IMPLEMENTATION OF THE MASSACHUSETTS POLICY ON YOUTH SPORT-RELATED MILD TRAUMATIC BRAIN INJURIES: PERCEPTIONS OF KEY PERSONNEL AT MASSACHUSETTS PUBLIC AND CHARTER SCHOOLS

A Dissertation Presented

by

GRETCHEN ANDERSON KILBOURNE

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ABSTRACT

IMPLEMENTATION OF THE MASSACHUSETTS POLICY ON YOUTH SPORT-RELATED MILD TRAUMATIC BRAIN INJURIES: PERCEPTIONS OF KEY PERSONNEL AT MASSACHUSETTS PUBLIC AND CHARTER SCHOOLS

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Objective: The major purpose of this cross-sectional, descriptive, and explanatory survey research was to assess key school personnel's perceptions of barriers to and facilitators of implementation of the Massachusetts (MA) policy on youth sport-related mild traumatic brain injury (mTBI) to guide, inform, and increase awareness of implementation of this policy.

Background: Mild TBI is a serious public health concern. A legislative act aimed at educating those directly involved in interscholastic youth sports on the potential severity of mTBIs was established in MA on August 19, 2010. This act establishes and mandates that key personnel in all MA public schools and all other schools under the MA

Interscholastic Athletic Association (MIAA) umbrella attend a head injury safety-training program. The policy also requires that any athlete with a suspected or actual TBI be removed from play immediately, not to return until given written consent from an authorized healthcare provider (a licensed physician, nurse practitioner, physician assistant, neuropsychologist, or athletic trainer).

Methods: An investigator-designed survey was completed by key personnel at all MA public schools and those private schools that are members of the MIAA using a web-based survey (hosted by Survey Monkey). Quantitative data was analyzed using descriptive statistics. Three open-ended survey questions were analyzed using qualitative thematic content analysis.

Results: Respondents (N=171) reported perceived facilitators and barriers to implementation of the MA policy on youth sport related mTBI. The web-based survey methodology and the indirect access to the schools' key personnel likely contributed to the low response rate (<32% of all schools contacted) for this study. Key school personnel were largely aware (93.59%, N=146) of the MA policy on youth sport-related mTBI, and similarly most respondents (92.31%, N=144) reported being aware of the DPH regulations established to enforce the policy. Most respondents (83.09%, N=113) reported that they believe their colleagues are aware of the policy, and 78.67%, N=107 believed that coaches are compliant with the policy. A smaller majority of respondents (66.17%, N=90) believed athletes are compliant with the policy, and roughly half of the respondents (55.14%, N=75) believe parents also comply with the policy. Themes that emerged from the open-ended questions included a perceived need for increased communication and education from the MA DPH to school personnel, coaches, athletes,

parents, and healthcare providers, a belief that the reporting requirements are complex and burdensome and would benefit from simplification and clarification, as well as a call for improved technology to standardize the data collection and storage.

Conclusions: Access to training courses online and availability of handouts and other materials provided by regulatory agencies, as well as internal standardized processes and teamwork within each individual institution were perceived by respondents as facilitators to implementation of this policy. Perceived barriers to implementation of the policy were the lack of compliance from parents and students, a burdensome volume of required documentation, and healthcare provider inconsistency in diagnosis and recommendations.

Implications: The results of this study can be used to inform future research as it revealed concern regarding the complexity of the regulations, the burden of the requirements, and the lack of utilization of technology. A larger sample size and a methodology allowing for direct access to key school personnel would improve generalizability and transferability of findings.

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Finally, and most of all, I am profoundly grateful for my husband, Barry, and our four extraordinary children, Anderson, Finian, Annika, and Elin. Throughout this process, they have been a constant source of happiness and inspiration, and without their love and patience none of this would be possible.

DEDICATION

This dissertation work is dedicated to my mother. Mom, I am deeply grateful your support throughout my education and your constant encouragement for me to see this adventure through to the end. Although you aren't here to see me complete this journey, I know you are cheering me on from up above.

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CHAPTER 1

BACKGROUND

In the past decade, few subjects at the intersection of healthcare and sports have generated as much public interest as sports-related head injuries – especially among youth (Younger, 2018. In 2013, there were approximately 2.8 million TBI-related emergency department (ED) visits, hospitalizations, and deaths in the United States (Taylor et al., 2017). In 2012, an estimated 329,290 youth under age 19 were treated in U.S. EDs for sport-related TBI, including mild TBIs (mTBIs; Coronado et al., 2015). Concussions (i.e., mTBI) as they are commonly called, account for more than 75% of all TBIs and are the most common neurological disorder worldwide (Brain Trauma Foundation, 2014; CDC 2003; Bannon et al., 2020). Sport injuries are second only to accidents as the leading cause of mTBIs (Marar et al., 2012). Furthermore, multiple studies suggest a considerable increase in the number of sport-related mTBIs in recent years; however, it is estimated that only 50% of mTBIs are reported (CDC, 2011a; Gilchrist et al., 2011; Sahler & Greenwald, 2012; Broglio, et al, 2017; Iverson, et al, 2017). This issue is further complicated by the problem that many athletes, parents of athletes, coaches, athletic trainers, school nurses, and others may not be aware of the potential severity of mTBIs, and there are inconsistencies with safe and appropriate management of an athlete with a suspected or actual mTBI (Covassin et al., 2009).

As a result, between 2009 and 2015 all 50 states and the District of Columbia, have enacted legislation aimed at educating key personnel on the potential severity of

mTBIs and the appropriate actions to take when faced with a suspected or actual mTBI (National Conference of State Legislatures, 2015). In 2010, the Commonwealth of Massachusetts (MA) passed Chapter 111, Section 222, herein after known as 'the policy.' (See full text of the bill in Appendix A). The policy establishes and mandates a head injury safety-training program for key personnel in all schools under the MA Interscholastic Athletic Association (MIAA) umbrella including all MA public schools. The law includes written authorization required for participation in extracurricular athletic activity following unconsciousness or diagnosis of mTBI and maintenance of records showing compliance with the policy. The Massachusetts Department of Public Health (MDPH), Division of Violence and Injury Prevention was delegated by the state to create regulations (105 CMR 201.000 Head Injuries and Concussions in Extracurricular Activities) to assist in implementation the policy.

Purpose of Study

Upon review of the literature, the focus has been on physical and psychological outcomes of those who have suffered sport-related mTBIs. Little appears on issues and challenges related to implementing policies established to address youth sports-related mTBIs. Areas such as identifying barriers and facilitators to implementing policy on youth sport-related mTBIs have not been fully explored. The purpose of this study was to explicate perceptions of key personnel at MA public and charter schools regarding barriers to and facilitators of implementation of the policy on youth sport-related mTBIs and to determine whether key personnel are aware of the requirements of the policy and if institutions are enforcing the policy.

Research Questions

Question 1: Are schools' key personnel aware of the requirements of the policy?

Question 2: Are institutions enforcing the policy?

Question 3: Which features of the policy are perceived by schools' key personnel to be barriers to and facilitators of implementation of the policy?

Question 4: What recommendations do schools' key personnel suggest to improve implementation of the policy?

The Problem

According to the CDC (2003; 2013), mTBI is frequently referred to as the "silent epidemic" because the problems that result from it (i.e. headache, impaired memory, mood changes) are not visible and although there are validated symptom scoring measures, the degree of damage cannot be objectively measured. Evidence suggests that many individuals do not fully understand the risks associated with the potential severity of mTBIs and may not give the injured brain enough time to heal, which can lead to long term cognitive and emotional issues, debilitating brain injury, or death (Harmon, et al., 2012).

Brain injury in childhood is one of the most common causes of morbidity and mortality in youths and is receiving increasing public attention (Bruns, 2003; Mason, 2013). The findings of one study (Zhang et al., 2016) suggested that the incidence of mTBIs diagnosed in the general U.S. population is increasing, and this increase is driven largely by a substantial rise in the adolescent age group. Specifically, the incidence of

patients under age 24 diagnosed with mTBI increased by 60% from 2007 to 2014 and as such, the adolescent population should be prioritized for ongoing work in mTBI education, diagnosis, treatment, and prevention (Zhang et al., 2016). It was estimated that each year nearly 300,000 youth seek medical attention for sports or recreation-related TBI (Sarmiento et al., 2019). Not including all the TBIs that are treated in emergency departments, urgent care, primary care, or those that go untreated, youths age birth to 17 had 16,070 TBI-related hospitalizations in 2019 and nearly 3,000 TBI-related deaths in 2020 (CDC, 2022). Mild TBIs sustained during adolescence are particularly dangerous as the young brain is still developing and adolescent mTBI victims may develop long-term functional impairment and some measureable emotional and behavioral functioning problems in the months post-injury (Hartonian, 2013). Numerous studies have identified persistent disabilities following mTBI in adolescents, including impairment in intellectual functioning, hyperactivity, memory, learning, psychomotor skills, language, executive functioning, and increased incidence of psychiatric, emotional, behavioral, academic, and social functioning problems (Anderson & Catroppa, 2006; Baillargeon et al., 2011; Fay et al., 2009; Halstead et al., 2010). Furthermore, the potential exists for adolescent TBI victims to fail to reach full cognitive ability (Hartonian, 2013). Aside from cognitive and behavioral disturbances post-TBI, physical impairments may also result (Prince & Bruhns, 2017).

Sport-related mTBI is a common injury likely underreported by youth athletes and is a hot-topic in the media and in health care (Halstead, et al., 2018). Often, youth sport-related mTBIs go unnoticed and undertreated because of a lack of awareness of signs, symptoms, and the potential severity of the injury. The lack of understanding and

appreciation of the risks associated with youth sport-related mTBIs jeopardizes the health of youth athletes through failure to efficiently recognize mTBIs and/or allowing youth athletes to return-to-play too soon following injury (CDC, 2013).

Potential Severity of mTBIs

Mild TBIs are associated with numerous negative effects though catastrophic effects such as seizures, tremors, and dystonia are rare. After suffering a mTBI, adolescents can experience a large array of symptoms and side effects including loss of consciousness, headaches and body aches, dizziness, fatigue, cranial nerve symptoms, psychological and somatic problems, cognitive impairment, hematomas, and amnesia (CDC, 2016). The duration of these symptoms and effects is highly variable and may last anywhere from days to years following injury (CDC, 2016). Additionally, suffering a mTBI increases the chance of repeat mTBIs, which increases the risk for developing chronic traumatic encephalopathy (CTE) - a rare, but debilitating brain injury causing progressive degenerative disease that leads to dementia (Washington, et al., 2015). Repetitive brain trauma is linked to CTE, which is marked by an abnormal accumulation of tau, a protein that can destroy brain cells, and can only be diagnosed after death making its prevalence impossible to determine (McKee, et al., 2015). Mild TBIs are a common, but potentially serious injury, with life-threatening repercussions, if not treated appropriately (CDC, 2011b).

Economics of the Problem

Every year in the United States, TBI – including mTBI - is estimated to have direct and indirect costs of $76.5 billion on top of the emotional suffering and burden placed on family and friends (AANS, 2020), as the direct and indirect medical costs of

TBI in 2000 was estimated to be $76.5 billion in the United States (Finkelstein, et al., 2006). There are immediate health care costs for diagnosis, treatment, and rehabilitation of mTBI that may include imaging and other tests, as well as the delayed health care costs resulting from disabilities. Other costs include the cost to society from loss of productivity, the cost to education as many of these students return to school requiring formal Individualized Education Programs (IEPs), and the emotional burden imposed on self and others.

Sociology of the Problem

Mild TBI poses several profound and persistent social challenges for adolescents who sustain injuries and their families (Brooks, 1991; Wade, et al., 2005), which may not be addressed by existing policy and services. Mild TBI may result in cognitive, psychosocial, behavioral/emotional, and physical deficits that impact the individual, as well as their family and social relationships (Arango-Lasprilla, et al., 2008). Those who experience mTBI may have short- or long-term social deficits in the wake of the injury and these deficits in social behavior are a major obstacle of rehabilitation (Flanagan, et al., 1995). Parents also report psychological symptoms that can persist for months after the injury (Wade, et al., 1998). Additionally, data suggest that mTBI may cause high levels of stress and strain on family relationships, with problems commonly described as irritability, anger, depression, anxiety, isolation, and family/individual role changes (Bannon, et al., 2020; Christensen, et al., 1997; Wood, et al., 2005). Low socioeconomic status, dysfunctional family environments, reduced access to resources, and other environmental factors are associated with poorer mTBI recovery in adolescents (Taylor, et al., 2001). This suggests that age, injury severity, and environmental factors interact to

influence outcomes (Crowe, et al., 2012). These problems, along with financial concerns secondary to medical bills, lost wages of caregivers, and potential loss of future scholarship monies and wages, contribute to adverse sociological consequences following sport-related mTBI in adolescents.

Organized sports, defined as physical activity that is governed by a set of rules and often played competitively motivates and shapes our culture, values, and daily lives. The mystique of sports is intricately woven into American culture and plays a large role in both the economic and political landscape of the nation (Sahler & Greenwald, 2012). Increasing importance has been placed on sports in our society as an outlet by which athletes compete to win and potentially place their own health at risk (Weir, et al., 2009). Athletes are a unique population that often place maximizing performance and winning as the primary objectives, even at the cost of bodily harm to self or others; sports have become an outlet for strength, aggression, and a critical commitment to competition that highlights a fixation on winning (Sahler & Greenwald, 2012).

According to the 2018 National Federation of State High School Association's High School Athletics Participation Survey, high school sports participation was at an all-time high and had increased for the 28th straight year during the 2016-2017 school year; the survey estimated that more than 55% of all high school students in the United States played at least one sport. More recent data suggests that youth sport participation has declined significantly due to cancellation of sports during the COVID-19 pandemic for infection prevention (Watson & Koontz, 2020), but organized sport participation was at an all-time high prior to the pandemic. During this decade of increased interest in organized sports, there was a rise in interest in sport-related mTBIs (IOM, 2013).

Despite growing interest and awareness of sport-related mTBIs and the initiation of policies to educate athletes, coaches, parents, and healthcare professionals about mTBI recognition and management, there continues to be an increase in incidence as well as controversy and misunderstanding regarding how to treat.

History of the Problem

The history of organized sports in the United States began with the New York Knickerbockers, a baseball club formed in the 1840's from a social club composed of well-to-do professional men. Competition and winning soon became more important to the club than social status and they began to allow working class ballplayers free membership to increase their odds of winning (Pankey, 2013). From the 1870's until the start of the 1900's men collegiate sports grew on campuses until its influence grew so large it threatened to overshadow the educational climate of colleges. Administrative intervention and control of sports didn't come into fashion until the early 1900's after there were many injuries and deaths in American sports, particularly football (Pankey, 2013). In fact, President Theodore Roosevelt summoned university presidents across the United States to the White House and threatened federal intervention if they did not find a way to eliminate aggression and brutality from organized sports at the schools. Although the violence decreased and better protective equipment helped protect athletes the problem was not solved (Rehberg, 2012).

Recent discoveries of the long-lasting effects of sports mTBI in youth combined with lawsuits in cases of second-impact syndrome have sparked the attention of lawmakers resulting in a flurry of legislation aimed at educating key personnel on the identification and management of youth sport-related mTBIs (Schatz & Moser, 2011). In

May 2009, Washington State was the first state to pass legislation requiring student athletes to receive medical clearance prior to returning to play after mTBI. The impetus for this legislation, known as the Zackery Lystedt Law, was a 13-year old boy named Zackery Lystedt who hit his head during a routine tackle in a football game in October 2006. Minutes after sustaining his injury, Zackery returned to the field without being properly evaluated. At the conclusion of the game Zackery collapsed from severe bleeding in the brain caused by the mTBI he suffered on the field. Zackery has spent the years since his injury relearning how to walk, talk, and perform routine tasks like feed himself. Since Washington State passed the Zackery Lystedt Law the remaining U. S. states have passed similar legislation (NCSL, 2015).

Theoretical Significance

Mild TBIs among adolescents have been identified as an important health priority (IOM, 2013). Between 2009 and 2014 all 50 states and the District of Columbia enacted policies to help educate key personnel on the risks of mTBI and their identification and management, though post-implementation follow-up studies are lacking. The prevalence and costs associated with TBIs has compelled the federal government to invest in the development of policies and programs that support evidence-based care for TBIs, including mTBIs (Helmick, Baugh, Lattimore, & Goldman, 2012). Despite the establishment of policies to help educate key personnel and protect youth athletes, implementation is often slow and irregular.

Developing health policies is just a first step; for these policies to contribute to the improvement of health, they must be effectively implemented. Barriers to health policy implementation can be rooted in a variety of causes including organizational/operational

deficits and/or a lack of resources. Specifically, organizational deficits may include a lack of structure and responsibility within the implementing organization, lack of coordination/ collaboration between parties responsible, lack of clarity on operational guidelines, opposition from key stakeholders, lack of education on the problem, and/or lack of motivation (Health Policy Project, 2014; Aldridge, et al., 2016). Often, implementation of policies is slowed due to a lack of resources including inadequate human resources as well as inadequate funding. There are complex reasons for the issues and challenges to policy implementation that are beyond the scope of this survey. It is important that such barriers to implementation of the policy are recognized and acknowledged to initiate change.

