



The Nelson A. Rockefeller Center at Dartmouth College
The Center for Public Policy and the Social Sciences

Policy Research Shop

Concussion Education, Management, and Prevention Policy

Current Options and Implications for the State of New Hampshire

**Presented to the New Hampshire State Advisory Council on
Sport-Related Concussion**

PRS Policy Brief 1112-07
June 24, 2012

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This report was written by undergraduate students at Dartmouth College under the direction of professors in the Rockefeller Center. The Policy Research Shop is supported by a grant from the Fund for the Improvement of Postsecondary Education (FIPSE). The PRS reports were developed under FIPSE grant P116B100070 from the U.S. Department of Education. However, the contents of the PRS reports do not necessarily represent the policy of the U.S. Department of Education, and you should not assume endorsement by the Federal Government.



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EXECUTIVE SUMMARY

The purpose of this report is to outline the history of concussion education, management, and prevention, as well as current action and legislation designed to address this problem. The report defines what a concussion is and its prevalence in sports, along with estimates for the cost of concussion treatment. It includes a detailed discussion of current national policies, private sector programs, and action taken by national sports organizations. The report then assesses the current concussion programs and policies in the state of New Hampshire, and provides a cost-benefit analysis for the value of concussion education, management, and prevention programs in other states and municipalities. The report concludes with suggestions on how New Hampshire could extend recently passed concussion legislation in light of other states' actions, program feasibility, and policy implementation.

1. INTRODUCTION

Over the past decade, concussion-based lawsuits have generated significant national and international media attention. As a result, legislators and civil leaders across the country, and around the world, are seeking solutions to address this health concern. In 2001, an international conference to examine “Concussion in Sports” was established by several high-profile organizations. Conference experts from around the world examined topics including: acute versus complex concussions, return-to-play policy, and the long-term problems and consequences of concussion. Despite budgetary concerns, concussion prevention has presented itself as politically expedient.

Since 2009, over 30 states have passed laws that regulate or facilitate concussion education, management, and prevention practices for youth sporting programs through the high school level. When our research began, New Hampshire was one of the only states without existing legislation. However in January, the Senate introduced Senate Bill 402 to address concussion management. This bill was signed into law in June and will begin implementation in August. This report investigates the growing need for concussion management by examining the health and social costs of sports related head injuries. The report then examines the programs and policies other states, and most recently New Hampshire, have adopted, what research suggests about best practices in the areas of concussion education, management, and prevention, and what the costs and benefits of specific policy options may be.



2. BACKGROUND: CONCUSSIONS AND SPORTS

2.1 The Definition of Concussion

There is no singular, universally accepted definition for a “concussion,” or, Mild Traumatic Brain Injury (MTBI). The most widely recognizable attempt to construe this injury was the result of the work of the initial International Symposium on Concussion in Sport, which occurred in 2001 in Vienna, Austria.¹ The Concussion in Sport Group, a convening of neurobiological experts, concurred that the most encompassing definition of a concussion is the “complex pathophysiological process affecting the brain, induced by traumatic biomechanical forces.”² Structural damages to the brain are sometimes not present or are negligible. Changes affecting the brain’s neurons, synapses, and cell membranes are generally thought to be the underlying physical causes of concussive symptoms. Loss of consciousness, once considered the primary identifying marker, is not required for a head injury to be labeled a concussion; this symptom typically denotes a more dire form of the injury. Concussion symptoms – loss of consciousness, dizziness, confusion, loss of balance and/or coordination, slurred speech, nausea, headache, vomiting, poor concentration, inappropriate emotional response, as well as other symptoms, can be the result of a wide variety of physical traumas to the head, and can persist for weeks. Assessment and treatment of concussions can be a nuanced and complex process requiring a certain threshold of education and experience. Currently, if an individual experiences at least one or more of the symptoms he or she is subject to a possible concussion, and it is recommended the individual seek proper management.³

2.2 Concussion & Sporting Demographics in the United States and New Hampshire

Nationwide, 69 percent of girls and 75 percent of boys participate in organized and team youth sports.⁴ In 2011, for the 22nd consecutive year, participation in high school athletics increased. In the 2007-2008 school year 55 percent of enrolled high school students in the United States participating in their school’s athletic programs, totaling over 7.2 million.⁵ Since 2008 this number has grown to just over 7.6 million.⁶ Compared to the national average, in New Hampshire student participation in school athletics is higher. In the 2010-11 school year, 73 percent of students enrolled in public or charter schools participated in school-affiliated sports.⁷ While it is possible this percentage is higher because the study double counted students who participate in more than one sport, 46,059 students presents a large demographic of the New Hampshire minor population that is at risk. While all student athletes are at risk of a concussion, football is the most concussion-prone sport played in the United States, with approximately 67,000 diagnosed concussions every year.⁸ It also is the one of the most-played sports at the high school level both nationally as well as in New Hampshire. Roughly one million teenage boys compete annually, and in New Hampshire 56 schools have football teams and 3,755



students participate⁹¹⁰ This helps to explain why 58 percent of sports-related concussion visits to U.S. emergency departments are youth, ages 14 to 18.¹¹ For every 100,000 participatory sessions (which include any instance, regardless of time involved, where the athlete is engaging in the sport), the highest rates of concussion for males occur in football and lacrosse, with soccer a close third. For girls, the outlook is similar, with the highest rates of occurrence found in soccer and lacrosse, with basketball finishing third.¹² Conventional literature estimates 300,000 traumatic sport-related brain injuries occur annually,¹³ but the National Center for Catastrophic Sport Injury Research estimates that number could actually reflect football-related concussions alone.¹⁴

