CT) |
| | PI | "…the school district shall not be liable...if the youth sports team organization provides the school district proof of an insurance policy in the amount of not less than $50,000 per person, per occurrence…" (3, NJ) |
| | | "The student's guardian signs a consent form regarding the following….understand the immunity provisions under TEC Section 38.158." (2, TX) |

TBI = traumatic brain injury.
[a] Inclusion of a detailed five-step RTP protocol specifying frequency, intensity, and type of exercises at each step is included in this protocol.
[b] The protocol does provide further description of any tests specified beyond this statement.
[c] Included in this protocol is a full table comprising a list of postconcussion effects, associated school problems, and management strategies for each problem.

consistent with some states' laws, some policies specified clearance was only accepted from a Medical Doctor or Doctor of Osteopathic Medicine, while other policies only stated, "licensed health care provider," which could include a wider range of health professionals such as nurses, psychologists, or chiropractors, depending on state and local definitions, which vary by state.

Only 39.4% (28/71) of policies specified that health professionals providing RTP clearance be trained in TBI management, and of these 28 policies, 27 (96.4%) contained definitive language on this requirement. None of the policies that required the health professionals to be trained in TBI management specified the type or frequency of TBI training required, which is consistent with their existing state laws.

Out of 71 policies, 55 (77.5%) required clearance for RTP to be in the form of a written document. However, the policies exhibited wider divergence about the specificity of language required in the written document. Only one-third (34.5%, 19/55) of the policies specified the type of written document accepted before RTP.

For example, one school policy from North Carolina clearly specified, with a score of "3" on language enforcement,

> "…A written note sanctioned by the NCHSAA must be presented…"

However, a school policy from Kentucky did not have such specificity in its written return requirement, with a score of "1":

> "All student-athletes that have been removed from activity by a physician must be cleared by a physician, in writing, to return to that activity."

### *TBI education tenet*

Significant variation was observed in educational requirements throughout the schools' TBI policies. Only 24 policies (33.8%) required that coaches receive education on the TBI recognition and management. These same 24 policies utilized clear and restrictive language regarding the type and/or frequency of training, but not all of these clearly specified both. For

example, a school policy from Massachusetts specified the type and frequency of training required for coaches, with a score of "3" on policy implementation:

> "All coaches shall annually, prior to coaching an athletic activity complete…the National Federation of State High School Associations [course]…"

However, a policy from a different school in Massachusetts only stated, with score of "2":

> "[Coaches] shall be required to participate in an annual training in the prevention and recognition of a sports-related head injury…"

Over half of the policies (59.2%, 42/71) specified that TBI information sheets be distributed to student-athletes and their parents, and 49.3% (35/71) of these policies required parents to sign the TBI information sheet. Less than half (39.4%, 35/71) required students to sign the information sheet.

Only 8 policies (11.3%) required the TBI information sheet be updated with new information on TBI risks and management recommendations. Six out of eight policies (75%) provided strict language requiring updates to the information sheets, and seven policies (87.5%) provided clear implementation steps for doing so.

### *Other requirements*

The majority of policies (78.9%, 56/71) included a requirement for a five-step RTP protocol, and over half of these 56 policies (51.8%, 29/56) specified implementation steps to fulfill this protocol. Five-step RTP protocols ranged from providing full explanations for each step of the RTP progression, to only stating that a five-step protocol may be required for student-athletes recovering from a TBI. Forty-nine of the 71 TBI policies (69%) required standardized testing for student-athletes who sustained a TBI, and 81.6% (n = 40) of these 49 policies specified the type of testing required.

Nearly half (49.3%, n = 35) of the TBI policies addressed return-to-learn guidelines. Of the 35 policies, 31 (88.6%) used strong enforcement language with return-to-learn guidelines and 26 (74.3%) provided an excellent description of this requirement. However, policies received mixed scores in describing implementation steps for this requirement. For example, a school policy from Indiana that received a score of "3" for implementation steps required the student-athlete be seen by the named school psychologist for an individualized return-to-learn plan, while another policy from Maine that received a score of "1" simply stated,

> "School personnel should be alert to cognitive and academic issues."

Only seven policies (9.9%) addressed liability provisions; however, 6 (85.7%) of these 7 policies did so using clear, restrictive language. Only three of the seven policies (42.9%) described liability provisions in sufficient detail, while four (57.1%) specified implementation procedures.