Massachusetts Policy on Sport-Related mTBIs

Chapter 111, Section 222 of MA State Law outlines a policy enacted to educate key personnel on the risk, signs, symptoms, and appropriate management of youth sport-related concussions and other TBIs with the goal of helping injured athletes receive appropriate treatment and preventing costly secondary injuries. The MA policy was developed to increase awareness of the potential severity of concussions and help ensure that injured athletes receive appropriate treatment and decrease their risk for secondary injuries.

Who the Policy Applies To?

The policy applies to all key personnel involved in extracurricular activities (defined as varsity, junior varsity or club sports, academic clubs, social clubs, volunteer clubs, etc.) being operated by, in conjunction with, or otherwise representing a MA Interscholastic Athletic Association (MIAA) participating school. MIAA member

schools include all public and charter middle and high schools, and any private high school (defined as a school with grade 12 that has a single principal, graduation, valedictorian, etc.) in MA that is approved by the MIAA Board of Directors (MIAA, 2013). Participation in the concussion education program outlined by the policy is required annually for key personnel including athletes, coaches, athletic trainers, parent volunteers, physicians, and nurses who are employed by the school districts, as well as school athletic directors, school marching band directors, and a parent/guardian of a child who participates in an extracurricular activity.

Purpose of the Policy

The purpose of the policy is to educate key personnel in recognizing the dangers associated with concussions, the increased risk for repeat concussions, and the medical protocol for recovery and return-to-play decisions. Additionally, the policy aims to avoid re-injury. The policy has three core elements: (1) annual education of key personnel at schools, athletes, and parents, (2) mandatory removal from play for athletes suspected of suffering a mTBI, and (3) medical clearance by an approved clinician.

Strengths of the Policy

The MA policy directly addresses the problem of lack of awareness of the potential severity of sport-related mTBIs by establishing and mandating completion of a head injury safety-training program. The head injury safety-training program aims to educate key personnel on the science behind mTBIs, early and delayed symptoms, and common and rare risks. Furthermore, the policy establishes a protocol requiring an athlete with a suspected or actual mTBI to be immediately removed and withheld from competition until receipt of written authorization from an accepted healthcare provider.

To address the potential for increased risks of subsequent mTBIs versus initial mTBIs, the policy also mandates that participating athletes complete prior head injury information forms so that key personnel can identify those athletes at increased risk for repeat mTBIs (Parkas & Bilsky, 2012; Sahler & Greenwald, 2012). Through education of the potential severity of sport-related mTBIs, symptom recognition, neuropathology of mTBIs, increased risk for secondary injury, and the recommended medical protocol following suspected mTBIs, the safety-training program has the potential to decrease the risk of secondary injuries and the severe risks associated with youth sport-related mTBIs.

Limitations of the Policy

The policy is singular in its aim and fails to address other problems associated with youth sport-related mTBIs beyond education of the potential severity. For example, the policy fails to address the lack of effort to increase prevention and lack of standardized testing procedures to objectively assess and evaluate mTBIs in youth athletes (Sahler & Greenwald, 2012). The policy makes no effort to ensure that rules of the sport are enforced, despite evidence suggesting that sport rules aimed at preventing head injuries (i.e. no hitting from behind in hockey or no head contact in football) are poorly enforced (CBC News, 2013). The policy does not reference the importance of proper maintenance of fields and other various playing surfaces even though there is evidence to suggest that greater than 20% of mTBIs across multiple high school sports and greater than 25% of mTBIs across multiple youth sports occur as a result of contact with the playing surface (Concussion Legacy Foundation, 2015). The policy does not incorporate scientific evidence that youth mTBIs vary based on many factors including age, gender, and the sport played (Chhabra, Bay, Lam, & Valovich McLeod, 2012).

There is consensus within the science community that victims of mTBI should be gradually reintroduced to both academic and athletic pursuits (American Academy of Pediatrics, 2013), and though the policy requires a medical clearance for return to sport participation, it makes no mention of guidelines to direct the creation of an academic re-entry program.

The policy also has several structural problems that may increase the odds of implementation failure. The regulations set forth by the MDPH to implement the policy are quite verbose and schools may be unclear if the regulations apply to them and whether they are responsible to implement them. Though compliance is monitored by MDPH, there is currently no inclusion of any established method or resources to invoke consequences for those institutions that fail to submit the required data or for those key personnel that fail to attend the safety-training program. There is also no way to enforce implementation of the policy on the field at the time of injury, as implementation is ultimately dependent upon the front-line key-personnel's assessment and judgment in the specific situation. The policy also fails to address a large portion of youth athletes in the state by applying only to public schools, charter schools, and a very limited number of private schools; the policy fails to apply to the non-MIAA private schools, extracurricular activities organized by youth organizations like the YMCA, non-organized extracurricular activities such as neighborhood games and sports, town-sponsored extracurricular activities, as well as elite sports teams (travel teams that youth athletes must compete for selection). Enactment of the policy is a good first step towards educating key personnel about the potential severity of sport-related mTBIs, however

there are many limitations in both content and design that may lead to slowed implementation.

MDPH Regulations in accordance with the Policy

Following enactment of the policy, the MDPH was charged with creating regulations and enforcement, leading to the MDPH Regulation 105 CMR 201: Head Injuries And Concussions in Extracurricular Athletic Activities (herein after known as 'the regulations'; see Appendix B for full text of the regulations). The regulations outline the required training program, school policies, participation requirements of students and parents, required documentation, record maintenance and reporting, as well as the responsibilities of key personnel (i.e., athletic director, coaches, athletic trainers, and school nurses). Schools must collect and maintain documentation relating to (1) student-athlete history of head injury ('Pre-Participation Form' - to be collected prior to participation), (2) any suspected or actual head injury that occurs during extracurricular activities ('Report of Head Injury Form'), and (3) all return-to-play authorizations received from approved providers ('Post Sports-Related Head Injury Medical Clearance and Authorization Form). At the completion of each school year, participating schools must tally total numbers of each form received and report the total (deidentified data) to the MDPH using the 'Year-End Reporting Form' found on the MDPH website. (See Appendix C, D, E, and F for copies of the forms). These forms are collected and data is maintained by the MDPH.

Definitions of Key Terms

Adolescents

For the purposes of this study, adolescents were students enrolled in MA public or charter middle or high school (approximate age 12-18).

Athletic Trainers

For the purposes of this study, athletic trainers were identified as licensed athletic trainers who were employed at a MA public or charter middle or high school.

Mild Traumatic Brain Injury

Mild TBI was defined as, complex pathophysiologic processes that affect the brain, induced by traumatic biomechanical forces secondary to direct or indirect forces to the head (CDC, 2011a).

Organized Team Sports

For this study, organized sport teams has been defined as those that are governed by a set of rules and played competitively.

Principals

For the purposes of this study, principals were licensed educational professionals who hold the highest authority at their MA public or charter middle or high school.

School Nurses

For the purposes of this study, school nurses were licensed nurses, at either the LPN or RN designation, who were employed in a MA public or charter middle or high school.

Superintendents

For the purposes of this study, superintendents were licensed educational professionals who hold the highest authority in their MA public or charter school district.

Conceptual Framework

The Conceptual Model of Nursing and Health Policy

The Conceptual Model of Nursing and Health Policy (CMNHP; Fawcett & Russell, 2001; Russell & Fawcett, 2005) was used to guide this study. This framework provides a framework for analysis and evaluation of policies influencing the quality, cost, and access to nursing and other health care services. According to the CMNHP there are three sources of policies: public, organizational, and professional. The policy is a public policy enacted by the Commonwealth of Massachusetts. A philosophical assumption of the CMNHP and a guiding principle of this study is that school nurses and non-nurse school personnel including athletic trainers, school administrators, teachers, and coaches are active participants in the formulating, implementing, and evaluating of public policy directed toward the improvement of the health of individuals, families, groups, and communities (Russell & Fawcett, 2005). Principals, teachers, school nurses, athletic trainers, coaches, and other school personnel operationalize the policy component of the conceptual model. DPH regulation 105 CMR 201 Head Injuries and Concussions in Extracurricular Activities is implemented by the school personnel with the aim of improving the health of individuals, families, groups, and communities.

The CMNHP is a four-level framework to study access, quality, cost, and outcomes of healthcare (Russell & Fawcett, 2005). The four levels are:

I. Efficacy of nursing practice processes.

II. Effectiveness of nursing practice processes and effectiveness and efficiency of health care delivery subsystems.

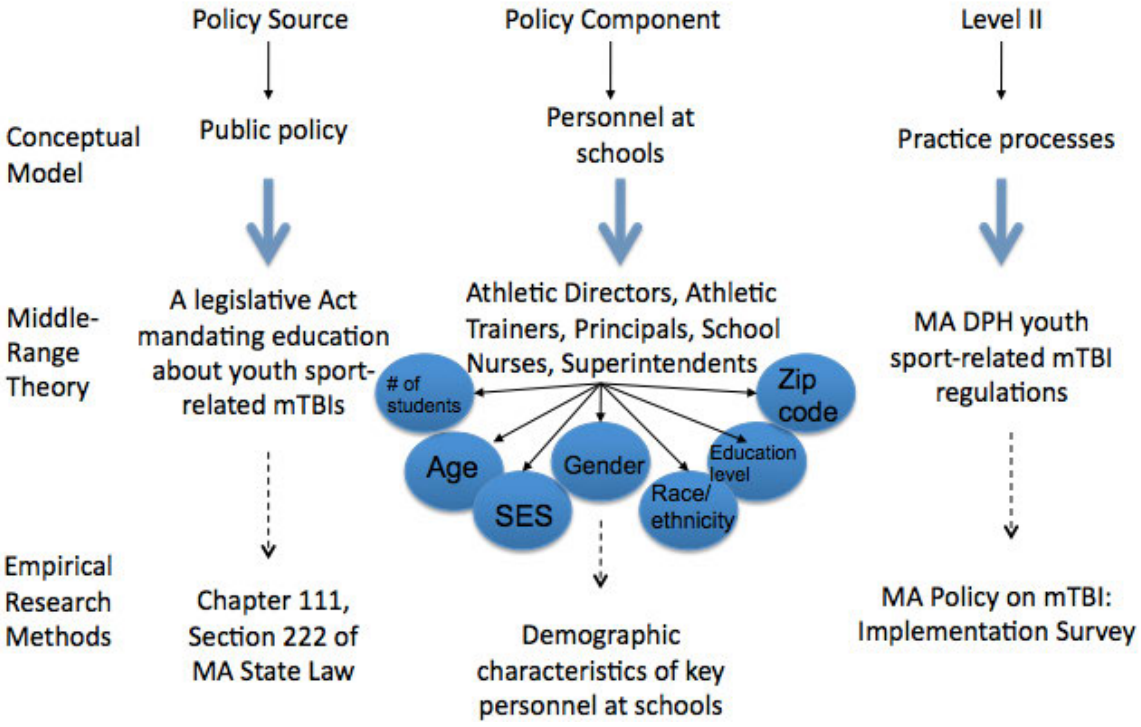
III. Equity of access to effective nursing practice process and efficient nursing practice delivery systems and equity in distribution of the costs and burdens of care delivery.

IV. Justice, in social changes and market interventions that address equity.

This study encompasses Level II as it focuses on the efficiency of healthcare practice processes in a school setting through the implementation of the MA mTBI public policy by key personnel at schools. The conceptual-theoretical-empirical structure is used to frame this study. This model consists of three components. The first is the conceptual model, which is a disciplinary frame of reference for the study and guides the development of the second component, which is the middle range theory. The third component is empirical indicators which is the data or how this data can be obtained. The conceptual-theoretical-empirical structure for this study is illustrated in Figure 1.

Figure 1

Conceptual-Theoretical-Empirical (CTE) Model for the study of the MA policy on youth sport-related mTBIs



CHAPTER 2

REVIEW OF RELATED LITERATURE

A systematic literature review was conducted to investigate and synthesize the current state of the literature on youth sport-related mTBI. Specifically, the literature review centered on the effect of mTBI on normal growth and development during adolescence, the existence of youth sport-related mTBI policies, barriers to and facilitators of implementation of public policies, and the implementation status of existing mTBI policies. Studies of sport-related mTBI, with an emphasis on implementation of associated policies, were searched in the literature using electronic databases: Cumulative Index to Nursing and Allied Health Literature (CINAHL), OVID, Medline, PubMed, and Cochrane. The keyword search terms included adolescence, adolescent, athlete, barrier, concussion, facilitator, implement, mild traumatic brain injury, policy, policies, sport, sport-related, and traumatic brain injury. Keywords were used separately and in combination. Articles were assessed for inclusion at the point of title, abstract, and full-text review. Articles were eligible for inclusion if they were peer-reviewed and published between 2000-2015 in the English language. Articles were selected, and data was extracted by one researcher.

The comprehensive literature search yielded 79 abstracts reviewed for content relevant to the research purpose and study topic. Of these, 33 (42%) were assessed for inclusion at the point of full-text review, and 23 (29%) were considered relevant and included in this review. To supplement the database search, a hand search of the

reference lists of publications was conducted to identify key texts and authors, resulting in an additional 18 references. All were published as full-text articles. Overall, the literature search revealed a multitude of articles on the neuropathology and health effects of mTBI and minimal publications on the topic of youth sport-related TBI management. Even fewer articles focused on sport related mTBI policy, and only two articles found explored the experiences of states implementing youth sport mTBI policies (Lowrey & Morain, 2014; Shenouda, et al., 2012).

Mild Traumatic Brain Injury (mTBI)

Epidemiology & Neuropathology

In the United States, TBIs were diagnosed in almost 2.9 million ED visits, hospitalizations, and deaths that occurred in 2016, with estimates of actual number of TBIs nearly doubling this number (CDC, 2019). Figure 2 illustrates the estimated average annual number of traumatic brain injury-related emergency department visits, hospitalizations, and deaths in the United States from 2002-2006 (Faul, et al., 2010). Mild TBIs, commonly called concussions, are the most common form of TBI (CDC, 2003). In the youth population, mTBI is commonly caused by a direct impact or other mechanical energy applied to the head, such as from sudden acceleration, deceleration, or rotational forces as experienced in competitive sports (Ontario Neurotrauma Foundation, 2013) and sports are second only to accidents as the leading cause of youth mTBIs (CDC, 2013). The literature suggests that the incidence of sport-related mTBIs has increased considerably in recent years. For example, Taylor et al. (2017) found that ED visits for sport-related mTBIs among youth increased significantly between 2007-2013. More specifically, Coronado, et al. (2015) found that ED visits because of TBIs experienced

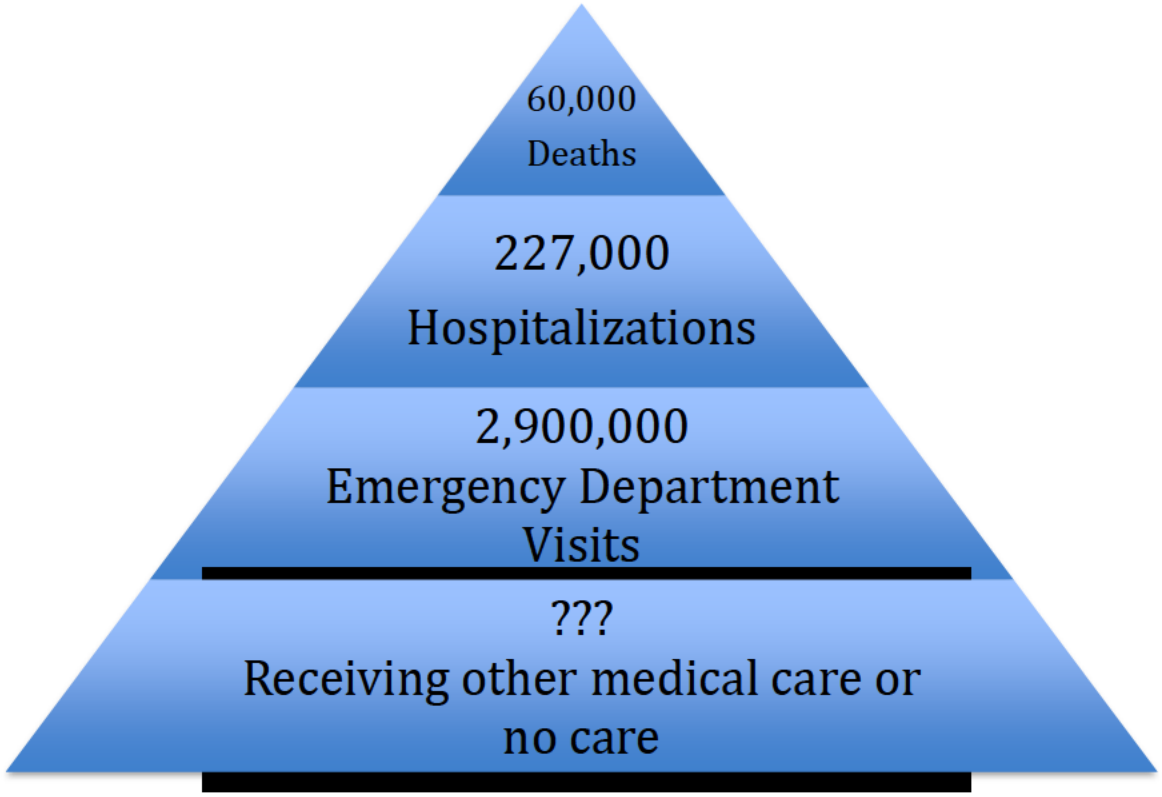
during sports or recreational activities have increased. The increase in ED visits, however, may not be the result of a true increase in incidence, but rather a response to increased public awareness about concussion and the subsequent result of increasing the likelihood of seeking care, as well as improved training of clinicians on mTBI diagnosis, and the passage of legislation in all 50 states requiring provider clearance prior to return to play (CDC, 2018). Using data from the Nationwide Emergency Department Sample (NEDS) database, Marin, et al. (2014) found that in 2010, ED visits for TBI increased by 29% from 2006; by comparison, total ED visits increased by 3.6% indicating an 8-fold rate of increase of total emergency department visits for TBI. Another study found that from 1997-2007, ED visits for mTBIs occurring in organized team sports almost doubled in children aged 8-13 and more than tripled in youth aged 14-19 years (Bakhos, et al., 2010).