2.3 Costs

Concussions cause both health and monetary costs to individuals. The health costs of a minor concussion are relatively small. Patients typically experience slight disorientation, confusion, and the inability to focus.¹⁵ Duration of these side effects depends on the severity of the concussion, and whether the patient receives proper treatment.¹⁶ When an individual does not receive proper diagnosis, treatment, or experiences multiple concussions such costs increase. The duration of side effects can prohibit an individual from being productive at work or in school, which can ultimately lead to additional monetary costs.¹⁷

In the most severe cases patients who suffer multiple, undiagnosed, or, mistreated concussions are at risk of traumatic brain injury.¹⁸ In these cases, patients can suffer from permanent brain swelling, epilepsy, and in the most serious cases, death.¹⁹ The CDC estimates that the average cost of treating traumatic brain injury is \$2,500 per patient.²⁰ However, the cost of treatment can reach as high as \$11,000.²¹ In addition to these costs, patients who suffer traumatic brain injury pose indirect costs to their family members, close friends, and all members of society.²² It is estimated that the total cost of traumatic brain injury to society, thus the sum of all the direct and indirect costs, is \$60 billion annually.²³ Moreover, severe concussion situations pose a substantial cost to both individuals and society. By managing concussions through treatment and diagnosis, an individual can reduce their risk of bearing concussion costs.

Severe concussions pose financial costs to the individual and society. Sports-related concussions accidents fall second only behind motor vehicle crashes as the leading cause of traumatic brain injury among 15-24 year olds.²⁴ During the 2009 football season, nine brain injuries resulted in death—all at the high school level.²⁵ Five deaths occurred during the subsequent 2010 season, and according to research performed by *The New York Times*, at least 50 youth football players have died or suffered extremely serious head injury since 1997.²⁶ Hospital staff salaries, facility costs, supplies, follow-up and/or



outpatient visits, and time spent are just a few examples of the direct and indirect expenditures required to provide care for these serious injuries.

Due to inconsistent and difficult diagnosis processes, it is difficult to gather specific data on the financial impact of sports-related concussions. However, one way to estimate the cost of care is to analyze costs associated with administering a CT exam. A recent study estimated that it costs a hospital, on average, \$160 to administer the exam.²⁷ The CDC estimates that between 5 and 15 percent of student athletes will sustain a concussion annually. Assuming the incident rate to be 10%, an estimated 3,685 concussions will occur annually in New Hampshire high school athletic activities. If we assume each of these incidents results in a CT exam, the total cost to New Hampshire hospitals or medical providers could equate to roughly \$736,944. Nevertheless, this estimate does not account for long-term costs. Many individuals do not seek or receive medical attention when a concussion. As previously mentioned, several undiagnosed concussions can ultimately result in brain complications later in life. These costs can be reduced with proper education and protocol, and preemptive management.

3. PRIVATE SECTOR PROGRAMS AND POLICIES

3.1 Private Third-Party Concussion Prevention & Evaluation Services

3.1.1 ImPACT Testing

Developed in the early 1990s by Drs. Joseph Maroon and Mark Lovell, ImPACT testing software is one of the most widely used computerized concussion evaluation service.²⁸ The 20-minute test is a competent concussion management system that provides users with the capability for pre- (baseline) and post-concussive neurocognitive readings. This computer test measures mental reaction time, coordination, and memory function. It allows for close observation of an athlete during the concussion management cycle: from healthy, to concussed, to mid-recovery, to post-recovery and subsequent return-to-play phase. Over 100 professional sports teams in the United States currently use ImPACT testing.²⁹ Thirty NHL teams, 19 MLS teams, 32 MLB teams, 23 NFL teams, and 5 NBA teams choose to include ImPACT testing as their primary concussion diagnostic and management tool. Professional auto racing and boxing organizations, and many colleges and high schools, are also taking advantage of ImPACT testing. The service provides an accessible testing tool that can be administered by nearly anyone, with the proper training. It should be noted that the cost to user groups for the program remains constant, regardless of how many tests an organization administers to its athletes.



3.1.2 PACE PROGRAM

Dick's Sporting Goods has begun an initiative in conjunction with ImPACT testing services entitled "Protecting Athletes through Concussion Education" (PACE), which is currently the nation's largest baseline concussion screening initiative.³⁰ PACE seeks to provide schools across the U.S. with free access to concussion education materials. Twelve-month ImPACT Test Packages will also be contributed, free of charge, to over 3,000 schools. Each of these packages is capable of providing baseline tests for 300 athletes; the goal of the program is to screen roughly one million youth athletes. The educational portion of the program is targeted at school medical staffs; it is aimed at increasing their collective understanding of concussions, their proficiency in treating young athletes for concussions, and raising awareness of the possible ensuing consequences for different courses of action.