## Discussion

Existing research on youth sports TBI laws primarily focuses on analyzing law implementation at the state level [9,10,12] or among select sports [10,19], or the impact of TBI laws on emergency department visits for concussed youth [20–23]. This study is the first to analyze implementation of state TBI laws at the school level by examining the content specificity of high school TBI policies situated against the three tenets of state-level TBI laws [6–8]. Specifically, this study utilized qualitative and quantitative methods to analyze each school's written TBI policies and coded each policy on three policy dimensions: policy enforcement, policy description, and policy implementation steps. The main findings showed that all high school TBI policies contained at least two TBI law tenets; however, significant variations in language were found among policies across each of the tenets. Results of this study contribute to scientific literature on the profile of sports-related TBI school policies. TBI policies with stricter enforcement language and clear-cut implementation steps should yield less divergence between state law language and school-level policy enforcement.

While all high school TBI policies analyzed in this study contained language addressing at least one of the three tenets, the presence and specificity of requirements varied. Such variation may be attributed to differences in the content of individual state laws, the discrepancies in the interpretation of the laws by local schools or school districts, or a combination of the two [9,10,12]. Although there is general agreement on mandatory education regarding TBIs and associated negative consequences for coaches, parents, and student-athletes, subtle differences in educational requirements exist across states, which may explain differences in policy requirements observed in this study [9,12,24]. Specifically, of the 42 schools that required TBI information sheets be distributed to parents and student-athletes, only 35 required parent signature and 28 required student signature acknowledging receipt. These results are similar to previous study findings analyzing state-level TBI laws, which showed that 88.7% of 47 state TBI laws passed at that time required parents to receive TBI information sheets, 81.8% required parents to sign the sheet, and only 75% required the athletes to sign the sheet [12]. Furthermore, a study analyzing state-level experiences with TBI law implementation concluded that unclear authority delegation and language ambiguity accounted for uncertainty in key processes necessary to effectively implement the law [24]. In our study, among the 42 policies requiring distribution of a TBI information sheet to parents and student-athletes, 71.4% do not specify clear implementation, making it more challenging to effectively implement this policy. Several state TBI laws require or direct the state athletic association or state health department to write statewide TBI policy or educational requirements [25,26], which may result in lack of clarity in defined procedures or requirements or may influence interpretation of these requirements at the high school level [9,24]. Legislative factors such as lack of uniformity or misinterpretation of the laws would likely weaken the impact of such laws at the local level [9].

Some state TBI laws may involve actions, measures, requirements, or procedures not reflected in a school's policy or enforced by a school. Therefore, these elements could be vague or absent from the school written TBI policies. For example, while coach training in TBI management is part of the laws [5], only 33.8% of policies included in this study required coach training on TBI recognition and management. It is possible that some schools may defer coach TBI management training as part of coach certification, which usually is handled by a third party association. In addition, although 33 states require student-athletes seeking RTP clearance be seen by health professionals trained specifically in

treating and managing TBIs [5], less than 40% (n = 28) of the school policies we analyzed included this policy. A possible reason is that a health professional's continuing education is often regulated by a state-level professional board or association. Thus, most schools cannot directly enforce professional education requirements or member-association guidelines [27,28]. Furthermore, student-athletes are limited by their parents' health insurance plans, which may restrict the type of health care provider from whom they receive care [29]. While 58 (83%) policies specified the types of health professionals student-athletes must see to obtain RTP clearance, schools cannot force student-athletes to be seen by specific providers. Medical specialists may be more costly than primary care providers or not covered under certain insurance plans. These findings may have important implications for post-TBI treatment and recovery, as not all health care providers receive specialized training in TBI management [30,31].

Differences in financial resources, staff members, or other school resources could impact how schools are implementing youth sports TBI laws including developing their school TBI policy. All the schools participating in High School RIO, from which a subset were used for this study, employ or contract at least one full-time AT, who are often the first responders to identify and manage TBIs. Since not all U.S. schools or school districts have the capacity to employ an AT, there may be even greater variation in law implementation for schools without ATs, which could have substantial impact on TBI identification, management, and treatment [5,14,24,32–34].

As states adopt evidence-based youth sports TBI laws, more elements are added or modified to reflect best practices and growing scientific consensus [3]. Currently, at least half of the policies in this study include new requirements beyond the three tenets, including return-to-learn policies, standardized concussion testing for all student-athletes, or five-step RTP protocols [5,35]. Presently, only seven states have enacted laws requiring return-to-learn protocol implementation in schools, although more return-to-learn laws may be passed in 2017 and beyond [36–38]. Perhaps due to public awareness of changes in state law scheduled in the future, schools may have begun to include and implement return-to-learn requirements in preparation for these laws [24,39] or have chosen to adopt best practices for concussion management beyond current state concussion law requirements. Approximately half of school policies in this sample incorporated standardized testing and five-step RTP protocols in advance of state law requirements that expand nonsport recovery time minimums for athletes returning from sports-related TBIs [8].