A hallmark of concussion is that neurological change occurs following biomechanical force to the brain in the absence of macroscopic neural damage (Giza & Hovda, 2015). The study of the neuropathology of mTBIs reveals disruption in the neuronal membrane causing irregular movement of fluid and electrolytes, suppression of neuronal activity, decreased blood flow to the brain, and injuries to the axons of the brain resulting in axonal swelling, likely caused from the forces associated with injury (Giza & Hovda, 2015). According to theory of the neurometabolic cascade, following a mTBI there is an initial ionic flux and glutamate release resulting in an enormous energy demand and a period of metabolic crisis for an injured brain (Giza & Hovda, 2015). Forces involved in the cause of mTBI are those acceleration, deceleration, and rotational forces between the soft frontal and temporal lobes of the brain, lending evidence to

support the belief that no direct contact with the skull is needed to experience TBI, as seen in whiplash injuries (King, 1997). Furthermore, evidence suggests there is significant cumulative damage that occurs from multiple concussions (King, 1997; Meehan, et al., 2012)

Figure 2

Annual Results of TBIs 2016



Note: There is no data for the number of people with non-fatal TBI seen outside of an emergency department or hospital or who receive no care at all.

Source: Adapted from Faul, Xu, Wald, & Coronado, 2010 based on 2016 data from CDC (2019).

Common Signs and Symptoms

Mild TBI is defined by the Centers for Disease Control (CDC; 2011a) as a complex pathophysiologic process affecting the brain, induced by traumatic biomechanical forces secondary to direct or indirect forces to the head. The signs and symptoms of mTBI may be subtle at first, and unfortunately individuals with a mTBI usually look and behave normally, making it difficult for the injured person or bystanders to recognize (ACSM, 2013). Symptoms of mTBI can last days, weeks, months, or even years. Possible symptoms include headache, body aches, confusion or other cognitive problems, amnesia of the event or other memory problems, ear ringing, nausea or vomiting, slurred speech, fatigue, emotional changes, or temporary loss of consciousness (Mayo Clinic, 2013; See Table 1). These deficits are seen in the absence of structural brain damage in a diagnostic MRI (Davis, et al., 2009). Most of these symptoms resolve spontaneously though some may linger and no two mTBIs have the same presentation or outcomes (Cantu, 1998). The problem of mTBI is of particular concern among youth athletes as they are the most frequent victims of mTBI, suffer from increased mTBI severity, prolonged recovery times, and tend to have more complications. The specific mechanism underlying neural tissue damage is different in the adult brain as compared to the developing brain (Daneshvar, et al., 2011). Developing neural tissue differs from mature neural tissue in response to injury in both plasticity and alteration of developmental trajectory (Kirkwood, et al., 2006). The adult and developing brain also differ in terms of structure related to the skull and its musculature, leading to different biomechanics and injury profiles (Cantu & Mueller, 2009).

Table 1

Signs and Symptoms of Mild Traumatic Brain Injury

Symptom	Description
Dizziness/vertigo	Occurs with or without changes in position
Headache	Photophobia, throbbing, constant or increased duration or severity with increased activity, sensitivity to sound
Visual disturbance	Double vision, blurred vision
Nausea/vomiting	Vomiting that occurs more than twice in one hour initially is cause for concern. May indicate need for CT
Loss of consciousness	Loss of consciousness for less than 30 minutes
Fatigue or difficulty sleeping	Increased sleepiness, sluggishness, feeling foggy
Blacking out/blank spells	Difficulty concentrating, forgetfulness
Emotional disruptions/ Mood and personality changes	Anger and temper outburst beyond child's baseline, shorter tolerance for limit setting
Difficulty with memory	Forgetfulness or trouble understanding or accessing new or old information, trouble concentrating, confusion

Source: Adapted from Anderson, et al., 2006; Arango-Lasprilla, et al., 2008; Mayo Clinic, 2013.

Long-Term Risks of Mild TBI

Many individuals who have experienced mTBI will have no long-term effects following their injury, though up to 50% will develop some post-concussion symptoms that linger for sometimes several months to years after injury (King, 1997; CDC, 2016). Long-term risks associated with mTBIs vary including increased likelihood of secondary injury, hearing and vision impairment, continuous headaches, dizziness, sleep disturbance, depression or other emotional problems, long-term or permanent cognitive problems, and permanent brain damage. One study suggests that the risk of suffering a second TBI doubles within 6 months of suffering a primary TBI (Swaine, et al., 2007). One long-term effect that may occur after an athlete suffers multiple mTBIs is chronic traumatic encephalopathy (CTE) a rare, progressive degenerative disease of the brain found, common in athletes, following a history of repetitive brain trauma including

symptomatic and asymptomatic hits to the head. Another potential complication, termed second impact syndrome, is when a second blow to the head follows an unhealed mTBI (Mayo Clinic, 2013). Due to the increased susceptibility of a previously injured brain to a secondary injury, second impact syndrome may be caused by an unremarkable second blow, which may not involve any direct contact to the victim's head (Mayo Clinic, 2013; Swaine, et al., 2007). Though rare, second impact syndrome may cause massive swelling of the brain, collapse, loss of consciousness, cessation of respiration, permanent brain damage, and death (Meehan, 2011).

Serious risks of mTBIs are highest among youth under the age of 18, as their brains are in a period of rapid development (Harmon, et al., 2013; Cantu, 2015). Youth are also at increased risk because they tend to be more active than adults and not giving the brain enough time to health. This is dangerous and significantly increases the chance of permanent brain damage and death (Harmon, et al., 2013). Furthermore, the risks faced by youth are of particular concern as they may not fully understand the risks associated with the severity of injury and may not give the brain enough time to heal (Harmon, et al., 2013).

Adolescence

Adolescence is a period of significant development that begins with the onset of puberty and ends in the mid-twenties (National Academies of Sciences, Engineering, and Medicine 2019). These ages, roughly 10-25, includes the typical age of middle and high school students. Adolescents are in a unique developmental stage of life that is distinct from younger children and older adults. Adolescence is a period of rapid physical, cognitive, psychosocial, and emotional development (National Academies of Sciences,

Engineering, and Medicine 2019). The adolescent brain is still undergoing active development, and this can cause unique pathophysiologic responses. It is during adolescence that youth strive for independence from their parents, develop individual identity, and make important decisions about education (and athletics), careers, and relationships (Erickson et al., 2013).

Adolescents are frequent participants in sports. A study of a nationally representative sample of over 14,000 U.S. high school students revealed that approximately 70% of male students and 53% of female students participated in at least one organized team sport (Pate, et al., 2000). The National Study of Children's Health (Child and Adolescent Health Measurement Initiative, 2005) found that organized sport participation among those aged 10-17 has jumped to nearly 60%, and prior to the COVID-19 pandemic, participation in organized youth sports was at an all-time high and growing (NFHS, 2015), lending to the belief that the problem of youth sport related mTBIs will get worse. Having said that, the COVID-19 pandemic has disrupted organized sports as authorities canceled, greatly modified, or postponed sporting participation as part of a strategy to reduce virus transmission and it will likely take years to fully rebound in number of participants and level of competition (Fitzgerald, et al., 2021).

Implementation of Public Policies

Implementation is the fourth step in the policy process: following problem identification, policy formation, and policy adoption. The fifth and final step in the policy process is policy evaluation. Implementation is the process of turning policy into practice (Steinbach, 2009). More specifically, policy implementation is the combined

activities and operations taken on by stakeholders to meet goals and objectives outlined in a policy (Bhuyan, et al., 2010). Implementation rarely goes as planned, and it is common for there to exist a discrepancy between what is planned and what occurs because of a policy (Steinbach, 2009). Policy implementation involves three main steps: (1) Interpretation defined as the translation of policy into administrative regulations; (2) organization is the establishment of administrative methods needed to implement the regulations; and (3) application is the routine administration of the regulations (Anderson & Sotir Hussey, 2006). Each of these three steps presents potential for the breakdown of health policy implementation.

Barriers to Implementation

Some common barriers to effective health policy implementation including: lack of time and resources, poor understanding of required tasks, lack of communication and coordination, and inability to enforce regulations (Hunter, 2003). On a basic level, the word 'policy' itself has various meanings for people: some see it as a regulation, others as a guideline, and still others as a way for management/government to cover themselves in the event of a problem (Hoyle, 2014). Individuals, such as nurses, that are directly involved in implementing policy on the street-level will exercise their own discretion in how those policies are carried out, leaving policies, at least to some extent, up to the interpretation of street-level bureaucrats (Hoyle, 2014). This means that policies may not be implemented as perhaps they are intended, and their implementation varies from person-to-person (Hoyle, 2014). Thus, while policies aim to meet objectives implementation is not linear, changes over time, and varies depending on who is directly responsible for implementing it (Bhuyan, et al., 2010).

Facilitators to Implementation

Evidence suggests that there exist mechanisms to facilitate the implementation of public policies. For example, establishing and circulating a checklist so that all parties are aware of the requirements of their role has been shown to decrease uncertainty and improve understanding of complex processes (Avery, et al., 2015). Other known facilitators to implementation are widespread education/knowledge of the problem, low level of burden, strong leadership, flexible resources, and coordination between involved parties (Evans, 2012; Gladwin, et al., 2008). Effective implementation requires planning and mobilization of sufficient resources, as well as strong strategic action plans, work plans, budgets, and operational directives (Bhuyan, et al., 2010).

State-Level Public Policies on Youth Sport-Related Mild Traumatic Brain Injury

Recently youth sport-related mTBIs have received increasing public attention. State legislatures are responding by passing legislation to educate individuals on identification and management of mTBIs in sports. In 2009, Washington State (WA) passed the first law that attempted to set general guidelines involving the education of key personnel in identification and management of mTBIs in youth sports. Between 2009-2015, every other state and the District of Columbia passed similar laws (Law Atlas, 2015). Youth sport-related mTBI laws have little variance (Harvey, 2013). The most common elements of the laws are mandating a minimum 24-hour period of youth athlete removal, requiring medical assessment before returning-to-play, coach education in mTBI identification and management, annual education for athletes and parents, and clauses waiving liability for specific parties (Harvey, 2013). No state's youth sports mTBI law focuses on primordial or primary prevention. Rather they focused on

secondary prevention in the form of (1) increasing an individual's ability to identify and respond to mTBIs and (2) reducing the immediate risk of multiple mTBIs (Harvey, 2013). The components of the youth sport-related mTBI laws are similar across all 50 states, but empirical evidence is lacking. For states like MA, that were early adopters of the legislation, implementation evaluation is a next and necessary step especially given the length of time that has elapsed since implementation (Lowrey & Morain, 2014).

An additional critique of the policies is that scientific evidence behind some of the provisions of the laws is suspect. Most state laws establish a minimum 24-hour period of youth athlete removal, but there is no scientific agreement or consensus among the community of scientists and clinicians regarding optimal amount of time a victim of mTBI should be removed from play (Harvey, 2013). Evidence suggests that mTBI assessment and diagnosis is poorly understood, secondary to the subjective nature of symptoms, even by health care professionals (Lebrun, et al., 2013), yet more than half of the youth sport-related mTBI policies do not require that medical clearance for return-to-play be given by a healthcare professional that has received mTBI-specific training (Harvey, 2013). Another problem identified with the youth sport-related mTBI policies is the lack of enforcement of the policies. Enforcement of youth sport-related mTBI laws is essentially nonexistent across all states, and this will likely decrease compliance as enforcement has been demonstrated to improve compliance of public health policies in other domains (Robert Wood Johnson Foundation, 2011). In addition, though there are validated tools to assess for mTBI (i.e. Immediate Post-Concussion Assessment and Cognitive Testing (imPACT) and Scales of Cognitive Ability (SCAT)) there is currently

no gold standard mTBI diagnostic or assessment test and, if and when one is identified these policies will likely need to be changed.

Implementation Status of State-Level Policies in MA and WA

Because existing youth sports-related mTBI policies are relatively recent, there is very little research available on their implementation status. All 50 state policies are in the implementation phase of the policy process. Policy evaluation at this point is nearly non-existent. Research regarding the implementation of only two state policies, MA and Washington (WA) both early adopters of the law, was found in the literature search.

Massachusetts

In the spring of 2014, the author of this study was employed as an unpaid intern at the MA DPH Division of Violence and Injury Prevention, which oversees implementation regulations of the Policy in MA, and discovered first-hand many problems with the Policy's implementation. The initial year (2011-2012) of the Policy had a poor return of schools (N=190, 26%) reporting year-end mTBI data; there was no outreach done to increase compliance. In year two (2012-2013), only 31% (N=230) of schools were reporting year-end data on time. After strong outreach via phone and email correspondence to school principals, superintendents, athletic directors, athletic trainers and school nurses, compliance increased to 66% (N=485). Many of the non-reporting schools were unaware of the existence of the Policy, or unsure of the mandatory reporting requirements of the Policy. Unfunded mandates present challenges in time and resources, and the Policy's implementation has been inhibited by lack of manpower and resources to allow the MA DPH to reach out to schools to educate key personnel on the existence and requirements of the Policy. In a study examining implementation of the Policy, Doucette

(2015) found that funding and manpower were two issues that negatively affected implementation of the Policy; one example of this is schools relying on parents and student-athletes to self-report completion of concussion education due to a lack of resources to confirm completion.

Washington

The implementation of a similar policy in Washington State (WA) had encouraging results in educating individuals on important information about mTBIs in youth sports. Shenouda, et al. (2012) conducted a study one year after the establishment of youth sport-related mTBI legislation in WA, and revealed that parents, coaches and officials held high general knowledge of mTBI and recent legislation, though gaps in knowledge and practice regarding mTBI prevention still exist.

Facilitators and Barriers to Implementation of Existing Policies

The National Center for Injury Prevention and Control (NCIPC) conducted a case study evaluation on the youth sport-related mTBI policy implementation, specifically the return-to-play provision, in two states: WA and MA (2015). These two states were selected because they were both quick to enact mTBI legislation and because their laws varied regarding the role of the DPH and state interscholastic athletic associations (NCICP, 2012). The study identified several barriers to implementation of mTBI laws including: (1) not consulting with stakeholders (See Table 2) individually in order to understand their unique perspective, (2) lack of specificity in assigning roles and responsibilities, (3) difficulty accessing appropriate health care after a suspected mTBI, (4) lack of resources for implementation, monitoring, and evaluation, and (5) student resistance to reporting symptoms/parent pressure to keep children in the game (NCICP,

2012). The study also identified facilitators to implementation including: (1) inviting stakeholders to the table early in the planning process, (2) minimizing burden (eg. minimizing effort needed to comply with policy and clearly identifying when, and for whom, training is required and how required personnel can access said training) and (3) provide extensive outreach and education (NCICP, 2012).