3.2 Professional Sports

3.2.1 Pioneering Practices: NFL and NHL Policy

Professional sports leagues with the most physical contact have emerged as public advocates to increase player safety and decrease the number and severity of injuries sustained during competition. The National Football League (NFL) has come under increasing amounts of congressional, public, and legal pressure to adjust its rules, alter its style of play, and increase player safety. Emerging evidence that previous players have been suffering from severe health consequences as the direct result of their playing experiences has forced the NFL, under Commissioner Rodger Goodell, to make rapid adjustments to how treatment of violent collision on the playing field is handled. As a result, the NFL has begun to lead a very public charge to protect its athletes, as much as is possible, within their sport. This included the funding of several recent studies, one of which examined occurrence rates of Alzheimer's Disease in the League's former players and discovered a yield rate 19 times the national average for men aged 30 to 49.³¹

Organizations like the National Hockey League (NHL), whose players are also often susceptible to serious injuries, have similarly moved to create rules limiting contact to the head. Measures taken include both increasing requirements for medical clearance and expanding the availability of, and requirement for, regular neurological testing services. Through investments intended to protect their product and image, these privately owned businesses are influencing public and private sector policy and advocating increased awareness of the treatment of sports-related injuries. The result has been a downward trickle of technology, systemized educational practices, and increasing general knowledge of head injury issues from the NFL to college, high school, and youth sporting environments.



3.2.2 MLB, NBA, and MLS Policy: Adhering to Established Norms

During the most recent season (2011), Major League Baseball (MLB), a sport with a low annual rate of head injuries, moved to adopt a universal concussion policy for its clubs.³² This policy is similar in its protocols to those previously enacted by contact sport leagues. The policy includes more stringent and careful measures to be used in regulating head injuries and return-to-play requirements, to ensure that the injured athlete is fully recovered, and thereby protected, before re-entering competition.

Major League Soccer (MLS), the governing body of professional soccer in the United States, has taken the opposite approach, despite evidence of soccer's high concussion rate.³³ While the MLS has embraced ImPACT testing and gives its players baseline exams, the overarching body has not required its clubs to adhere to a sole league-wide policy regarding the treatment to head injuries, recovery, and return-to-play. While soccer is one of the most concussed sports at every level, the MLS has chosen to give its 19 clubs individual control over how each deals with player concussions.

Unlike the MLB and MLS, the National Basketball Association (NBA) does not have a concussion policy. It does not anticipate implementing one in the near future, and its oversight of the treatment of concussion education, management, and prevention within its organization has not been identified as a major concern at this time for the league.

3.3 Collegiate Sports

3.3.1 NCAA

During the 2004-2005 academic year, 389,566 young adults participated in college athletics.³⁴ The National Collegiate Athletic Association (NCAA), the governing body for each of these athletes and college sports as a whole recently announced a public partnership with the Centers for Disease Control and Prevention (CDC) to promote concussion safety issues. The NCAA currently requires its member institutions to create and submit internal documentation that outlines each institution's provisions for concussion education and management. This requirement is non-specific however, and as a result the NCAA exercises little control over what provisions its member institutions implement. As long as the member institution has some protocol on file, they have satisfied NCAA requirements and may continue to operate in good standing within the organization.



3.3.2 Ivy League

The Ivy League has positioned itself as a vocal proponent of moving college sports into a new and physically safer era. It proactively initiated the creation of a committee assembled to investigate new ways to increase safety among student athletes. It has initiated tougher standards to drastically reduce injury, chief among them decreasing the number of allowable full-contact football practices per week by member institutions: from the five the NCAA allows, to two.³⁵ It also seeks to decrease physical contact in all phases of practice, and to educate its players on such issues as safer tackling techniques and the potential consequences of repetitive brain trauma.

4. CURRENT NEW HAMPSHIRE CONCUSSION-RELATED PROGRAMS

4.1 New Hampshire State Legislation

In January of 2012, The New Hampshire Senate Committee of Health and Human Services introduced Senate Bill 402. This proposed legislation sought to improve management of concussion and mild head injuries that occur in student sports. On May 8th votes signaled the bill ought to pass with amendment. The passed amendment requires school districts to develop concussion and head injury policies, and also limits school's liability for injuries that occur on school property.³⁶ These amendments were adopted on May 15th, which Senator Bradley concurred with on the 23rd. On June 18th Governor Lynch signed New Hampshire's first concussion legislation into law.

The final version of New Hampshire's concussion law requires school districts to develop a management protocol as well as a return to play policy. Student athletes may not return to play without proper documentation from a medical official indicating they are safe to resume activity. Students must also present a form signed by his or her parent or guardian. To reduce liability, New Hampshire's law does not hold individuals who authorize return to play accountable for any subsequent injury or damage.³⁷ The law also requires schools to inform and educate students, parents, and coaches about the health risks associated with head injury and concussions as well as the school's policies. It is also suggested that the school district annually distribute head injury information.³⁸ These provisions apply to schools with students in grades 9-12. The law also defines a health care provider as person who is "licensed, certified, or otherwise authorized by the state to provide medical treatment and is trained in the evaluation and management of concussions".³⁹ The law will go into effect on August 17th 2012.