## Limitations

This study has several limitations. First, despite drawing from a national sample, our study sample only included high schools with ATs, and consisted of high schools from 26 states and the DC, with over half of states having only one to two participating schools. Therefore, our sample did not convey the full range of laws existing across states nor within each state. Our results could not be generalized to all high schools in the United States or high schools without ATs. Second, this study used an inter-jurisdictional approach to examine a school TBI policy's consistency with the three tenets, due to limited schools per state. Further research is needed to evaluate intrajurisdictional policy consistency by aligning a particular school's TBI policy with its respective state's law. Third, existing written school policies only reflected the law at the time of data collection. As the laws continue to be revised and improved, additional alterations to written school TBI policies may have occurred that were not included in this sample. Finally, information on how these written policies were created, updated, implemented, evaluated, and improved was not available, which would have yielded additional information about translation of law to policy and subsequent implementation.

In our sample standardized analysis of school TBI policies, we found that while all 71 schools in our sample had a TBI policy, there were wide variations in the specificity of enforcement language, description, and implementation steps in relation to the three key tenets of youth sports TBI laws. Best adherence to these tenets was found for requiring that athletes be seen by a certified health professional before returning to play (98.6%), and poorest adherence was found (19/71, 26.8%) for specifying who should be responsible for removing from play a player with a suspected TBI. Only 33.8% required coaches to receive formal education on TBI recognition and management. Future studies are needed to assess variations in school's TBI policy in relation to its respective state's TBI law, factors influencing such variations, and the potential effects of such variations on youth sports TBI rates and resolution.

## Acknowledgments

The authors express their appreciation to High School RIO (Reporting Information Online) and to athletic directors and athletic trainers who participated in this project.

## Funding Sources

This work was supported by the Robert Wood Johnson Foundation (grant #30822). The interpretations and conclusions in this article do not necessarily represent those of the funding organization.

## References

[1] 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 Apr;40:747–55.
[2] Bompadre V, Jinquji TM, Yanex ND, et al. Washington state's Lystedt Law in concussion documentation in Seattle public high schools. J Athl Train 2014; 49:486–92.
[3] Harvey HH, Koller DL, Lwrey KM. The four stages of youth sports TBI policymaking: Engagement, enactment, research, and reform. J L Med Ethics 2015;43:87–90.
[4] Washington State Traumatic Brain Injury Council. Zackery Lystedt Law—House Bill 1824. Available at: http://www.tbiwashington.org/tbi_wa/bill1824.shtml. Accessed January 15, 2017.
[5] Harvey HH. Reducing traumatic brain injuries in youth sports: Youth sports traumatic brain injury state laws, January 2009—December 2012. Am J Public Health 2013;103:1249–54.
[6] Harmon KG, Drezner J, Gammons M, et al. American Medical Society for sports Medicine Position Statement: Concussion in sport. Clin J Sport Med 2013;23:1–18.
[7] Giza CC, Kutcher JS, Ashwal S, et al. Summary of evidence-based guideline update: Evaluation and management of concussion in sports: Report of the guideline Development Subcommittee of the American Academy of Neurology. Neurology 2013;80:2250–7.
[8] 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. J Sci Med Sport 2013;16:178–89.
[9] Lowrey K, Morain SR. State experiences implementing youth sports concussion laws: Challenges, successes, and lessons for evaluating impact. J L Med Ethics 2014;42:290–6.