Table 2

Stakeholder Analysis Matrix

Stakeholder	**Relationship to the Problem**	**Capacity to Address Problem** (High, Medium, or Low)	**Motivation to Solve the Problem** (High, Medium or Low)
Parents	- Want to see their children healthy - Want kids to succeed, get accolades, get scholarship - May push kids too hard	-Low because of limited resources, lack of power and lack of unified voice	High
Coaches	- Want to win - Want to maximize status and reputation - Concerned with short team success of team	Low because of limited resources, lack of power, and lack of unified voice	Low
Athletes	- Want to be able to play - Want to win - Don't want to let teammates down - Don't necessarily understand risks of TBI	Low because of limited resources, lack of power, and young age.	Low
College/Pro Teams	- Want to ensure health of youth athletes as they are groomed for college and beyond	- High because of deep resources, power to make change, and unified voice	Medium
School districts & school administrators	- Want to win - Concerned with status and reputation of school	-High because of deep resources and power to make change.	Medium
Health care providers	- Want to ensure proper treatment of youth athletes with suspected or actual mTBI	- High because of deep resources, high level of education, power to make change, and strong unified voice	High
Department of Public Health	- Wants to protect our nation's youth - Wants to limit costs associated with TBI	- High because of deep resources, power to make change and strong unified voice	High
School Nurses and Athletic Trainers	- Want to ensure proper treatment of youth athletes with suspected or actual mTBI	- Low because of limited resources, lack of power, and lack of a unified voice	High

Summary

The problem of mTBI has had a rapidly increasing rate if incidence, is more severe in those under age 18, can cause mild to severe health problems up to and including total disability and death, and is a serious public health concern. Signs and symptoms of mTBI tend to be mild and non-specific at first and can often be overlooked by bystanders. Recovery from a mTBI is highly variable as symptoms can last for days, weeks, months, or even years, and youth tend to have increased mTBI severity, prolonged recovery times, and more related complications.

MA, along with all other states and the District of Columbia, has developed legislation aimed at educating individuals on identification and management of mTBI. The MDPH has developed regulations to implement the policy and the regulations apply to all MA schools as well as those private schools that are members of the MIAA.

Research on the implementation of youth sport-related mTBI policies is sparse, and there is much to be learned. Barriers to implementation center around lack of time and resources, poor understanding of required tasks, lack of communication and coordination, and inability to enforce regulations. Facilitators of implementation involve increasing knowledge of the problem, minimizing burden, strong leadership, flexible resources, and improving coordination between involved parties.

CHAPTER 3

METHODS

Study Design

This study used a cross-sectional, descriptive, and exploratory survey design to examine perceptions of key personnel in MA public and charter middle and high schools on barriers to and facilitators related to the implementation of the policy. The unit of analysis of this study was the total sample responsible for implementation of the policy at MA public and charter middle and high schools.

Sample

The target population was MA public and charter middle and high school personnel in charge of implementing the policy: principals, superintendents, school nurses, coaches, athletic trainers, and athletic directors (herein known as 'key personnel'). Participants were selected using purposive sampling and encouraged to complete the survey to be entered into a raffle to win prizes (See Appendix G). Key personnel from each MA public and charter middle and high school received a cover letter and link to the survey via electronic communication. A list of all MA public and charter middle and high schools was obtained from the Department of Elementary and Secondary Education (DESE) website. Collaborative and special education schools were excluded as they have different extracurricular activity offerings, and their students have special health care needs.

The survey was sent to 534 MA middle and high school principals and 434 MA superintendents and asked to forward the cover letter and survey link to athletic directors, athletic trainers, and school nurses within their school and/or school district. It was difficult to predict responses rates for this population, as only a percentage of schools had these key personnel on staff. Frequently a school district employs only one athletic director for all schools within the district, and some districts have no athletic directors. Although 78% of MA schools have access to athletic training services, only 44% of MA public secondary schools have a full time and 30% have a part-time athletic trainer on staff (Pryor et al., 2015). Only 45% of United States schools have a full-time nurse, 30% have a part-time nurse, and 25% have no nurse at all (NASN, 2011). Based on other nursing research that utilized web-based surveys, the anticipated response rate for this study was projected to range from 13%-48% (Rideout, 2012).

Human Subjects

Institutional Review Board (IRB) approval for this study was obtained from the University of Massachusetts, Boston. Participants remained anonymous, as survey responses were not linked to participant email addresses. Anonymity, confidentiality, and implied consent was conveyed to study participants in a cover letter accompanying the web-based survey (Appendix H). Consent was implied with completion of the web-based survey.

Data Collection

Data was collected using a web-based survey, an appropriate survey method for addressing the research question as well as the sample in this study. There are several benefits of conducting surveys via the internet including ease of implementation,

reduction of costs, and given the ability to automatically transfer data into a database, elimination of data entry error (Braithwaite, et al., 2003; Wilkerson, et al., 2016). Furthermore, using the internet offers significant reduction in time, energy, and financial cost and the internet is a useful mode for conducting surveys targeted at very specific populations (Dillman, Smith, & Christian, 2009). Data was collected with a 33-item investigator-developed survey and qualitative data was gathered through three open-ended questions included in the survey (Appendix I). All data collection was Web-based using the online survey-hosting site Survey Monkey, a web-based survey development company that provides survey hosting, allows for real-time data collection, and conducts text analysis and graphical data analysis. Background demographic data was collected through seven brief questions included at the end of the 33-item survey.

Recruitment of key personnel was done through direct electronic contact with key personnel of MA Public and Charter middle and high schools. Email addresses for superintendents and principals of MA public and charter schools was obtained through the Department of Elementary and Secondary Education (DESE website. Email addresses for other key personnel were obtained through this author's telephone and email outreach to MA charter and public middle and high schools. A three-contact strategy was used to promote increased response rates. The first email provided information about the survey with an invitation to participate. The second and third emails served as a thank you to those who completed the survey and a reminder to those who had not (Dillman, et al., 2009; See Appendix J).

Operational Definitions

Key Personnel

Participants included in this study have worked with adolescent athletes in a school as a school nurse, athletic trainer, athletic director, or administrator. In survey questions numbered 2-5, participants self-reported their personal experiences with the policy within their organization. In survey questions numbered 6-8, participants self-reported their own awareness of the Policy. In survey questions 9-12, participants reported on their perceptions of barriers to and facilitators of implementation of the Policy on youth sport-related mTBIs.

The roles of school nurse, athletic trainer, and educator are bound by state and institutional policies and protocols, and as such may vary between participants. Participants self-reported their role in the assessment and management of adolescent athletes with suspected or actual mTBIs in various questions in the survey.

Participant Demographics

Demographic questions were collected via survey questions numbered 13 – 22. Demographics include: total years in current role, total years working with adolescents age 12-18, location of institution (reported by zip code), number of students in the institution, level of education, licensure/certification, age, gender, and race.

Survey

A 33-item investigator-developed survey including three open-ended questions was created for data collection in this study. The survey was developed with guidance from Phillip Brenner, PhD, in the Center for Survey Research at the University of Massachusetts Boston. Consideration was given to how the questions were posed, the

answer options presented, and scales used in an attempt to reduce any bias in the survey as well as to encourage reliable responses and a strong response rate. The survey was pretested by fifteen test participants whom were all Registered Nurses in various fields including school nursing, emergency medicine, behavioral health, and outpatient pediatrics. These test participants provided written feedback, which directed improvements in formatting as well as the question wording and the answer options presented.

Data Analysis

Quantitative Data

The survey data was downloaded into an excel database. The analysis was conducted in stages. Initially, univariate analysis was conducted with all variables to assess the distribution of the data. Descriptive statistics were used to identify distributions of participant demographics (age, gender, race/ethnicity, sports played, school year, zip code). Perceptions of key personnel regarding facilitators and barriers to implementation of the policy were descriptively summarized.

Data collected from questions 6, 7 and 8 of the survey pertain to the first research question: Are schools' key personnel aware of the requirements of the policy? Questions 6 and 7 were Yes/No questions regarding participants' awareness of (6) MA legislation and (7) MDPH regulations regarding youth sport concussions. Question 8 is a multiple selection format and asks participants to select all the options that they are aware to be requirements of the MDPH regulations.

Data collected from questions 2, 3, 4, and 5 of the survey pertain to the second research question: Are institutions enforcing the policy? These questions are all Yes/No

questions and ask participants about their awareness of (2) an existing policy in their institution about concussion prevention and management; (3) if they have completed an approved concussion education training; (4) if their institution offers concussion education to parents; and (5) if their institution offers concussion education to athletes.

Data collected from questions 9 and 10 of the survey pertain to the third research question: Which features of the policy are perceived by schools' key personnel to be barriers to and facilitators of implementation of the policy? Question 9 and 10 are both rated on a Likert Scale with options ranging from Strongly Disagree to Strongly Agree. These questions have multiple parts within them and ask participants to rate their agreement with statements regarding their perceptions of (9) the implementation of the regulations and (10) the willingness of parents, students, and coaches to complete the requirements. Descriptive statistics were used to identify distributions of this data.

Qualitative Data

Qualitative research methodologies are used in health care to explore complex phenomena encountered by nurses, other health care providers, policy makers, and patients (Curry, et al., 2009). Qualitative data were collected through three open-ended questions regarding key school personnel's self-report of barriers to and facilitators of the policy implementation as well as recommendations to improve implementation. These three questions are: (1) What has made implementation of the policy on sport-related concussions easy?", (2) "What has made implementation of the policy on sport-related concussions difficult?", and (3) What recommendations do schools' key personnel suggest to improve implementation of the policy? Open-ended questions are useful to add richness to the quantitative data collected in the survey (Miles & Huberman, 1994).

Qualitative data were uploaded into NVivo software and conventional content analysis (Hsieh & Shannon, 2005) of the open-ended questions was done to classify textual material and reduce it to more relevant, manageable pieces of data (Lewis-Beck, in Weber, 1990, p. 5).

Participant responses to open-ended questions were read repeatedly and grouped according to themes; the themes were not preconceived, but rather flowed directly from the data (Hsieh & Shannon, 2005). Data was read repeatedly and exact words that captured key thoughts or concepts highlighted. Next, initial analysis was done to develop codes that are reflective of more than one thought (Hsieh & Shannon, 2005). Categories and subcategories were developed by sorting codes into groups, and definitions for each category, subcategory and code were developed as the basis of analysis.

Data collected from the first two open-ended research questions, questions 11 and 12 of the survey, pertain to the third research question: Which features of the policy are perceived by schools' key personnel to be barriers to and facilitators of implementation of the policy? Question 11 asked participants what has made implementation of the policy easy and question 12 asked participants what has made implementation of the policy difficult. Data were descriptively summarized as outlined above.

Data collected from the third open-ended question, question 13 of the survey, pertain to the fourth research question: What recommendations do schools' key personnel suggest to improve implementation of the policy? This data was descriptively summarized as outlined above.

CHAPTER 4

RESULTS

The aim of this research was to assess key school personnel's perceptions of barriers to and facilitators of implementation of the MA policy on youth sport-related mild traumatic brain injury (mTBI) in order to guide, inform, and increase awareness of implementation of this policy. Descriptive statistics were used to describe the demographic characteristics of respondents (age, gender, race/ethnicity, sports played, school year, zip code). Perceptions of key personnel regarding facilitators and barriers to implementation of the policy were descriptively summarized. Frequency and percentages were used to summarize the responses from survey questions 6, 7, and 8, which ask about participants' awareness of MA legislation as well as the MDPH regulations on youth sport-related mTBIs, to answer the first study question:

Question 1: Are schools' key personnel aware of the requirements of the policy? Frequency and percentages were used to summarize the responses from survey questions 2, 3, 4, and 5, which ask participants about existing policy at their institution as well as availability of mTBI educational programs, to answer the second study question:

Question 2: Are institutions enforcing the policy? Frequency and percentages were used to summarize the responses from survey questions 9 and 10, and thematic content analysis of the first two open-ended questions, questions 11 and 12, was completed to answer the third study question:

Question 3: Which features of the policy are perceived by schools' key

personnel to be barriers to and facilitators of implementation of the Policy?

Thematic content analysis of the third open-ended question, survey question 13 which allowed participants to free-text their recommendations on implementation of the policy, was completed to answer the fourth study question:

Question 4: What recommendations do schools' key personnel suggest to improve implementation of the policy?

Summary Statistics

Summary statistics of respondent demographics, professional characteristics, survey responses, and institution demographics, are provided in Tables 3-5. There was a N=171 respondents to this survey. The indirect survey method led to a lack of clarity on the total number of schools/institutions that were represented in the data, though if we estimate that one employee from any given institution responded to the survey, then the response rate was approximately 32%, though it is more likely that some institutions had more than one respondent which would lower the response rate.

Respondent Demographics

Four survey questions, number 19-22, asked the respondents to provide demographic information regarding age, gender, race/ethnicity, and highest level of education completed.

Age

The respondents ranged in age from 25 to 70 (mean 50.2, SD 10.2). Forty-six respondents declined to provide their year of birth.

Gender

Survey respondents were 61% female; there were 51 male survey respondents and 76 female survey respondents. Forty-one respondents skipped this question.

Race/ethnicity

Most respondents (N=116, 93.5%) self-identified as White. One respondent identified themselves as Asian, three respondents identified themselves as Black or African American, and four respondents identified themselves as Hispanic. Forty-seven respondents declined to identify the race/ethnicity they most closely identify with.

Highest level of education

Greater than 97% of respondents (N=130) have a bachelor's degree or higher. More than half of respondents (N=85) hold a master's degree or higher. Thirty-seven respondents declined to provide their highest level of education.

Table 3

Respondent Demographics

Variable	Categories	Frequency	Percentage
Age	20-29	5	4.17%
	30-39	14	11.67%
	40-49	33	27.50%
	50-59	47	39.17%
	60-69	19	15.83%
	70+	2	1.67%
Gender	Male	51	39.23%
	Female	79	60.77%
Race/Ethnicity	American Indian or Alaska Native	0	0.00%
	Asian	1	0.81%
	Black or African American	3	2.42%
	Hawaiian Native or Other Pacific Islander	0	0.00%
	Hispanic	4	3.23%
	White	116	93.55%
	Other (please specify)	3	2.36%
What is the highest level of education completed?	High School Diploma / GED	1	0.75%
	Associates Degree	3	2.24%
	Bachelors Degree	45	33.58%
	Masters Degree	77	57.46%
	Doctoral Degree (PhD, DNP, EdD, etc.)	8	5.97%
	Other (please specify)	7	4.96%

Respondent Professional Characteristics

Questions 14, 15, 16, and 23 asked the respondents to provide information regarding their professional title, years employed in current role, years employed in any role at an institution working with middle or high school aged students, and whether they are responsible for their institution's compliance with the Policy.

Professional title

Respondents' professional titles include school nurse (N=47), principal (N=42), athletic director (N=23), athletic trainer (N=13), coach (N=8), and others. Thirty-eight respondents opted to skip this question.

Years employed in current role

The mean number of years employed in current role was 15 (SD=6.9) and ranged from 1 to 25 years. Thirty-three respondents opted to skip this question.

Years employed in any role at an institution working with adolescents

The mean number of years respondents have been employed in any role at an institution working with adolescents is 24 years (SD=8.6) and ranges from 1 to 42 years. Thirty-four respondents opted to skip this question.

Responsible for compliance with the policy

Approximately 56% of respondents are responsible for ensuring their institution complies (collecting prior head injury forms, ensuring coaches, parents, and athletes attend head injury training, etc.) with the policy. Thirty-four respondents opted to skip this question.

Table 4

Respondent Professional Characteristics

Variable	**Categories**	**N**	**Percentage**
Professional Title	Athletic Director	23	15.75%
	Athletic Trainer	13	8.90%
	Coach	8	5.48%
	Principal	42	28.77%
	School Nurse	47	32.19%
	Superintendent	0	0.00%
	Other	13	8.90%
Years Employed in Role	1-5	43	31.16%
	6-10	42	30.43%
	11-15	28	20.29%
	16-20	14	10.14%
	21+	11	7.97%
Years Employed in any role at an Institution Working with Adolescents	1-5	22	16.06%
	6-10	29	21.17%
	11-15	27	19.71%
	16-20	18	13.14%
	21+	41	29.93%
Responsible for compliance with MA Policy on Sports-Related Concussions	Yes	77	56.20%
	No	60	43.80%

Institution Demographics

The respondents provided information regarding whether their institution offers sports to students, the zip code of the town where their institution sits, number of students enrolled, and the position within the institution that is responsible for ensuring compliance with the policy. The zip code of the community served by each institution was used to obtain the median income, as published on IRS.gov.

Sports Offering

More than 95% (N=168) of the institutions where respondents are employed offer sports to their students. All respondents answered this question.

Mean Income by Zip Code

As from IRS.gov on February 10, 2019, the mean per capita income by zip code of each institution was $55,000 with a range of $26,120 to $105,000. The U.S. Census Bureau defines this mean per capita income as middle class. Thirty-eight respondents opted to skip this question.

Number of Students Enrolled

The mean number of students enrolled at institutions where respondents were employed was 1063 (SD 614) with a range of 2 to 6500. There were two respondents that noted the total number of students at their institution was 2, which was likely respondent entry error. Thirty-six respondents opted to skip this question.