4.2 New Hampshire State Advisory Council on Sport-Related Concussion

The New Hampshire State Advisory Council on Sport-Related Concussion is a program of the Brain Injury Association of New Hampshire that was “created to provide guidance for school and youth league administrators, coaches, parents and athletes on the topic of sport-related concussion.”⁴⁰ The council consists of the following fifteen New Hampshire organizations and state departments concerned with the issue of concussion among youth athletes:

- Bureau of Developmental Services of Health and Human Services
- Children’s Hospital at Dartmouth Injury Prevention Program
- Injury Prevention Program of NH Department of Health and Human Services
- New Hampshire Association of School Psychologists
- New Hampshire Athletic Directors Association
- New Hampshire Athletic Trainers Association
- New Hampshire Department of Education
- New Hampshire Interscholastic Athletic Association Sports Medicine Committee
- New Hampshire Musculoskeletal Institute
- New Hampshire Medical Society
- New Hampshire Pediatric Society
- New Hampshire School Learning Incentives Concussion 911
- New Hampshire School Nurses Association
- Northern New England Neurological Society
- Traumatic Brain Injury Program at Dartmouth⁴¹

4.2.1 Main Roles

The New Hampshire State Advisory Council on Sport-Related Concussion serves two main functions: 1) to regularly releases its Sport-Related Concussion Consensus Statement, and 2) to educate and assist coaches, school districts, and the public with implementing and updating concussion management protocols. The Sport-Related Concussion Consensus Statement is intended to be a valuable resource for coaches, school administrators, and legislators when considering concussion education, prevention, and management protocols.

The New Hampshire State Advisory Council on Sport-Related Concussion is available to educate and assist coaches, school districts, and the New Hampshire public with implementing and updating concussion management protocols. Persons interested in receiving this type of assistance can contact the New Hampshire Brain Injury Association office and then work directly with members of the Advisory Council to develop or update their concussion protocols.



In a telephone interview with Laura Decoster, the Consensus Committee Chair, she indicated that the Consensus Statement is based upon the Third International Consensus Statement on Concussion in Sport released in November 2008, the National Athletic Trainers Association Position Statement on Management of Sport-Related Concussion in September 2004, and the most recent research concerning sport-related concussions in youth athletes.⁴² The Sport-Related Concussion Consensus Statement includes:

- Definition of concussion;
- Concussion grading scales;
- Special considerations for pediatric concussions and gender differences;
- Impact of multiple concussions;
- Role of baseline testing in management of concussion;
- Return-to-sport and school following a concussion; and
- Other relevant considerations related to concussion education, prevention and management in New Hampshire and on a broader scale.⁴³

This statement is a tool and source of information that was influential in providing information on current best practices relevant to youth sport-related concussion, to policymakers, as well as assisting them in developing the basis of SB 402.

4.2.2 Project Grants for School Districts

The New Hampshire State Advisory Council has also granted five project grants to school districts in New Hampshire to support concussion-related programs and protocols.⁴⁴ The districts of John Stark, Hanover, New Hampton, Lebanon, and Dover were selected to receive the project grant.⁴⁵ Ms. Decoster indicated that ten school districts now receive project grants to support their concussion management programs.⁴⁶ These grants pay for cognitive baseline ImPACT testing, for all of the student athletes in each school district.⁴⁷ The grant also provides funding for each school district's consultation with a neuropsychologist in regards to ImPACT testing and when an athlete should be cleared to return to play.⁴⁸ School officials interviewed for this report from districts receiving project grants indicated that their schools are awarded \$500 twice a year for a total of three years.^{49,50} This funding primarily covers the cost of the cognitive baseline testing, or ImPACT testing, for their athletes. The cost of providing consultation with a neuropsychologist for each school is not included in the \$3,000 awarded, according to the two school officials.

Mark Searles, Athletic Director of John Stark Regional High School, indicated that the school has adopted the guidelines recommended by the Advisory Council. These guidelines were adopted after their athletic trainer attended a training session held by the



Advisory Council for athletic trainers of the school districts receiving project grants.⁵¹ The concussion management policy of John Stark Regional High School specifies that if a student is suspected of sustaining a concussion, the student will be removed from play until the student passes the ImPACT test and the trainer or a medical professional clears them to return to play.⁵² John Stark Regional High School's concussion management protocol also specifies that the student suspected of concussion should be introduced back into physical activity slowly through a five-step process.

Adam Tyson, Head Athletic Trainer of the New Hampton School, explained that the project grant covers all of the high school's costs associated with their concussion management program. He also noted that all varsity athletes and only some junior varsity athletes were included in ImPACT testing last year.⁵³ Therefore, not all student athletes attending the New Hampton School are included in the ImPACT testing program. Prior to the project grant, the New Hampton School did not provide ImPACT testing for their student athletes. With the grant, the school has been able to enhance its existing return-to-play protocol. Mr. Tyson also indicated that the New Hampton School has adopted the concussion management protocols outlined by the New Hampshire Advisory Council on Sport-Related Concussion. Furthermore, the New Hampton School has begun distributing a sport-concussion education packet to coaches and holds a concussion education session for varsity athletes at the beginning of each season.⁵⁴

Both school officials stated that they felt their school's updated concussion management protocols, combined with the use of ImPACT testing and consultation with a neuropsychologist, have resulted in greater safety for their student athletes.^{55,56} Mr. Tyson further noted that the financial costs associated with concussion management programs, especially with cognitive baseline testing such as ImPACT, and the general lack of knowledge about the best practices in concussion management were the two main reasons for not developing a more comprehensive concussion management program at the New Hampton School prior to the project grant and advice from the New Hampshire Advisory Council on Sport-Related Concussion.⁵⁷

4.3 Existing Programs in Local Municipalities

4.3.1 School Districts

Prior to the requirement of recently passed legislation, many school districts in New Hampshire adopted concussion-related policies for student athletes. However, only 23 out of 167 New Hampshire school districts currently prior require a baseline concussion test for all athletes and mandate that an athlete must pass the baseline test before returning to play following a suspected concussion.⁵⁸ Other school districts, such as Epping School District, only recommend baseline concussion testing for any student



participating in sports, as well as a follow-up test for any athlete suspected of having a concussion.⁵⁹

As previously mentioned in section 4.1.2, ten school districts are receiving project grants from the New Hampshire State Advisory Council on Sport-Related Concussion that enable school districts to provide cognitive baseline testing to student athletes and consultation with a neuropsychologist. The concussion management protocols in these school districts may serve as model protocols for other school districts looking to implement or update concussion management protocols or related programs.