[10] Centers for Disease Control and Prevention. Implementing return to play: Learning from the experiences of early implementers. Available at: http://www.cdc.gov/headsup/pdfs/policy/rtp_implementation-a.pdf. Accessed January 15, 2017.
[11] 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 L Med Ethics 2014;42:297–313.
[12] Tomei KL, Doe C, Prestigiacomo CJ, Gandhi CD. Comparative analysis of state-level concussion legislation and review of current practices in concussion. Neurosurg Focus 2012;33:E11.
[13] Gibson TB, Herring SA, Kutcher JS, Broglio SP. Analyzing the effect of state legislation on health care utilization for children with concussion. JAMA Pediatr 2014;169:E1–6.
[14] Program for Injury Prevention. Education & Research (PIPER). High School RIO: Reporting Information Online. Available at: http://www.ucdenver.edu/academics/colleges/PublicHealth/research/ResearchProjects/piper/projects/RIO/Pages/default.aspx. Accessed January 15, 2017.
[15] Robert Wood Johnson Foundation & Thompson, K. Codebook for youth sports traumatic brain injury laws. Available at: http://lawatlas.org/files/upload/201554_YouthTBI_Codebook(2).pdf. Accessed January 15, 2017.
[16] Chrisman SP, Schiff MA, Chung SK, et al. Implementation of concussion legislation and extent of concussion education for athletes, parents, and coaches in Washington State. Am J Sports Med 2014;42:1190–6.
[17] Smart Growth America & The National Complete Streets Coalition. The best complete streets policies of 2014. Available at: http://www.smartgrowthamerica.org/documents/best-complete-streets-policies-of-2014.pdf. Accessed January 15, 2017.
[18] Zhang N, Campo S, Janz KF, et al. Electronic word of mouth on Twitter about physical activity in the United States: Exploratory infodemiology study. J Med Internet Res 2013;15:e261.
[19] Esquivel A, Haque S, Keating P, et al. Concussion management, education, and return-to-play policies in high schools. Sports Health 2013;5:258–62.
[20] Trojian T, Violano P, Hall M, Duncan C. The effects of a state concussion law on the frequency of sport-related concussions as seen in two emergency departments. Inj Epidemiol 2015;2:1–7.
[21] Guerrero JL, Thurman DJ, Sniezek JE. Emergency department visits associated with traumatic brain injury: United States, 1995-1996. Brain Inj 2000;14:181–6.
[22] Jager TE, Weiss HB, Coben JH, Pepe PE. Traumatic brain injuries evaluated in U.S. emergency departments, 1992-1994. Acad Emerg Med 2000;7:134–40.
[23] Thurman DJ. The epidemiology of traumatic brain injury in children and youths: A review of research since 1990. J Child Neurol 2016;31:20–7.
[24] Lowrey KM. State laws addressing youth sports-related traumatic brain injury and the future of concussion law and policy. J Bus Tech L 2015;10:61–72.
[25] Ohio Legislative Service Commission. Substitute House Bill 143. Available at: http://archives.legislature.state.oh.us/bills.cfm?ID=129_HB_143. Accessed January 15, 2017.
[26] Public Health Law Research. Youth sports traumatic brain injury laws map. 2015. Available at: http://lawatlas.org/query?dataset=sc-reboot. Accessed January 15, 2017.
[27] Glassman SJ, Holt BD. Concussions and student-athletes: Medical-legal issues in concussion care & physician and school system risks. New Hampshire Bar J 2011;52:26–35.
[28] American Academy of Pediatrics. Role of the school physician (policy statement). Pediatrics 2013;131:178–82.
[29] Ensor T, Cooper S. Overcoming barriers to health service access: Influencing the demand side. Health Policy Plan 2004;19:69–79.
[30] Zonfrillo MR, Master CL, Grady MF, et al. Pediatric providers' self-reported knowledge, practices, and attitudes about concussion. Pediatrics 2012;130:1120–5.
[31] Amberg PA. Protecting kids' mellons: Potential liability and enforcement issues with youth concussion laws. Marq Sports L Rev 2012;23:171–90.
[32] Kerr ZY, Roos KG, Schmidt JD, Marshall SW. Prevention and management of physical and social environment risk factors for sports-related injuries. Am J Lifestyle Med 2012;7:138–53.
[33] Kroshus E, Baugh CM, Stein CJ, et al. Concussion reporting, sex, and conformity to traditional gender norms in young adults. J Adolesc 2017 Jan;54:110–9.
[34] Register-Mihalik J, Baugh C, Kroshus E, et al. A multifactorial approach to sport-related concussion prevention and education: Application of the socioecological framework. J Athl Train 2017;52:195–205.
[35] National Conference of State Legislatures. Traumatic brain injury legislation. Available at: http://www.ncsl.org/research/health/traumatic-brain-injury-legislation.aspx. Accessed January 15, 2017.
[36] McGowen K, Lowrey K, Moore A, Ruben J. "Return-to-Learn": Academic reentry for student athletes recovering from sports-related TBI: Issue brief. Available at: https://www.networkforphl.org/_asset/gkb1iy/Sports-Related-TBI-RTL-Issue-Brief.pdf. Accessed January 15, 2017.
[37] Illinois High School Association. Concussion management: Sports medicine update – Youth Sports Concussion Act (Public Act 099-0245). Available at: http://www.ihsa.org/resources/sportsmedicine/concussionmanagement.aspx. Accessed January 15, 2017.
[38] Fairfax County Public Schools, Office of Government Relations. 2016 General Assembly summary: Student activities regular session report. Available at: http://webcache.googleusercontent.com/search?q=cache:PiH6ABJ0kSAJ:www.fcps.edu/supt/govtrelations/va_gen_assembly/documents/RegularSessionReport2016StudentActivities.pdf+&cd=6&hl=en&ct=clnk&gl=us. Accessed January 15, 2017.
[39] California Interscholastic Federation. Concussions. 2016. Available at: http://cifstate.org/sports-medicine/concussions/index. Accessed January 15, 2017.