Position Responsible for Ensuring Compliance with the Policy

This was the last question of the survey and one hundred eleven respondents opted to skip this question. Given the volume of missing data, coming to any conclusions is impossible. Of those that responded (N=60), the majority (68.33%, N=41) indicated that the athletic director was the person responsible at their institution to ensure compliance with the policy. Other positions holding this responsibility include the school nurse (N=10), athletic trainer (N=5), and other (N=2). There were 2 respondents that reported being unsure.

Table 5

Institution Demographics

Variable	Categories	Frequency	Percentage
Offers Sports	Yes	163	95.32%
	No	8	4.68%
Median Income by Zip Code	$20000-29999	4	3.03%
	$30000-39999	24	18.18%
	$40000-49999	23	17.42%
	$50000-59999	34	25.76%
	$60000-69999	26	19.70%
	$70000-79999	9	6.82%
	$80000-89999	7	5.30%
	$90000-99999	4	3.03%
	$100000+	1	0.76%
Number of Students Enrolled	1-399	24	17.78%
	400-799	54	40.00%
	800-1099	19	14.07%
	1100-1499	13	9.63%
Position responsible for compliance with MA Policy on Sports-Related Concussions	Athletic director	41	68.33%
	Athletic trainer	5	8.33%
	Coach	0	0.00%
	Principal	0	0.00%
	School nurse	10	16.67%
	Superintendent	0	0.00%
	Unsure	2	3.33%
	Other (please specify)	2	3.33%

Summary

In summary, the study sample was mostly comprised of white females with a mean age of 50 years (SD= 10). The professional title of respondents was mostly nurses (N=47, 32%,), principals (N=42, 27%), and athletic trainers (N=23, 16%). The average length of time respondents had been working in their current role was 14 years and just over half (56%) of the respondents were responsible for ensuring implementation of the

policy at their institutions. Nearly all the schools (N=168) where the respondents are employed offer sports to their students.

Research Question 1

Survey questions 6, 7, and 8 aim to answer Research Question 1: Are schools' key personnel aware of the requirements of the policy?

Most respondents (93.59%, N=146) reported being aware of existing Massachusetts legislation regarding youth sport-related concussions. Fifteen respondents declined to identify if they were aware of the policy. Similarly, 92.31% (N=144) of survey respondents were aware that MDPH has created regulations to enforce the policy in public and charter middle and high schools in MA.

The MDPH regulations have many requirements. These requirements include policies and procedures governing the prevention and management of sport-related concussions within the school or school district, concussion education for parents, athletes, and coaches, and collection and maintenance of pre-participation documentation as well as documentation of actual or suspected concussions. The requirements also include the immediate removal of play of any athlete with a suspected or actual concussion that occurs during extracurricular activities, an athlete to receive medical clearance from an approved clinician before returning to play after a suspected or actual concussion, and sport related concussion documentation to be submitted to DPH at the conclusion of each school year. Greater than 89% of all survey respondents indicated awareness of each of these requirements outlined by the DPH regulations.

Table 6

Survey Responses to Answer Research Question 1: Are schools' key personnel aware of the requirements of the policy?

Variable	**Categories**	**Frequency**	**Percentage**
Respondent Awareness of MA Legislation Regarding Youth Sport-Related Concussion	Yes	146	93.59%
	No	10	6.41%
Respondent Awareness of the DPH Regulations Created to Enforce the MA Legislation	Yes	144	92.31%
	No	12	7.69%
Awareness of DPH regulations requiring:			
Policies and procedures governing the prevention and management of sport-related concussions within the school or school district	Yes	136	97.84%
Concussion education for parents	Yes	124	89.21%
Concussion education for athletes	Yes	131	94.24%
Concussion education for coaches	Yes	136	97.84%
Collecting and maintaining pre-participation documentation from athletes	Yes	130	93.53%
Collecting and maintaining documentation for all suspected of actual concussions that occur during extracurricular activities	Yes	133	95.68%
The immediate removal from play of any athlete with a suspected or actual concussion that occurs during extracurricular activities	Yes	137	98.56%
An athlete to receive medical clearance from an approved clinician before returning-to-play after a suspected or actual concussion	Yes	135	97.12%
Sport-related concussion documentation to be submitted to the Department of Public Health at the conclusion of each school year	Yes	125	89.93%

Research Question 2

Survey questions 2, 3, 4, and 5 aim to answer Research Question 2: Are institutions enforcing the Policy?

Most respondents (97.47%, N=154) were aware of an existing policy within their institution regarding head injury management and prevention. A smaller majority (85.44%, N=135) have completed a head injury education training course. Fewer (75.95%, N=120) note the existence of a head injury education training course for parents of students at their institution, while 17.09% (N=27) of respondents were unsure of any parent concussion education offerings. Most respondents (86.08%, N=136) reported that athlete head injury education is offered at their institutions, while 10.13% (N=16) were unsure of any athlete head injury education offerings.

Table 7

Survey Responses to Answer Research Question 2: Are institutions enforcing the policy?

Variable	Categories	Frequency	Percentage
Awareness of existing policy within institution regarding concussion management and prevention	Yes	154	97.47%
	No	4	2.53%
Respondent completion of concussion education training course	Yes	135	85.44%
	No	23	14.56%
Parent concussion education training offered by institution	Yes	120	75.95%
	No	11	6.96%
	Unsure	27	17.09%
Athlete concussion education training offered by institution	Yes	136	86.08%
	No	6	3.80%
	Unsure	16	10.13%

Research Question 3

Survey questions 9, 10, 11, and 12 aim to answer Research Question 3: Which features of the policy are perceived by schools' key personnel to be barriers to and facilitators of implementation of the policy?

Respondents (83.09%, N=113) agreed or strongly agreed that their peers were aware of the MDPH regulations, and only 4.41% (N=6) respondents believe their peers were unaware of MDPH regulations. Most respondents (81.62%, N=111) agreed or strongly agreed that the MDPH regulations were easy to understand, and 6.62% (N=9) believed the MDPH regulations were not easy to understand. Similarly, 76.3% of respondents (N=103) agreed or strongly agreed that the DMPH regulations were easy to implement, and 11.85% (N=16) believed the reverse. Only 21.48% (N=29) of respondents agreed or strongly agreed that implementation of MDPH regulations was too time-consuming and 59.25% (N=80) of respondents disagreed or strongly disagreed with this. Most respondents (80.14%, N=109) perceived the MDPH regulations to be effective at their aim to provide standardized procedures for sport-related head injuries in order to protect the health and safety of students.

Roughly half of the respondents (55.14%, N=75) perceived parents to be cooperative with participating in required trainings and completing required documentation, but 17.65% (N=24) of respondents disagreed or strongly disagreed with this. A slightly higher number of respondents (66.17%, N=90) perceived students to be cooperative in participating with the required trainings and completing required documentation, with only 13.24% (N=18) respondents disagreeing or strongly disagreeing. One hundred and seven respondents (78.67%) believed coaches were

cooperative with participating in required trainings and completing required documentation.

Table 8

Survey Responses to Answer Research Question 3: Which features of the policy are perceived by schools' key personnel to be barriers to and facilitators of implementation of the policy?

	Strongly Disagree		**Disagree**		**Unsure**		**Agree**		**Strongly Agree**	
Variable	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**
Respondents' peers are aware of DPH regulations	2	1.47	4	2.94	17	12.50	74	54.41	39	28.68
DPH regulations are easy to understand	4	2.94	5	3.68	16	11.76	81	59.56	30	22.06
DPH regulations are easy to implement	4	2.96	12	8.89	16	11.85	79	58.52	24	17.78
Implementing the DPH regulations is too time-consuming	20	14.81	60	44.44	26	19.26	26	19.26	3	2.22
DPH regulations are effective at their aim to provide standardized procedures for sport-related head injuries in order to protect the health and safety of students	3	2.21	5	3.68	19	13.97	82	60.29	27	19.85
Parents are cooperative with participating in required trainings and completing required documentation	3	2.21	21	15.44	37	27.21	67	49.26	8	5.88
Students are cooperative with participating in required trainings and completing required documentation	5	3.68	13	9.56	28	20.59	80	58.82	10	7.35
Coaches are cooperative with participating in required trainings and completing required documentation	3	2.21	6	4.41	20	14.71	74	54.41	33	24.26

Qualitative Analysis: Survey Question 11

Survey question 11 was an open-response question asking respondents for their perception on what has made implementation of the policy easy. In response to this open-ended qualitative question, respondents offered brief responses regarding their perceptions of facilitators of implementation of the policy. Approximately 48% (N=83) of respondents chose to skip this question.

Five clear themes emerged from the free-text responses:

Theme 1: The use of online **technology** allowing for easier **accessibility** of training programs at the convenience of the end users was the most commonly reported factor assisting in the facilitation of implementation of the policy.

Theme 2: Respondents reported that the **guidelines, training tools, and materials** provided by regulatory agencies including MDPH assisted in implementation of the policy.

Theme 3: Respondents identified the importance of **teamwork** as well as having **dedicated staff** responsible for institutional compliance with the policy.

Theme 4: A common belief that respondents perceive as being a facilitator to implementation of the policy is that the fundamental basis for the policy is rooted in increasing **safety and well-being** of our youth.

Theme 5: The policy is **mandatory** which has assisted in its implementation.

Theme One: Accessibility and Technology.

Approximately 40% (N=33) of respondents perceive that accessibility of training programs and information available at their convenience online has helped facilitate implementation of the policy. Respondents noted that the availability of free training online through the CDC has helped make implementation and compliance of the policy easier. In addition to the responses noting how "easy" it is to receive training online through the CDC, multiple respondents also commented on the helpfulness of being able to review the guidelines online and obtain and print materials online through the MDPH website.

Theme Two: Guidelines, Training Tools, and Materials.

Approximately 39% (N=32) of respondents perceived that the provided and available guidelines, training tools, and materials had helped ease implementation of the policy by enhancing education on the topic and expectations/requirements of the policy. Respondents noted that the provided guidelines, forms, and detailed instructions help to provide "clear expectations of what schools and [other key personnel] are responsible for." Respondents called the guidelines "clear," "concise," and "helpful."

Theme Three: Teamwork and Dedicated Staff.

Respondents found it helpful to work together with colleagues within their school and district to assist with compliance with the policy as reported by approximately 28% (N=25) of respondents. Respondents noted it was important that they had the "support," "leadership," "direction," and "guidance" of their district, school, and colleagues. Two respondents noted that they take a "team approach" to complying with the policy noted that administrators, nurses, trainers, student-athletes, and parents" work together.

Multiple respondents noted the importance of the athletic directors, athletic trainers, and school nurses in compliance with the policy.

Theme Four: Safety and Well-Being of Youth.

Respondents clearly indicated a belief that the fundamental basis for the policy, being that it is rooted in maintaining the safety and well-being of youth, has helped to facilitate implementation of the policy. Approximately 27% (N=24) of respondents reported that the good intentions of the policy, as well as fear of negative effects from injury, helps to facilitate implementation of the policy. One respondent noted that the district, school, and key personnel are "on the same page and understand the importance of concussion education, prevention, and recognition." Multiple respondents commented on the fear of injury, very real possibility of serious harm, as well as long-term or sometimes permanent complications that can result from concussions. Respondents noted that the awareness of the risks has helped to facilitate implementation, as there is less pushback on compliance. In fact, one participant reported that follow-up phone calls to parents of injured athletes are far less time-consuming than they once were because of increased awareness, as "parents already know the majority of the information."

Theme Five: Mandatory Policy.

Approximately 12% (N=11) of respondents reported that implementation of the policy is facilitated by the fact that it is required by the Commonwealth of MA for the schools to comply. As a mandatory policy for schools, there is no option to not comply, thus they have each developed a way to successfully comply with it, despite the lack of funding associated with it. One respondent noted that, "strong enforcement, or at least the specter of it, got the ball rolling effectively. The regulations give backing to public

health professionals and other concerned adults to force change." Two respondents noted that implementation of the policy is made easier because student-athletes are unable to participate in sports until they submit the required forms.

Qualitative Analysis: Survey Question 12

Survey question 12 was an open-response question asking respondents for their perception on what has made implementation of the policy difficult. In response to this open-ended qualitative question, respondents offered brief responses regarding their perceptions of barriers to implementation of the policy. Approximately 47% (N=81) of respondents chose to skip this question.

Three clear themes emerged from the free-text responses:

Theme 1: Respondents reported that **parent and student athlete failure to comply** with the policy is the most difficult barrier to implementation.

Theme 2: Respondents identified that the **time-consuming** nature of the requirements of the policy as well as the **burdensome volume of paperwork** required is a barrier to implementation.

Theme 3: **Healthcare provider inconsistency** in documentation, diagnosis, and return to play recommendations was reported as making the policy implementation difficult.

Theme One: Parent and Student-Athlete Failure to Comply.

Approximately 31% (N=28) of respondents perceive lack of parent and student-athlete compliance to be the most common barrier to implementation of the policy. Respondents report that parents and student-athletes act as barriers to implementation in many different areas including failure to complete trainings, failure to return required

documentation (both pre and post injury), failure to follow through with appointments required for return to play clearance, and failure to report injuries to avoid being removed from play. One respondent noted that it is hard to get families and student-athletes to follow through with appointments required for return to play clearance and by that time often "their student feels fine." Another participant noted that "sometimes parents and/or players are resistant to seek the proper treatment for fear the player will miss playing time."

Theme Two: Time Consuming and Burdensome Volume of Paperwork.

Approximately 21% (N=19) of respondents perceive implementation of the policy to be difficult because of the time-consuming nature of the policy due to the burdensome volume of paperwork. Other factors contributing to the time-consuming nature of the policy implementation included the lack of availability of training tools in foreign languages needed for families/students with limited English proficiency, lengthy and difficult to interpret guidelines, as well as challenges completing the requirements with student population of lower socioeconomic status due to lack of access to the internet. Tracking information and multiple documents for all student-athletes over multiple seasons and school years was identified as a barrier to implementation. Respondents noted that it is difficult to track the volume of paperwork required prior to participation as well as all the paperwork required when an athlete sustains a head injury and requires follow up, ongoing evaluation, and return to play clearance.

Theme Three: Healthcare Provider Inconsistency.

Approximately 13% (N=12) of respondents perceive healthcare provider inconsistency as a barrier to implementation of the policy. Specifically, respondents

noted that many physicians/other healthcare providers are not aware of the protocols, required documentation, or return to play guidelines. Two respondents noted that providers are inconsistent in their return to play guidelines and may recommend what key personnel perceive to be what the parent and/or student-athlete wants including documentation noting that a student-athlete may return to play but not return to academics.

Research Question 4

Survey question 13 aims to answer Research Question 4: What recommendations do key school personnel suggest to improve implementation of the policy?

In response to this qualitative open-ended response question, respondents offered rich detail and concise suggestions to improve implementation of the policy. This was not a required survey question, and ninety-five respondents (55%) opted to skip this question.

Four distinct themes emerged from analysis of the research data. The major themes identified from the results of this study included:

Theme 1: A need for **education** for all involved parties including parents, coaches, athletes, medical providers, and other members of the care team.

Theme 2: A belief that the guidelines need **simplification and clarification** to reduce the unfunded burden on educational institutions.

Theme 3: A request to **improve technology** to allow for easier tracking of training completion, reduce paperwork, and increase compliance.

Theme 4: A call for improved **communication** by the MDPH with the

individual educational institutions, the MIAA, and medical providers including primary care providers and pediatricians regarding the processes and protocols as well as the documentation requirements.

Theme One: Education

Approximately 29% (N=22) of respondents recommended a need for increased education of the policy, procedures, and documentation requirements. Of those respondents that suggested a need for education, more than half (79%, N=15) noted a need for education of community healthcare providers diagnosing and assessing athletes as respondents report much variability in management of concussions. One participant stated there was a need for "outreach to medical personnel who diagnose concussions [as] every physician, nurse practitioner, and ER manage it differently." Respondents also note a delay in completion or incomplete execution of required documentation as healthcare providers are often unaware of what is required. One participant suggested that MDPH provide "training for primary care providers [on the] return to play protocols and forms," and another recommended "PCP and ER doctors take the [concussion education] courses as well."

In addition to education of the healthcare providers, it was also suggested that MDPH provide more education to teachers, parents, athletes, and coaches including those recreational coaches that are not affiliated with schools. Of the respondents that suggested a need for education, more than half (58%, N=11) identified a need for parental and coach buy-in. In fact, one person noted the needs for "more education about what actually happens to your brain; there needs to be a fear-factor that motivates parents to

seek proper treatment for their children." Another respondent suggested that "coaches need to be on board with the policy."

Theme Two: Simplification and Clarification

Approximately 18% (N=14) of respondents suggested a need for simplification and clarification of the school requirements. Terms that frequently appeared in the recommendations of respondents were the suggestion for the guidelines to be "concise," "streamlined," "clear," "clarified," and "consistent." Of those respondents that suggested a need for the guidelines to be simplified and/or clarified, 50% of them recommended development of a guidance tool or checklist to assist institutions in accurately and completely carrying out all the requirements. For instance, one respondent recommended that it would be helpful for the Commonwealth of MA to provide "concise step-by-step instructions [and a] checklist." Another person suggested it would be helpful if there was a single mandatory training that could be documented by a single external agency, as this would take much of the burden of record keeping off the individual institutions. Additionally, a participant noted that it would be helpful for the Commonwealth of MA to clarify requirements around required documentation as well as management and return to play of injured athletes as the complexity of the guidelines leads to "the confusion and noncompliance."