Although many school districts have taken measures to further protect youth athletes against concussions by implementing and developing concussion management protocols, the majority of school districts in New Hampshire have not. The initial survey of school districts indicates a lack of concussion management protocols and available baseline testing as well as a general lack of education surrounding the best practices in concussion management. This conclusion suggests that school districts may be a good target for concussion education, prevention, and management initiatives, whether such initiatives are in the form of state legislation or another type of program.

4.3.2 Hospitals and Health Centers

Hospitals and health centers throughout New Hampshire also have concussion-related programs. The Dartmouth-Hitchcock Medical Center in Lebanon offers a Sports Concussion Program that provides baseline testing using ImPACT software, available by appointment.⁶⁰ The Dartmouth-Hitchcock Medical Center also has a webpage dedicated to the Sports Concussion Program that defines a concussion, outlines symptoms, and strongly advises against same day return-to-play for an athlete suspected of having a concussion.⁶¹ Concord Hospital offers a similar program, “Concussion Assessment and Management Program,” which includes three main components: 1) community education, 2) ImPACT baseline testing, and 3) post-concussion services.⁶² In addition to the treatment of those who have sustained a concussion, the Concussion Assessment and Management Program focuses on concussion prevention and community education, accompanied by a comprehensive website.

Other New Hampshire hospitals that offer concussion-related programs include Cheshire Medical Center (Dartmouth-Hitchcock Keene),⁶³ St. Joseph Hospital (Nashua), and Southern New Hampshire Medical Center (Nashua).⁶⁴ In addition, the New Hampshire EMS Conference of 2011, to which many New Hampshire hospital staff members attended, included a concussion-related session called “The Impact of Concussions.”⁶⁵ It is important to note, however, that many New Hampshire hospitals and health centers do not specifically outline concussion management programs and also do not offer baseline



cognitive testing. The lack of concussion management programs and baseline testing available to residents through hospitals and health centers is important to consider when deciding whether current New Hampshire programs are sufficient and whether state legislation regarding concussion education, prevention, and management may be necessary.

5. STATE LEGISLATION AND PROGRAMS

5.1 Lystedt Law Model Legislation

In 2009, the State of Washington adopted HB 1824, becoming the first state to pass legislation that required the adoption of policies for concussion management and head injury in youth sports.⁶⁶ Known as the Zackery Lystedt Law, this policy was in response to 13-year old Zackery Lystedt's near fatal traumatic brain injury in 2006. Lystedt's injury resulted after he sustained a concussion during a football game but quickly returned to the field; only to suffer another blow to the head. He is now partially paralyzed after enduring a coma for several months.⁶⁷

The Lystedt Law is considered the most comprehensive law of its kind and contains three main principles:

- 1) "Inform and educate youth athletes, their parents, and guardians, and require them to sign a concussion information form;"
- 2) "Removal of a youth athlete who appears to have suffered a concussion from play or practice at the time of the suspected concussion;"
- 3) "Requirement of a youth athlete to be cleared by a licensed health care professional trained in the evaluation and management of concussions before returning to play or practice."⁶⁸

Since the Lystedt Law was adopted in Washington, it has served as a model for other states seeking to draft concussion education, prevention, and management legislation. Such legislation is often evaluated on the basis of whether or not the three main tenants of the Lystedt Law are included.

5.2 Overview of Concussion Legislation Existing in Other States

As of April 1, 2012, 33 states and the District of Columbia had passed some form of legislation related to concussion education, management, and prevention. Thirty-two of these states and the District of Columbia passed legislation that included all three principles of the Lystedt law (Figure 1).⁶⁹ These states include: Alabama, Alaska, Arizona, California, Colorado, Connecticut, Delaware, District of Columbia, Illinois,



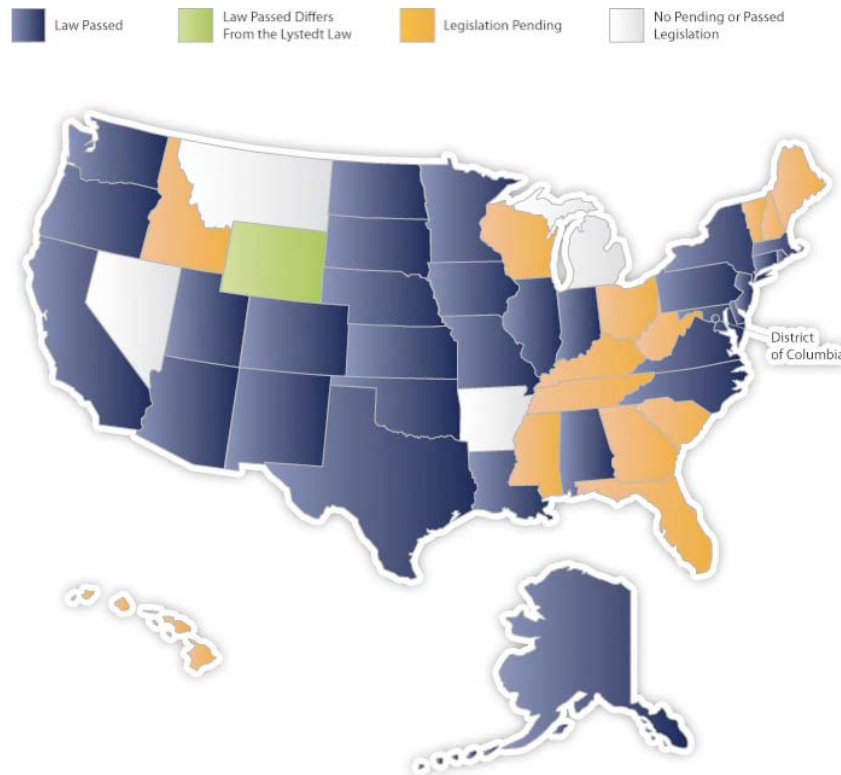
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Indiana, Iowa, Kansas, Louisiana, Maryland, Massachusetts, Minnesota, Missouri, Nebraska, New Jersey, New Mexico, New York, North Carolina, North Dakota, Oklahoma, Oregon, Pennsylvania, South Dakota, Rhode Island, Texas, Utah, Virginia, and Washington.⁷⁰ Wyoming passed legislation related to concussion management for youth athletes, yet the legislation does not explicitly include the principles of the Lystedt Law.⁷¹ Concussion-related legislation is pending in Florida, Georgia, Hawaii, Idaho, Kentucky, Mississippi, Ohio, South Carolina, Tennessee, West Virginia, and Wisconsin.⁷² The proposed legislation in Florida, Hawaii, Ohio, Tennessee, and Wisconsin includes the three main principles of the Lystedt Law.⁷³ Updated information regarding whether the three tenants of the Lystedt model legislation are included in legislation pending in Georgia, Idaho, Kentucky, Mississippi, South Carolina, and West Virginia was not available. Four states have not adopted any kind of concussion education, management, and prevention legislation.⁷⁴ Michigan and Nevada proposed such legislation that did not pass.⁷⁵ Arkansas and Montana have never proposed legislation related to concussion education, management or prevention.⁷⁶ It is also important to note that, as of this writing, no state has passed concussion legislation and then repealed it.



Figure 1. Map of Concussion Legislation by State as of March 2012



Source: *National Football League*⁷⁷

5.2.1 Amendment Proposed to Current Rhode Island Concussion Law

One state that should be mentioned in more detail is Rhode Island where an amendment to the existing concussion law is currently pending.⁷⁸ Rhode Island's current concussion legislation, H.B. 5440 establishes "further safeguards and procedures governing how to treat youth athletes who receive concussions." Rhode Island's amendment to H.B. 5440 would broaden the scope of those medical professionals that are permitted to diagnose and clear an athlete suspected of suffering a concussion to return to play.⁷⁹ Under the new law, physician assistants, certified nurse practitioners, and certified athletic trainers would be allowed to diagnose and clear athletes as well, in addition to the originally specified physicians. The amendment also would require all student athletes to complete baseline cognitive testing prior to the start of every season and would mandate coaches and volunteers to complete an annual concussion refresher course.⁸⁰ This amendment to Rhode Island H.B. 5440, provides an example of where New Hampshire legislators might seek to amend or extend current management legislation.



5.3 Comparing Concussion Management In Oregon, Texas, Washington, and New Hampshire

In May 2010, the United States Government Accountability Office (GAO) singled out Oregon, Texas, and Washington in their report *Concussion in High School Sports*.⁸¹ The Texas legislation was passed in 2007, and both Washington and Oregon passed concussion laws in 2009.⁸² All three laws contain varying education components and return-to-play requirements. These state laws are both similar and different to New Hampshire's recently passed legislation. A detailed chart depicting these three state laws and the different ways in which they address concussion education, prevention and management is available on pages 12 and 13 of in the Concussion in High School Sports Report released by the United States GAO in May 2010.

5.3.1 Education Requirements

While all three state laws contain education components, they vary in target audience receiving education and the frequency of specified training. In Oregon, coaches are the targeted group for concussion-related education. In Texas, the targeted groups are coaches, trainers, physicians involved in sport-related activities, sponsors of extracurricular activities, and athletes.⁸³ in the law in Washington is similar to New Hampshire, where coaches, athletes, and parents are the focus of concussion-related education.⁸⁴ In addition to the difference in targeted groups, the laws also differ in requirements for the frequency of training. Oregon specifies annual training for its coaches.⁸⁵ Whereas the frequency of training for targeted groups is not specified in Texas or in New Hampshire; however, an annual safety drill is required and the University Interscholastic League (UIL) may require education for coaches and students annually.⁸⁶ Washington does not specify the frequency of training for coaches but requires athletes and parents to sign a concussion-related information sheet annually.⁸⁷

Although these state laws vary significantly in the targeted group for concussion education and the frequency of training required, the schools covered under their legislation and the content of the education is very similar, if not analogous, in each state. Laws in New Hampshire, Texas, Washington and Oregon cover schools in state school districts, and Texas also includes other schools subject to University Interscholastic League rules.⁸⁸ The content of concussion education specified by each law is almost equivalent in each state, as it focuses on recognizing concussion symptoms and the implementation of proper steps following a possible concussion.⁸⁹