Theme Three: Improve Technology

Improving technology was recommended by 15% (N=11) of respondents. Specifically, respondents suggested more online forms, a need to reduce paperwork, and increase in the availability of online educational resources for players, parents, coaches, and other school employees. They also suggested that a single online database be used for

easier tracking of documentation completion as well as auditing to ensure compliance. Three respondents recommended an online database that can be easily searched to determine whether a parent, athlete, coach, or other individual has completed their required training. It was also suggested that it would be ideal if this database could automatically alert individuals to due dates and send reminders. Someone recommended broadening the required education offerings making them accessible online to assist in compliance as well as to increase engagement of individuals as many of the parents, athletes, and coaches have seen the same video year after year.

Theme Four: Communication

Improving communication was recommended by roughly 11% (N=8) of respondents. They suggested that communication needs to improve between the Commonwealth of MA and parents, athletes, coaches, school administrators, and community healthcare providers. Specifically, one respondent suggested regular email communications to school administration, coaches, athletic directors, athletic trainers, school nurses, as well as community healthcare providers to answer frequently asked questions, provide a quick guide to the requirements, reminders of due dates, as well as annual summaries of compliance. One respondent suggested it would be helpful for the Commonwealth of MA to offer best practice strategies to institutions as this would likely improve compliance and minimize variation in practice.

CHAPTER 5

DISCUSSION

This was an exploratory study designed to assess key school personnel's perceptions of barriers to and facilitators of implementation of the Massachusetts (MA) policy on youth sport-related mild traumatic brain injury (mTBI) to guide, inform, and increase awareness of implementation of this policy. A discussion of the findings relative to implications for the future of public policy regarding youth sport concussions, implications for future research, and limitations of the study are addressed.

Research Questions

This study aimed to explore four main research questions and findings are discussed to address each of these questions.

Question 1: Are schools' key personnel aware of the requirements of the policy?

The MA Policy is guided and enforced by the lengthy and verbose regulations created by the MDPH, the agency charged with creating regulations to enforce the policy. These include mandatory concussion education, collection, and maintenance of documentation pre-participation, after injury, and prior to return to play. Most respondents in this study indicated that they are aware of the existence of the policy as well as the requirements of the policy.

Question 2: Are institutions enforcing the policy?

As an unfunded mandate, there is currently no established method to monitor participating schools to make sure they submit the required annual data or that all

key personnel attend and pay attention to the safety-training program. There is also no way to enforce implementation of the policy on the field at the time of injury. Furthermore, enforcement of the policy is reliant upon cooperation and compliance from a multitude of involved individuals including teachers, school nurses, coaches, athletic trainers, athletic directors, student-athletes, and parents/guardians.

Findings from this study indicate that many respondents are aware of the policy and note that concussion education is offered to student-athletes at their institution. Fewer respondents have completed a concussion education training course and even fewer are aware of the existence of concussion education training offerings for parents of student-athletes as required by the policy.

Results from this study indicate that the time necessary for key personnel to complete required follow-up (i.e., phone calls to go over next steps, required documentation, and information for return-to-play) with parents and injured athletes has been reduced since implementation of this policy. The decreased length of time needed to appropriately complete follow-up after a mTBI can be directly attributed to implementation of this policy and the benefits of increased awareness and education of the problem of youth sport-related mTBIs.

Question 3: Which features of the policy are perceived by key school personnel to be barriers to and facilitators of implementation of the policy?

Findings from this study indicate that key personnel have several common perceptions on facilitators and barriers to implementation of the policy. Studying implementation of the policy is important as creation of policy is not sufficient to make

change; implementation is the conversion of policy guidelines into action (DeGroff & Cargo, 2009).

Perceptions of Facilitators

Respondents were forthcoming and generous with their free text responses to open-ended survey questions regarding perceptions of what makes implementation of the policy easy. Evident in the responses was the perceived benefit of the use of online technology allowing for easier compliance with the requirements of the policy including easier accessibility to training; it was clear from the data that both the ease of accessibility of information and required training is of the utmost importance to respondents. Respondents were also clear that the materials, guidelines, and training tools provided by regulatory agencies including the MDPH have been beneficial in easing the implementation of the policy in their institutions. Another clear theme that arose from the responses was the importance of teamwork, strong leadership, and dedicated staff responsible for institutional compliance with the policy. Finally, one perceived facilitator to the policy is rooted in a moral precept, to ensure the safety and well-being of youth, that is widely accepted and driven by a desire to do good.

Perceptions of Barriers

The creation of policy is a great first step towards reaching the intended outcome, but policies do not self-implement; reaching the intended outcome is dependent upon policy implementation, which is often impeded by a variety of barriers. Findings from this study indicate that institutions across the Commonwealth have faced a variety of common barriers to implementation of the policy.

Implementation of the policy depends, in part, on the buy-in and compliance of many involved individuals including coaches, parents, and student-athletes. Respondents reported that parent and student-athlete failure to comply with the policy is the most difficult barrier to implementation. As one respondent noted, it's imperative for coaches to reinforce "athletes to say something when injured and [educating parents and athletes that] it's not always about 'manning up' because another head injury could be fatal." Additionally, implementation of the policy relies on the timely completion and submission of documentation by parents and student-athletes; most respondents reported that parent and student-athlete failure to comply with timely completion and submission of documentation is a major barrier to implementation and results in burdensome additional work trying to provide reminders on needed trainings and track down required documents. Another barrier to implementation of the policy is the time-consuming nature of complying with the requirements along with the heavy volume of paperwork required. Respondents perceived there to be inconsistency in diagnosing, treating, and managing youth sport-related head injuries making implementation of the policy difficult.

Question 4. What recommendations do key school personnel suggest to improve implementation of the policy?

Respondents provided clear and ample suggestions to improve implementation of the policy. First, and most prevalently, respondents noted the importance of a need for education for all involved parties including parents, coaches, healthcare providers, and other involved parties. It was also suggested that ongoing and consistent education to coaches, parents, players, and other key personnel, especially that which outlines the potentially devastating effects of brain injury, will help to improve implementation. As

one respondent stated, “there needs to be a fear factor that motivates parents to seek proper treatment for their children.” In addition to the suggestion for continuing education regarding the clinical effects of concussion and the potentially severe consequences of the same, it was suggested that implementation of the policy would be improved by requiring ongoing concussion education to the healthcare providers in the community.

The second most common theme was a belief that the guidelines need simplification and clarification as this would help reduce the unfunded burden on educational institutions. Multiple respondents recommended more detailed, clear, concise step-by-step instructions The third most common theme was that implementation of the policy would be improved through improved technology as it would allow for easier completion of required training as well as reduce the volume of paperwork requiring completion and tracking which would likely lead to increased efficiency and compliance. One respondent suggested that all documentation be housed in a state-wide online database so there would be one central location to be able to store, access, and retrieve documentation.

The final theme that emerged was a call for improved communication by the MDPH with the individual educational institutions, the MIAA, as well as the healthcare providers in the state regarding the policy, concussion education, as well as the required documentation. Multiple respondents noted that implementation of the policy would improve if providers, including primary care and emergency medicine providers, received education regarding the required documentation as well as copies of the required forms. Respondents note this would help eliminate any confusion between the providers and the

schools regarding diagnosis, recommendations, and timeline for return to play/school, and would also minimize repeat visits/outreach to providers for completion of necessary paperwork. Respondents also reported that there is a "great deal of variation in the documentation, rest period, and return to play protocols between different providers" leading to significant variation in timelines dependent upon the individual provider recommendations. One respondent noted, "it's hard to enforce a policy when it varies from athlete to athlete due to variations in what the physician asks for in the documentation… and leads to confusion and non-compliance with athletes and parents."

Study Limitations

This study investigated the perceptions of key personnel at MA public and charter schools regarding barriers to and facilitators of implementation of the policy on youth sport-related mTBIs and to determine whether key personnel are aware of the requirements of the policy and if institutions are enforcing the policy. Surveying this population was necessary to reach the aims of the study, though reaching this population was difficult due to the variability in process within each individual district and school. Each individual district and school have developed their own process of implementation of the policy, thus the responsible party at each institution varies and respondents reported that often it is a shared responsibility; although, nurses, athletic trainers, and athletic directors are the most common party responsible for ensuring compliance with the policy, the ultimate responsibility falls on the administration. As such, the survey was sent to 534 MA middle and high school principals and 434 MA superintendents, at a total of 535 institutions, and they were asked to forward the cover letter and survey link to athletic directors, athletic trainers, and school nurses within their school and/or school

district. This indirect survey method led to a lack of clarity on the total number of schools/institutions that were represented in the data as more than one employee from any given institution may have responded to the survey. If we estimate that there was one respondent per school that received the survey, then the response rate would be approximately 32%, though it is more likely that many schools had more than one respondent, which would considerably lower the response rate. It is believed that a lack of direct access to the responsible parties, and the resultant use of the indirect survey method, may be the cause of a lower response rate for this survey.

Data were collected via a web-based survey and the link to the survey was distributed to key personnel via electronic mail. Utilization of electronic mail as well as a web-based survey limits the ability to describe the population of respondents and it's possible that respondents that have completed the survey did so because they have an inherent bias, which would limit the generalizability of the findings. As Heiervang and Goodman (2011) note, web-based surveys can be biased by low and selective participation.

In addition to the study limitations that can be attributed to the overall response rate as well as the web-based nature of the survey, there was considerable survey attrition. All 171 respondents answered question 1, but all other survey question had several respondents who chose to skip. The percentage of total respondents that chose to respond to each individual survey question is detailed in Table 9 below; these response rates varied from a high of 100% of respondents that answered the first question to a low of 35% of respondents that answered the final question. Response rates for survey

questions 11, 12, and 13, the three open-ended questions, were much lower at 44-52%, than those for multiple choice survey questions.

Table 9

Response Rate by Survey Question

Survey Question	Answered	Skipped	Response Rate by Question
1. Do you currently work in an institution that offers sports to middle or HS aged students?	171	0	100.00%
2. Are you aware of an existing policy in your institution regarding concussion prevention and education?	158	13	92.40%
3. Have you completed an approved concussion education training?	158	13	92.40%
4. Does your institution offer concussion education to parents?	158	13	92.40%
5. Does your institution offer concussion education to athletes?	158	13	92.40%
6. Are you aware of existing MA legislation regarding youth sport-related concussions?	156	15	91.23%
7. Are you aware of MA DPH has created regulations to enforce the MA policy on youth sport-related concussions in public and charter middle and high schools?	156	15	91.23%
8. Are you aware the MA DPH's regulations on sport-related concussions require specific items? *(10 items listed)*	139	32	81.29%
9. Please rate the following statements from strongly disagree to strongly agree in regards to implementation of the MA DPH's sport-related concussion regulations. (5 items listed)	136	35	79.53%
10. Please rate the following statements from strongly disagree to strongly agree in regards to the willingness of parents, students, and coaches to complete the requirements of the concussion regulations. (5 items listed)	136	35	79.53%
11. What has made implementation of the policy on sport-related concussion easy?	88	83	51.46%
12. What has made implementation of the policy on sport-related concussion difficult?	90	81	52.63%
13. What would you recommend to improve implementation of the policy?	76	95	44.44%
14. What is your professional title?	133	38	77.78%
15. For how many years have you been employed in this role?	138	33	80.70%
16. For how many years have you been employed, in any role, in an institution working with middle or HS aged students?	137	34	80.12%
17. What is the zip code of the town where your institution is located?	133	38	77.78%
18. Approximately how many middle and/or HS students are enrolled in your institution?	135	36	78.95%
19. What is the highest level of education you have completed?	134	37	78.36%
20. What year were you born?	125	46	73.10%
21. What is your gender?	130	41	76.02%
22. What is the race/ethnicity you most identify with?	124	47	72.51%
23. Are you responsible for overseeing compliance with the MA policy on youth sport-related concussions at your institution?	137	34	80.12%
24. Who is responsible for overseeing compliance with the MA policy on youth sport-related concussions at your institution?	60	111	35.09%

Implications for Future Research

This study, being of an exploratory nature, raises several opportunities for future research, and the results of this study can be used to inform future research. A larger sample size and a methodology allowing for direct access to key school personnel would improve generalizability and transferability of findings. Given the study limitations regarding the indirect access of study participants, the limited number of respondents, and the survey attrition, more research is necessary to validate and further refine the findings of this study.

Future research should allow for participants to select multiple options for their self-report of race/ethnicity they most closely identify with. Future research should also include an option for respondents to note how they gender identify with an option for non-binary as well as allowing them the opportunity to self-describe in a comment box.

Future research could be conducted on the policy implementation in MA as well as in all other states. This would potentially allow researchers to compare the different policies regarding youth sport-related mTBIs in each of the 50 states and how the policies and the facilitators and barriers to their implementations compare.

Conclusion

Prevention and mitigation of mTBI and other head injuries is now a priority across all sports and ages, though youths are at the greatest risk (Concussion Legacy Foundation, 2015). In 2010, the Commonwealth of MA established the policy to protect youth from sport-related mTBIs. The policy mandates a head injury safety-training program for key personnel in all MA public schools and all other schools under the MA Interscholastic Athletic Association (MIAA) umbrella. Other aspects of the law include

written authorization required for participation in extracurricular athletic activity following unconsciousness or diagnosis of mTBI and maintenance of records showing compliance with the section. Implementation of the Policy was led by the MDPH, Division of Violence and Injury Prevention. This study found that those responsible for ensuring compliance with the guidelines developed to guide implementation, have concern that they are complex, unclear, burdensome, and difficult to follow.

Based on the findings of this study from the data collected in the fall of 2019, it seems that despite awareness of and reported compliance with this policy, there remains at least a perceived lack of understanding and appreciation of the risks associated with youth sport-related mTBIs. Respondents suggested that it can be challenging to get parents to complete the required educational component and that there instilling fear in the parents and athletes will help facilitate compliance and that parents and athletes fear reporting mTBIs and seeking treatment for fear of missing playing time. It can be argued that parents, athletes, and others would have an inherent fear of mTBIs and a willingness to comply with the Regulations if they truly understood the pathophysiology of injury and the associated severe risks. If parents, athletes, and others had a true understanding of mTBIs and the appropriate management of them, then the health of youth athletes would not be jeopardized through failure to efficiently recognize mTBIs and/or allowing youth athletes to return-to-play too soon following injury.

In summary, this study succeeded in investigating the perceptions of key personnel at MA public and charter schools regarding barriers to and facilitators of implementation of the policy on youth sport-related mTBIs. Based on the data collected in this study, it was also determined that key personnel at roughly 171 of 535 MA public and charter

schools were aware of the requirements of the policy; however, each of these schools has their own unique process and varied personnel responsible to enforce the policy. Finally, this study confirms that more work needs to be done to educate all involved parties on the serious risks of youth sport-related mTBIs and the importance of recognition of these injuries, reporting these injuries, and seeking appropriate treatment for these injuries.

APPENDIX A

TEXT OF MASSACHUSETTS POLICY ON SPORT-RELATED CONCUSSIONS: CHAPTER 111, SECTION 222

Section 222. (a) The department shall direct the division of violence and injury prevention to develop an interscholastic athletic head injury safety training program in which all public schools and any school subject to the Massachusetts Interscholastic Athletic Association rules shall participate. Participation in the program shall be required annually of coaches, trainers and parent volunteers for any extracurricular athletic activity; physicians and nurses who are employed by a school or school district or who volunteer to assist with an extracurricular athletic activity; school athletic directors; directors responsible for a school marching band; and a parent or legal guardian of a child who participates in an extracurricular athletic activity.

In developing the program, the division may use any of the materials readily available from the Centers for Disease Control and Prevention. The program shall include, but not be limited to: (1) current training in recognizing the symptoms of potentially catastrophic head injuries, concussions and injuries related to second impact syndrome; and (2) providing students that participate in any extracurricular athletic activity, including membership in a marching band, the following information annually: a summary of department rules and regulations relative to safety regulations for students participation in extracurricular athletic activities, including the medical protocol for post-concussion participation or participation in an extracurricular athletic activity; written information related to the recognition of symptoms of head injuries, the biology and the short-term and long-term consequences of a concussion.

(b) The department shall develop forms on which students shall be instructed to provide information relative to any sports head injury history at the start of each sports season. These forms shall require the signature of both the student and the parent or legal guardian thereof. Once complete, the forms shall be forwarded to all coaches prior to allowing any student to participate in an extracurricular athletic activity so as to provide coaches with up-to-date information relative to an athlete's head injury history and to enable coaches to identify students who are at greater risk for repeated head injuries.