5.3.2 Return-to-Play Requirements

The state laws of New Hampshire, Oregon, Texas, and Washington all include return-to-play requirements, yet they differ with respect to “the conditions under which the requirements apply and the personnel who may authorize return-to-play.”⁹⁰ Similar to New Hampshire, in Oregon and Washington, the return-to-play requirements specified by their laws apply to an instance when there is suspicion of a concussion, whether that suspicion is a result of symptoms of a concussion or an observed blow to the head.⁹¹ However, the return-to-play requirements in Texas only apply when the athlete in question has lost consciousness for any reason.⁹² This difference in circumstance is important to note, as recent research has shown that concussions often occur without the loss of consciousness.⁹³

The return-to-play requirements of the three key state laws also vary with respect to the type of health care professional that may clear an athlete to return-to-play following the suspicion of concussion. In Oregon, an athlete suspected of receiving a concussion must receive medical release from a health care professional.⁹⁴ In Texas, the athlete in question must receive written permission to return-to-play from a physician.⁹⁵ Most stringent of the three key state laws, Washington law requires that the athlete suspected of suffering a concussion may only return-to-play when cleared by a “licensed health care provider trained in the evaluation and management of concussion.”⁹⁶

Although these concussion education and management laws differ in the above categories, they all require athletes suspected of suffering a concussion to be removed from play. Oregon, Texas, and Washington specify that the athlete should be removed from play the day of the injury.⁹⁷ While Oregon does not specify who must make the call to remove the athlete from play, in Texas the athlete must be removed by school-designated personnel, such as a coach or trainer, and in Washington the athlete may only be removed from play by the coach.⁹⁸

5.3.3 Sanctions

All three key state laws related to concussion education and management also differ in their inclusion or exclusion of possible sanctions for failure to comply with the law. The laws in Oregon and Washington do not specify any sanctions against schools. The Texas law indicates that schools may be subject to penalties by the University Interscholastic League (UIL), such as disqualification that may affect the coach or the school.⁹⁹ New Hampshire legislators may want to consider including sanctions in concussion education, management, and prevention laws to insure the proper implementation and enforcement of legislation.



5.4 Maine Concussion Management Initiative

The Maine Concussion Management Initiative (MCMI) was founded by Colby College in 2009 and aims to “enhance the health and safety of Maine high school athletes by educating medical practitioners and school administrators about the dangers of traumatic brain injury and the importance of consistent concussion management.”¹⁰⁰ The MCMI is working to meet their goal by providing baseline cognitive testing, in the form of ImPACT testing, to high schools throughout Maine. In the first year of the program, the MCMI provided 25 high schools with computerized ImPACT testing.¹⁰¹ The MCMI hopes to eventually expand its program to include 100 high schools.¹⁰²

The Maine Concussion Management Initiative serves as an example of a successful private program that is working to increase concussion education, prevention, and management within the state of Maine. This project is funded through a grant from the Goldfarb Center for Public Affairs and Civic Engagement at Colby College.¹⁰³ Therefore, the MCMI is one possible model for a non-legislative solution in New Hampshire. It would also be worthwhile to explore options for a program such as MCMI in collaboration with a New Hampshire academic institution through a similar grant.

Although the Maine Concussion Management Initiative has been successful in supplying schools with computerized baseline cognitive testing, concussion legislation is currently pending in Maine that includes all three tenants of the Lystedt Law.¹⁰⁴ This may be telling of whether the MCMI is sufficient in promoting concussion education, prevention and management on its own. It is important to note that Maine is now considering concussion legislation in addition to the privately run MCMI program.

5.5 Municipality Legislation

In addition to examples of concussion-related legislation from other states, municipal policies also provide options for New Hampshire to consider.

5.5.1 Chicago

On January 13, 2011, the City of Chicago passed an ordinance addressing sports concussions, specifically concerning children of the primary, middle, and high school ages.¹⁰⁵ The ordinance states that athletes exhibiting the symptoms of a concussion will be removed from play and not allowed to return to play until cleared by a “health care provider trained in the evaluation and management of concussion.”¹⁰⁶ The ordinance is particularly noteworthy because it applies to both public and private schools. It achieves this and also aims to increase compliance to the ordinance by including a provision specifying that any public or private schools found in violation of the ordinance will lose



their school exemptions from city water and sewer fees.¹⁰⁷ The ordinance is also notable because Illinois already has a youth concussion state law passed in July of 2011, which “directs the Illinois High School Association to set guidelines on concussion management which parallel the three key provisions of the Lystedt Law.”¹⁰⁸ Therefore, the City of Chicago’s Ordinance serves as a possible policy option for cities throughout New Hampshire to ensure further protection of their youth athletes, and provide baseline testing and treatment through state funding.

6. FEDERAL LEGISLATION AND PROGRAMS

6.1 Children’s Health Act 2000

Currently, no concussion legislation exists at the federal level. Nevertheless, over the past decade the US government has continued to research mild traumatic brain injury. Nationally-funded research officially began in 2000 after President Clinton enacted the *Children’s Health Act*. This bipartisan legislation provided funding for research on a variety of children’s health issues.¹⁰⁹ Under the *Children’s Health Act*, the Center for Disease Control created The Mild Traumatic Brain Injury Work Group. The objective of this research team was to determine how to best measure the rate at which concussions occur and their cost to society, as well as to determine the plausibility of potential national policy.¹¹⁰

In 2003 this Work Group concluded that mild traumatic brain injuries do pose a significant public health problem to Americans, and that their magnitude and impact was underestimated by previous surveillance.¹¹¹ According to their report, concussions and other mild traumatic brain injuries account for 75 percent of all traumatic brain injuries in the US. Their research found that mild traumatic brain injuries cost the nation nearly \$17 billion dollars annually.¹¹² However, the group also concluded that more research would be necessary to fully address the health problem and accurately identify preventable risk factors and policy options.

6.2 H.R. 1347 ContACT Act

In 2010, H.R. 1347 *ContACT* establishment and implementation of concussion management guidelines with respect to school-aged children.¹¹³ The Congressional Budget Office estimated that the cost of this resolution would be \$29 million over a five-year period from 2011-2015.¹¹⁴ This resolution did not pass, yet it did bring greater attention to this public health issue, especially at the state level.



6.3 CDC “Heads UP” Program

Following the failure of H.R. 1347, the Centers for Disease Control and Prevention enacted the “Heads Up” program. This educational program is a free, online course that is available to anyone. The website offers interviews with experts, interactive exercises, true stories, and general information to help inform American citizens about the severity of concussions and how to properly treat and diagnose mild traumatic brain injuries.

7. COSTS AND BENEFITS OF CONCUSSION POLICY OPTIONS

7.2 Cost of Privately-funded Concussion Management Program

Currently, New Hampshire does not require schools to provide baseline testing. Some states have utilized private funding to provide baseline exams. The Maine Concussion Management Initiative, described above, provides free impact testing and education services for students and administrators.¹¹⁵ Schools must go through an application process to be a part of this program.¹¹⁶ This private option is one alternative to statewide legislation. Therefore, we have outlined predicted costs of a privately-funded New Hampshire Concussion Management program in the table below. The cost of a private program that would educate and provide free testing for one year to all New Hampshire Athletic Association High Schools is outlined in the table below.

Table 2. Potential Cost of Privately funded Concussion Management Program in New Hampshire

Testing Costs		Pupils per School	Per School Annual Cost	Total # Schools in NH	# Schools with Athletics	Estimated Cost
	Small	0-500	\$350	41	28	\$9,800
	Medium	501-1000	\$500	27	20	\$10,000
	Large	1001+	\$750	20	18	\$13,500
	Subtotal:					\$33,300
HR	Salary for full time medical official:					\$70,000
	Miscellaneous administrative costs:					\$1,000
Total:						\$104,300

Source: Authors’ calculation



Costs in this table assume that only New Hampshire Athletic Association High Schools are eligible. Costs are also dependent on school size. To calculate these numbers we calculated how many schools were in each category: schools with less than 500 students, between 500 and 1000, and greater than 1000 students. One method for reducing costs would be to ask players to pay \$5 each year to receive a baseline test, which would cover most costs for the program.

7.3 Equal Opportunity and Consistent Concussion Care

One benefit of statewide concussion legislation is that it will increase awareness to the health costs associated with sustaining a concussion, as well as proper management. Prior to the mandate of education, many students who would suffer a concussion would not receive diagnosis or treatment. With the newly implemented law it is our belief that students in New Hampshire will benefit from greater awareness as they will be less likely to take a risk that might be detrimental to their health.

7.4 Protecting Against Potential Lawsuits–Civil Center Act

The failure to address concussions poses potential costs to institutions. Under the *Civil Center Act*, school districts are liable for any injury resulting from the negligence of the district.¹¹⁷ Over time, the frequency of concussion-based lawsuits nationally has increased. The most famous concussion lawsuit is the Lystedt case in Washington. In 2009, the Lystedt family settled a lawsuit against the school district for \$14.6 million.¹¹⁸ School districts risk serious lawsuits by not having a definite concussion management protocol or program. Concussion legislation will help protect school districts and institutions against costly lawsuits.

7.5 Cost of Concussion Legislation and State Programs

The cost of concussion legislation and programs varies between states. The majority of concussion legislation is revenue neutral. New Hampshire's legislation is an example of a revenue neutral bill. The state requires schools to adopt management and protocol, but does not specify how schools should administer these programs, and by doing so avoids creating an unfunded mandate. The education component of New Hampshire's law, as with other states, is supplemented by reports completed by the CDC that are made available to all players, coaches, parents, teachers and the general public online.¹¹⁹ Moreover, the cost of implementing a concussion law is fully dependent on how the legislation is drafted.



8. CONCLUSION

In June New Hampshire signed concussion management policy into law. This law will go into effect beginning in August, 2012. Based on our research, there are still many ways in which New Hampshire could extend current policy.

1. Pass legislation that includes one, or a combination, of the following mandates:
 - a. Extend requirements to elementary school sports and activities
 - b. Establish and mandate a universal concussion education program
 - c. Require doctor approval and a symptom free return to play policy for non-school sporting activities
2. Establish a committee to research concussion statistics and programs including whether the concussion management protocols that exist in New Hampshire are being properly implemented and effective
3. Raise funding to provide schools access to concussion baseline testing programs such as ImPACT

When considering these options, the following costs can be considered. As defined in our research, the estimated annual cost of concussions to New Hampshire hospitals to run CT exams for 10% of high school athletes is an estimated \$736,944. It would cost the state, or a private organization, an estimated \$104,000 to implement a statewide concussion management program. This would provide medical training and baseline testing for all New Hampshire Athletic Association affiliated high schools for one year.



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Appendix. Contacts

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