(c) If a student participating in an extracurricular athletic activity becomes unconscious during a practice or competition, the student shall not return to the practice or competition during which the student became unconscious or participate in any extracurricular athletic activity until the student provides written authorization for such participation, from a licensed physician, licensed neuropsychologist, certified athletic trainer or other appropriately trained or licensed health care professional as determined by the department of public health, to the school's athletic director.

If a student suffers a concussion as diagnosed by a medical professional, or is suspected

to have suffered a concussion while participating in an extracurricular athletic activity, the student shall not return to the practice or competition during which the student suffered, or is suspected to have suffered, a concussion and shall not participate in any extracurricular athletic activity until the student provides written authorization for such participation, from a licensed physician, licensed neuropsychologist, certified athletic trainer or other appropriately trained or licensed health care professional as determined by the department of public health, to the school's athletic director.

(d) A coach, trainer or volunteer for an extracurricular athletic activity shall not encourage or permit a student participating in the activity to engage in any unreasonably dangerous athletic technique that unnecessarily endangers the health of a student, including using a helmet or any other sports equipment as a weapon.

(e) The superintendent of the school district or the director of a school shall maintain complete and accurate records of the district's or school's compliance with the requirements of this section. A school that fails to comply with this section, as determined by the department, shall be subject to penalties as determined by the department.

(f) Nothing in this section shall be construed to waive liability or immunity of a school district or its officers or employees. This section shall not create any liability for a course of legal action against a school district, its officers or employees.

(g) A person who volunteers to assist with an extracurricular athletic activity shall not be liable for civil damages arising out of any act or omission relating to the requirements of this section, unless such person is willfully or wantonly negligent in his act or omission.

(h) The division shall adopt regulations to carry out this section.

APPENDIX B

MA DPH REGULATION 105 CMR 201: HEAD INJURIES AND CONCUSSIONS IN EXTRACURRICULAR ATHLETIC ACTIVITIES
(Adapted from www.mass.gov/eohhs/docs/dph/com-health/injury/105-cmr-201.pdf)

Effective August 1, 2014

105 CMR 201.000: HEAD INJURIES AND CONCUSSIONS IN EXTRACURRICULAR ATHLETIC ACTIVITIES

201.001: Purpose
The purpose of 105 CMR 201.000 is to provide standardized procedures for persons involved in the prevention, training, management and return to activity decisions regarding students who incur head injuries while involved in extracurricular athletic activities, including but not limited to interscholastic sports, in order to protect their health and safety.

201.002: Authority
105 CMR 201.000 is promulgated pursuant to M.G.L. c. 111, § 222.

201.003: Citation
105 CMR 201.000 shall be known and may be cited as 105 CMR 201.000: *Head Injuries and Concussions in Extracurricular Athletic Activities*.Page 2 of 15

201.004: Scope
The requirements of 105 CMR 201.000 shall apply to all public middle and high schools, however configured, serving grades six through high school graduation, and other schools subject to the official rules of the Massachusetts Interscholastic Athletic Association. The requirements of 105 CMR 201.000 shall apply to students who participate in any extracurricular athletic activity.

201.005: Definitions
As used in 105 CMR 201.000, unless the context clearly requires otherwise, the following words shall have the following meanings:
Athlete means a student who prepares for or participates in an extracurricular athletic activity.
Athletic Director means an individual employed by a school district or school and responsible for administering the athletic program or programs of a school. The term Athletic Director refers to the Director and Assistant Directors. For schools that do not employ an Athletic Director, the term Athletic Director refers to the individual designated to be responsible for administering the athletic program or programs of a school.
Centers for Disease Control and Prevention refers to one of the major agencies of the United States Department of Health and Human Services with a mission to protect the health of people and communities through health promotion, prevention of disease, injury

and disability.
Coach means an employee or volunteer responsible for organizing and supervising student athletes to teach them the fundamental skills of extracurricular athletic activities. The term coach refers to both head coaches and assistant coaches.
Commissioner means the Commissioner of the Department of Public Health or his designee.
Concussion means a complex disturbance in brain function, due to direct or indirect trauma to the head, related to neurometabolic dysfunction, rather than structural injury.
Department means the Department of Public Health.
Diagnosed means a physician's, physician assistant's or nurse practitioner's opinion, derived from observation, examination, and evaluation of procedures or tests of a patient, that the patient has or had a concussion.
Extracurricular athletic activity means an organized school sponsored athletic activity generally occurring outside of school instructional hours under the direction of a coach, athletic director or band leader including but not limited to Alpine and Nordic skiing and snowboarding, baseball, basketball, cheerleading, cross country track, fencing, field hockey, football, golf, gymnastics, horseback riding, ice hockey, lacrosse, marching band, rifle, rugby, soccer, skating, softball, squash, swimming and diving, tennis, track (indoor and outdoor), ultimate frisbee, volleyball, water polo, and wrestling. All interscholastic athletics are deemed to be extracurricular athletic activities.
Game Official means a person who officiates at an extracurricular athletic activity, such as a referee or umpire including but not limited to persons enrolled as game officials in Massachusetts Interscholastic Athletic Association.
Head Injury means direct blow to the head or indirect trauma to the head including a concussion or traumatic brain injury. Scalp or facial laceration alone is not a head injury for purposes of 105 CMR 201.000.
Licensed Athletic Trainer means any person who is licensed by the Board of Registration in Allied Health Professions in accordance with M.G.L. c. 112, § 23A and 259 CMR 4.00 as a professional athletic trainer and whose practice includes schools and extracurricular athletic activities. Pursuant to M.G.L. c. 112, § 23A, the athletic trainer practices under the direction of a physician duly registered in the Commonwealth.
Massachusetts Interscholastic Athletic Association (MIAA) is a private, non-profit association organized by its member schools, public and private, to govern, coordinate and promote athletic activities in 33 or more sports for high school students.
MIAA Member Schools means all schools, whether public or private, that participate in interscholastic athletics under the auspices and rules of the Massachusetts Interscholastic Athletic Association.
Neuropsychologist means a professional who is licensed as a psychologist and as a health service provider by the Board of Registration of Psychologists pursuant to M.G.L. c. 112, §§ 118 through 129A with additional specialized training and expertise in the applied science of brain-behavior relationships and who has specific experience in evaluating neurocognitive, behavioral and psychological conditions and their relationship to central nervous system functioning. The neuropsychologist has specialized experience in administering and interpreting neuropsychological tests and has duties which may include, but are not limited to pre-injury measurement of the cognitive abilities that may be disturbed by a concussion, testing within the first few days post-head injury, and

periodic retesting to track resolution of the student's symptoms and improvement in cognitive functioning. The neuropsychologist may also advise school staff regarding the student's need for post injury academic accommodations.

Nurse Practitioner means a duly licensed and registered nurse authorized to practice in an expanded role as a nurse practitioner whose professional activities include performing physical examinations, diagnosing health and developmental problems, managing therapeutic regimens, and ordering therapies and tests.

Parent means the parent or guardian or foster parent of a student.

Physician means a duly licensed doctor of medicine or osteopathy.

Physician Assistant means a duly licensed and registered physician assistant who meets the requirements for registration as set forth in M.G.L. c.112, §9I. Play means a practice or competition.

School means a single school that operates under the direct administration of a principal, head master, director or school leader appointed by a school district, or a charter school board or independent school board of trustees. School includes a public school operated by a municipal or regional school district, an education collaborative established under M.G.L. c. 40, § 4E, or a school granted a charter by the Board of Elementary and Secondary Education under M.G.L. c. 71, §89 and 603 CMR 1.00: *Charter Schools* and operated by a board of trustees including Commonwealth and Horace Mann charter schools. School includes, but is not limited to, public and other schools that are members of MIAA. The term does not include associations of home-schooled students.

School-based Equivalent means a form or format that a school district or school develops in lieu of Department of Public Health forms, which at minimum include all of the information required by the most current Department form posted on the Department's website.

School district means a municipal school department or regional school district, acting through its school committee or superintendent of schools; a county agricultural school, acting through its board of trustees or superintendent director; a charter school, acting through its board of trustees or school leader; an educational collaborative; or any other public school established by statute or charter, acting through its governing board.

School Nurse means a nurse practicing in a school setting, who is licensed to practice as a Registered Nurse by the Board of Registration in Nursing pursuant to M.G.L. c. 112, who is licensed to work as an educator in a school by the Department of Elementary and Secondary Education pursuant to 603 CMR 7.00: *Educator Licensure and Preparation Program Approval*, and who is appointed or assigned to a public school by a school committee or a board of health in accordance with M.G.L. c. 71, §53 or employed by a superintendency district comprised of several towns in accordance with M.G.L. c. 71, §§ 53A and 53B or, who is employed, in the case of a charter or private school, by a board of trustees.

School Physician means a licensed physician practicing in a school setting including but not limited to a physician who is appointed or employed by a school committee or board of health in accordance with M.G.L. c. 71, § 53, or employed by a superintendency district comprised of several towns in accordance M.G.L. c. 71, §§ 53A, 53B or, in the case of a charter or private school, by the board of trustees. School physician includes, but is not limited to, physicians assigned to examine children who apply for health certificates in order to obtain an employment permit pursuant to M.G.L. c. 71, §54 and

team physicians.
School Health Advisory/Wellness Committee means a committee consisting of school and community members who advise a school district on its comprehensive, coordinated school health program.
Second impact syndrome means a potentially lethal condition that can occur when a person sustains a head injury prior to complete healing of a previous brain injury, causing dysregulation of cerebral blood flow with subsequent vascular engorgement.
Sports means extracurricular athletic activities.
Student means a person enrolled for part-time or full-time attendance in an educational program operated by a school or school district, including home schoolers.
Teacher means any person employed in a school or school district under a license listed in 603 CMR 7.00: *Educator Licensure and Preparation Program Approval* or person employed to teach students in a non-public school.
Team physician means a physician assigned to an interscholastic football game played by any team representing a public secondary school in the Commonwealth pursuant to M.G.L. c. 71, § 54A.
Trainer means a person who provides students who participate in an extracurricular athletic activity with health and fitness instruction, including but not limited to the fundamental skills of performance, strength, or conditioning, but who is not licensed as an athletic trainer.
Traumatic brain injury (TBI) means a complex pathophysiological process affecting the brain, induced by traumatic biomechanical forces. TBI may be caused either by a direct blow to the head, face, neck or elsewhere on the body with an impulsive force transmitted to the head. TBI includes, but is not limited to, a concussion.
Volunteer means an adult who volunteers as a game official, coach, assistant coach, team parent, physician, nurse, or in an authoritative role to assist students who are engaged in an extracurricular athletic activity.

201.006: School Policies

(A) All school districts and schools must have policies and procedures governing the prevention and management of sports-related head injuries within the school district or school. The School Committee or Board of Trustees, consulting with the Board of Health where appropriate, shall adopt policies and procedures governing the prevention and management of sports-related head injuries within the school district or school following development of a proposal by a team consisting, at a minimum, of a school administrator, school nurse, school or team physician if on staff, athletic director, licensed athletic trainer if on staff, neuropsychologist if available, guidance counselor, and teacher in consultation with any existing school health/wellness advisory committee. Policies and procedures must address sports-related head injuries occurring in extracurricular athletic activities but may be applied to all head injuries in students. Review and revision of such policies and procedures shall occur as needed but at least every two years. At a minimum, these policies shall include:

(1) Designation, by the superintendent or head master, principal or school leader, of the person responsible for the implementation of these policies and protocols, either the

Athletic Director or other school personnel with administrative authority;

(2) Annual training of persons specified in 105 CMR 201.007 in the prevention and recognition of a sports-related head injury, and associated health risks including second impact syndrome, including second impact syndrome, utilizing Department-approved training materials or program, and documentation of each person's completion of such training;

(3) Documentation of physical examination prior to a student's participation in extracurricular athletic activities on an annual basis, consistent with 105 CMR 200.100(B)(3): *Physical Examination of School Children*, and information for students participating in multiple sports seasons that documentation of one physical examination each year is sufficient;

(4) Procedure for the school to obtain and ensure review, prior to each sports season, of current information regarding an athlete's history of head injuries and concussions using either the Department Pre- participation Head Injury/Concussion Reporting Form For Extracurricular Activities (herein after "Pre-participation Form"), or school-based equivalent;

(5) Procedure for medical or nursing review of all Pre-participation Forms indicating a history of head injury;

(6) Procedure for the school to obtain and ensure timely medical or nursing review of a Department Report of a Head Injury During Sports Season Form (herein after "Report of Head Injury Form"), or school-based equivalent, in the event of a head injury or suspected concussion that takes place during the extracurricular activity season;

(7) Procedure for reporting head injuries or suspected concussions sustained during extracurricular athletic activities to the school nurse and licensed athletic trainer, if on staff;

(8) Procedure for identifying a head injury or suspected concussion, removing an athlete from practice or competition, and referring for medical evaluation;

(9) The protocol for medical clearance for return to play after a concussion that at minimum complies with 105 CMR 201.011;

(10) Procedure for the development and implementation of post- concussion graduated reentry plans to school and academic activities, if indicated, by persons specified in 105 CMR 201.010(E)(1);

(11) Procedure for providing information and necessary forms and materials, to all parents and athletes including the:

- (a) annual training requirement,
- (b) procedure for the school to notify parents when an athlete has been removed from play for a head injury or suspected concussion sustained during an extracurricular athletic activity,
- (c) protocol for obtaining medical clearance for return to play and academics after a diagnosed concussion,
- (d) parent's responsibility for completion of the Pre-participation Form, or school-based equivalent, and
- (e) parent's responsibility for completion of the Report of a Head Injury Form, or school-based equivalent;

(12) Inclusion in the student and parent handbooks of information regarding the sports-

related head injury policy and how to obtain the policy;

(13) Procedure for communicating with parents with limited English proficiency; (14) Procedure for outreach to parents who do not return completed forms required for students to participate in extracurricular sports and for how to handle situations where a student verifies completion of the annual training requirement but a parent has not;

(15) Procedure for sharing information concerning an athlete's history of head injury and concussion, recuperation, reentry plan, and authorization to return to play and academic activities on a need to know basis consistent with requirements of 105 CMR 201.000 and applicable federal and state law including but not limited to the Massachusetts Student Records Regulations, 603 CMR 23.00, and the Federal Family Educational Rights and Privacy Act Regulations, 34 CFR Part 99.

(16) Instructions to coaches, licensed athletic trainers, trainers and volunteers:

(a) to teach form, techniques and skills and promote protective equipment use to minimize sports-related head injury, and

(b) to prohibit athletes from engaging in any unreasonably dangerous athletic technique that endangers the health or safety of an athlete, such as using a helmet or any other sports equipment as a weapon;

(17) Penalties, including but not limited to personnel sanctions and forfeiture of games, for failure to comply with provisions of the school district's or school's policy.

(B) These policies and procedures shall be made available to the Department and to the Department of Elementary and Secondary Education upon request.

(C) The school or school district shall provide the Department with an affirmation, on school or school district letterhead, that it has developed policies in accordance with 105 CMR 201.000 and it shall provide an updated affirmation biannually by September 30th every odd numbered year upon review or revision of its policies.

201.007: Training Program

(A) The following persons annually shall complete one of the head injury safety training programs approved by the Department as found on the Department's website:

(1) Coaches;
(2) Licensed athletic trainers;
(3) Trainers;
(4) Volunteers;
(5) School and team physicians;
(6) School nurses;
(7) Athletic Directors;
(8) Directors responsible for a school marching band, whether employed by a school or school district or serving in such capacity as a volunteer;
(9) Parents of a student who participates in an extracurricular athletic activity; and
(10) Students who participate in an extracurricular athletic activity.

(B) The required training applies to one school year and must be repeated for every subsequent year.

(C) Each school shall maintain a record of completion of annual training for all persons specified by 105 CMR 201.007(A) through:
(1) a certification of completion for any Department-approved on-line course; or
(2) a signed acknowledgment that the individual has read and understands Department-approved written materials required by 105 CMR 201.008(A)(1); or
(3) an attendance roster from a session using Department-approved training; or
(4) other means specified in school policies and procedures.

(D) If a school district or school offers head injury safety training to guidance counselors, physical education teachers, classroom teachers or other school personnel, the school district or school at minimum shall offer one of the current head injury safety training programs approved by the Department as specified on the Department's website.

(E) Game officials shall complete one of the training programs approved by the Department as specified on the Department's website annually and shall provide independent verification of completion of the training requirement to schools or school districts upon request.

201.008: Participation Requirements for Students and Parents

(A) Pre-participation Requirements:
(1) Each year,a school district or school shall provide current Department-approved training, written materials or a list and internet links for Department-approved on-line courses to all students who plan to participate in extracurricular athletic activities and their parents in advance of the student's participation.
(2) All students who plan to participate in extracurricular athletic activities and their parents shall satisfy the following pre-participation requirements:
(a) Each year, before the student begins practice or competition, the student and their parents shall: 1.Complete current Department-approved training regarding head injuries and concussions in extracurricular athletic activities; and 2.Provide the school with a certification of completion for any Department-approved on-line course or a signed acknowledgment that they have read and understand Department-approved written materials, unless they have attended a school-sponsored training at which attendance is recorded or satisfied other means specified in school policies.
(b) Before the start of every sports season, the student and the parent shall complete and submit a current Pre-participation Form, or school-based equivalent, signed by both, which provides a comprehensive history with up-to-date information concussion history; any head, face or cervical spine injury history; and any history of co-existent concussive injuries.

(B) Ongoing Requirements: If a student sustains a head injury or concussion during

the season, but not while participating in an extracurricular athletic activity, the parent shall complete the Report of Head Injury Form, or a school- based equivalent, and submit it to the coach, school nurse or person specified in school policies and procedures.

201:009: Documentation and Review of Head Injury and Concussion History and Forms

(A) The school shall ensure that all forms or information from all forms that are required by 105 CMR 201.000 are completed and reviewed, and shall make arrangements for: (1) Timely review of all Pre-participation and Report of Head Injury Forms, or school-based equivalents, by coaches so as to identify students who are at greater risk of repeated head injuries. (2) Timely review of all Pre-participation Forms which indicate a history of head injury and Report of Head Injury Forms, or school-based equivalents, by: (a) the school nurse and (b) the school physician if appropriate; and (3) Timely review of accurate, updated information regarding each athlete who has reported a history of head injury or a head injury during the sports season by: (a) the team's physician if any, and (b) the school's licensed athletic trainer if any.

(B) The school may use a student's history of head injury or concussion as a factor to determine whether to allow the student to participate in an extracurricular athletic activity or whether to allow such participation under specific conditions or modifications.

201.010: Exclusion from Play

(A) Any student, who during a practice or competition, sustains a head injury or suspected concussion, or exhibits signs and symptoms of a concussion, or loses consciousness, even briefly, shall be removed from the practice or competition immediately and may not return to the practice or competition that day.
(B) The student shall not return to practice or competition unless and until the student provides medical clearance and authorization as specified in 105 CMR 201.011.
(C) The coach shall communicate the nature of the injury directly to the parent in person or by phone immediately after the practice or competition in which a student has been removed from play for a head injury, suspected concussion, signs and symptoms of a concussion, or loss of consciousness. The coach also must provide this information to the parent in writing, whether paper or electronic format, by the end of the next business day.
(D) The coach or his or her designee shall communicate, by the end of the next business day, with the Athletic Director and school nurse that the student has been removed from practice or competition for a head injury, suspected concussion, signs and symptoms of a concussion, or loss of consciousness.
(E) Each student who is removed from practice or competition and subsequently diagnosed with a concussion shall have a written graduated reentry plan for return to full academic and extracurricular athletic activities.

(1) The plan shall be developed by the student's teachers, the student's guidance counselor, school nurse, licensed athletic trainer if on staff,

neuropsychologist if available or involved, parent, members of the building-based student support and assistance team or individualized education program team as appropriate and in consultation with the student's primary care provider or the physician who made the diagnosis or who is managing the student's recovery.

(2) The written plan shall include instructions for students, parents and school personnel, addressing but not be limited to: (a) Physical and cognitive rest as appropriate; (b) Graduated return to extracurricular athletic activities and classroom studies as appropriate including accommodations or modifications as needed; (c) Estimated time intervals for resumption of activities; (d) Frequency of assessments, as appropriate, by the school nurse, school physician, team physician, licensed athletic trainer if on staff, or neuropsychologist if available until full return to classroom activities and extracurricular athletic activities are authorized; and (e) A plan for communication and coordination between and among school personnel and between the school, the parent, and the student's primary care provider or the physician who made the diagnosis or who is managing the student's recovery.

(3) The student diagnosed with a concussion must be completely symptom free at rest in order to begin graduated reentry to extracurricular athletic activities. The student must be symptom free at rest, during exertion, and with cognitive activity in order to complete the graduated re-entry plan and be medically cleared to play under 105 CMR 201.011.

201.011: Medical Clearance and Authorization to Return to Play

Each student who is removed from practice or competition for a head injury or suspected concussion, or loses consciousness, even briefly, or exhibits signs and symptoms of a concussion shall obtain and present to the Athletic Director, unless another person is specified in school policy or procedure, a Department Post Sports-Related Head Injury Medical Clearance and Authorization Form (herein after "Medical Clearance and Authorization Form"), or school-based equivalent, prior to resuming the extracurricular athletic activity. This form must be completed by a physician or one of the individuals as authorized by 105 CMR 201.011(A). The ultimate return to play decision is a medical decision that may involve a multidisciplinary approach, including consultation with parents, the school nurse and teachers as appropriate.

(A) Only the following individuals may authorize a student to return to play:

(1) A duly licensed physician;

(2) A duly licensed athletic trainer in consultation with a licensed physician;

(3) A duly licensed nurse practitioner in consultation with a licensed physician;

(4) A duly licensed physician assistant under the supervision of a licensed physician; or

(5) A duly licensed neuropsychologist in coordination with the physician managing the student's recovery.

(B) Physicians, nurse practitioners, physician assistants, licensed athletic trainers and neuropsychologists providing medical clearance for return to play shall verify that they have received Department-approved training in post traumatic head injury assessment and management or have received equivalent training as part of their licensure or continuing education.

201.012: Responsibilities of the Athletic Director

(A) The Athletic Director shall participate in the development and biannual review of the policies and procedures required by 105 CMR 201.006 for the prevention and management of sports-related head injuries within the school district or school.

(B) The Athletic Director shall complete the annual training as required by 105 CMR 201.007.

(C) The Athletic Director, unless school policies and procedures provide otherwise, shall be responsible for:

(1) Ensuring that the training requirements for staff, parents, volunteers, coaches and students are met, recorded, and records are maintained in accord with 105 CMR 201. 016;

(2) Ensuring that all students meet the physical examination requirements consistent with 105 CMR 200.000: *Physical Examination of School Children* prior to participation in any extracurricular athletic activity;

(3) Ensuring that all students participating in extracurricular athletic activities have completed and submitted Pre-participation Forms, or school-based equivalents, prior to participation each season;

(4) Ensuring that students' Pre-participation Forms, or school-based equivalents, are reviewed according to 105 CMR 201.009(A);

(5) Ensuring that the Report of Head Injury Forms, or school-based equivalents, are completed by the parent or coach and reviewed by the coach, school nurse, licensed athletic trainer and school physician as specified in 105 CMR 201.009(A);

(6) Ensuring that athletes are prohibited from engaging in any unreasonably dangerous athletic technique that endangers the health or safety of an athlete, including using a helmet or any other sports equipment as a weapon; and

(7) Reporting annual statistics to the Department in accord with 105 CMR 201. 017.

201.013: Responsibilities of Coaches

(A) Coaches shall be responsible for:

(1) Completing the annual educational training as required by 105 CMR.201.007;

(2) Reviewing Pre-participation Forms, or school-based equivalents, so as to identify those athletes who are at greater risk for repeated head injuries;

(3) Completing a Report of Head Injury Form, or school-based equivalent, upon identification of a student with a head injury or suspected concussion that occurs during practice or competition;

(4) Receiving, unless otherwise specified in school policies and procedures, and reviewing forms that are completed by a parent which report a head injury during the sports season, but outside of an extracurricular athletic activity, so as to identify those athletes who are at greater risk for repeated head injuries;

(5) Transmitting promptly forms in 105 CMR 201.013(A)(2) and (3) to the school nurse for review and maintenance in the student's health record, unless otherwise specified in school policies and procedures;
(6) Teaching techniques aimed at minimizing sports-related head injury;
(7) Discouraging and prohibiting athletes from engaging in any unreasonably dangerous athletic technique that endangers the health or safety of an athlete, including using a helmet or any other sports equipment as a weapon; and
(8) Identifying athletes with head injuries or suspected concussions that occur in play or practice and removing them from play. Coaches are responsible for communicating promptly with the parent of any student removed from practice or competition as directed in 105 CMR 201.010(C) and with the Athletic Director and school nurse as directed in 105 CMR 201.010(D).

201.014: Responsibilities of the Licensed Athletic Trainers

Licensed athletic trainers, if on staff, shall be responsible for:

(A) -Participating in the development and biannual review of the policies and procedures required by 105 CMR 201.006 for the prevention and management of sports-related head injuries within the school district or school;
(B) Completing the annual training as required by 105 CMR 201.007;
(C) Reviewing information from Pre-participation Forms, or school-based equivalents, which indicate a history of head injury and from Report of Head Injury Forms, or school-based equivalents, to identify students who are at greater risk for repeated head injuries;
(D) Identifying athletes with head injuries or suspected concussions that occur in practice or competition and removing them from play; and
(E) Participating, if available, in the graduated reentry planning and implementation for students who have been diagnosed with a concussion.

201.015: Responsibilities of the School Nurse

The School Nurse shall be responsible for:

(A) Participating in the development and biannual review of the policies and procedures required by 105 CMR 201.006 for the prevention and management of sports-related head injuries within the school district or school;
(B) Completing the annual training as required by 105 CMR 201.007;
(C) Reviewing, or arranging for the school physician to review, completed Pre-participation Forms, or school-based equivalents, that indicate a history of head injury and following up with parents as needed prior to the student's participation in extracurricular athletic activities;
(D) Reviewing, or arranging for the school physician to review, Report of Head Injury Forms, or school-based equivalents, and following up with the coach and parent as needed;
(E) Maintaining: (1) Pre-participation Forms, or school-based equivalents; and (2) Report of Head Injury Forms, or school-based equivalents, in the student's health record;
(F) Participating in the graduated reentry planning for students who have been

diagnosed with a concussion to discuss any necessary accommodations or modifications with respect to academics, course requirements, homework, testing, scheduling and other aspects of school activities consistent with a graduated reentry plan for return to full academic and extracurricular activities after a head injury and revising the health care plan as needed;

(G) Monitoring recuperating students with head injuries and collaborating with teachers to ensure that the graduated reentry plan for return to full academic and extracurricular activities required by 105 CMR 201. 010(E) is being followed; and

(H) Providing ongoing educational materials on head injury and concussion to teachers, staff and students.

201.016: Record Maintenance

(A) The school, consistent with any applicable state and federal law, shall maintain the following records for three years or at a minimum until the student graduates:

(1) Verifications of completion of annual training and receipt of materials;
(2) Department Pre-participation Forms, or school-based equivalents;
(3) Department Report of Head Injury Forms, or school-based equivalents;
(4) Department Medical Clearance and Authorization Forms, or school-based equivalents; and
(5) Graduated reentry plans for return to full academic and extracurricular activities.

(B) The school shall make these records available to the Department and the Department of Elementary and Secondary Education, upon request or in connection with any inspection or program review.

201.017: Reporting

Schools shall be responsible for maintaining and reporting annual statistics on a Department form or electronic format that at minimum report:

(A) The total number of Department Report of Head Injury Forms, or school-based equivalents, received by the school; and

(B) The total number of students who incur head injuries and suspected concussions when engaged in any extracurricular athletic activities.

REGULATORY AUTHORITY 105 CMR 201.000: M.G.L. c. 111, § 222.

APPENDIX C

PRE-PARTICIPATION FORM

DEVAL L. PATRICK
GOVERNOR

TIMOTHY P. MURRAY
LIEUTENANT GOVERNOR

JUDYANN BIGBY, MD
SECRETARY

JOHN AUERBACH
COMMISSIONER

The Commonwealth of Massachusetts
Executive Office of Health and Human Services
Department of Public Health
250 Washington Street, Boston, MA 02108-4619

PRE-PARTICIPATION HEAD INJURY/CONCUSSION REPORTING FORM FOR EXTRACURRICULAR ACTIVITIES

This form should be completed by the student's parent(s) or legal guardian(s). It must submitted to the Athletic Director, or official designated by the school, *prior* to the start of each season a student' plans to participate in an extracurricular athletic activity.

Student's Name	Sex	Date of Birth	Grade
School		Sport(s)	
Home Address			Telephone

Has student ever experienced a traumatic head injury (a blow to the head)? Yes_____ No_____

If yes, when? Dates (month/year): _____

Has student ever received medical attention for a head injury? Yes_____ No_____

If yes, when? Dates (month/year): _____

If yes, please describe the circumstances:

Was student diagnosed with a concussion? Yes_____ No_____

If yes, when? Dates (month/year): _____

Duration of Symptoms (such as *headache, difficulty concentrating, fatigue*) for most recent concussion: _____

Parent/Guardian:
Name: _____Signature/Date _____
(Please print)

Student Athlete:
Signature/Date _____

APPENDIX D

REPORT OF HEAD INJURY FORM

The Commonwealth of Massachusetts
Executive Office of Health and Human Services
Department of Public Health
250 Washington Street, Boston, MA 02108-4619

DEVAL L. PATRICK
GOVERNOR
TIMOTHY P. MURRAY
LIEUTENANT GOVERNOR
JUDYANN BIGBY, MD
SECRETARY
JOHN AUERBACH
COMMISSIONER

REPORT OF HEAD INJURY DURING SPORTS SEASON

This form is to report head injuries (other than minor cuts or bruises) that occur during a sports season. It should be returned to the athletic director or staff member designated by the school and reviewed by the school nurse.

For Coaches: Please complete this form immediately after the game or practice for head injuries that result in the student being removed from play due to a *possible* concussion.

For Parents/Guardians: Please complete this form if your child has a head injury outside of school related extracurricular athletic activities.

Student's Name	Sex	Date of Birth	Grade
School		Sport(s)	
Home Address		Telephone	

Date of injury: _____

Did the incident take place during an extracurricular activity? _____ Yes ____ No

If so, where did the incident take place? _____

Please describe nature and extent of injuries to student:

For Parents/Guardians:
Did the student receive medical attention? yes_____ no_____
If yes, was a concussion diagnosed? yes____ no _____

I HEREBY STATE THAT TO THE BEST OF MY KNOWLEDGE, MY ANSWERS TO THE ABOVE QUESTIONS ARE COMPLETE AND CORRECT.
Please circle one: Coach or Marching Band Director Parent/Guardian

Name of Person Completing Form (please print): _____

Signature _____ Date _____

APPENDIX E

POST SPORTS-RELATED HEAD INJURY MEDICAL CLEARANCE AND AUTHORIZATION FORM

The Commonwealth of Massachusetts
Executive Office of Health and Human Services
Department of Public Health

POST SPORTS-RELATED HEAD INJURY MEDICAL CLEARANCE AND AUTHORIZATION FORM

The student must be completely symptom free at rest, during exertion, and with cognitive activity prior to returning to full participation in extracurricular athletic activities. Do not complete this form until a graduated return to play plan has been completed and the student is found to be symptom free at rest, during exertion and with cognitive activity.

Student's Name	Sex	Date of Birth	Grade

Date of injury: _____ Nature and extent of injury: _____

Symptoms following injury (check all that apply):

☐ Nausea or vomiting	☐ Headaches	☐ Light/noise sensitivity
☐ Dizziness/balance problems	☐ Double/blurry vision	☐ Fatigue
☐ Feeling sluggish/"in a fog"	☐ Change in sleep patterns	☐ Memory problems
☐ Difficulty concentrating	☐ Irritability/emotional ups and downs	☐ Sad or withdrawn
☐ Other		

Duration of Symptom(s): _____ Diagnosis: ☐ Concussion ☐ Other: _____
If concussion diagnosed, date student completed graduated return to play plan without recurrent symptoms: _____

Prior concussions (number, approximate dates): _____

I HEREBY AUTHORIZE THE ABOVE NAMED STUDENT FOR RETURN TO EXTRACURRICULAR ATHLETIC ACTIVITY

Practitioner signature: _____ Date: _____
Print Name: _____
☐ Physician ☐ Licensed Athletic Trainer ☐ Nurse Practitioner ☐ Neuropsychologist ☐ Physician Assistant
License Number: _____
Address: _____ Phone number: _____
Name of Physician providing consultation/coordination/supervision (if not person completing this form; please print): _____

I ATTEST THAT I HAVE RECEIVED CLINICAL TRAINING IN POST-TRAUMATIC HEAD INJURY ASSESSMENT AND MANAGEMENT APPROVED BY THE DEPARTMENT OF PUBLIC HEALTH* OR HAVE RECEIVED EQUIVALENT TRAINING AS PART OF MY LICENSURE OR CONTINUING EDUCATION.

Practitioner's initials: _____
Type of Training: ☐ CDC on-line clinician training ☐Other MDPH approved Clinical Training ☐ Other (Describe)_____
* MDPH approved Clinical Training options can be found at: www.mass.gov/dph/sports concussion
This form is not complete without the practitioner's verification of such training.

APPENDIX F

YEAR-END REPORTING FORM

The Commonwealth of Massachusetts
Executive Office of Health and Human Services
Department of Public Health
250 Washington Street, Boston, MA 02108-4619

DEVAL L. PATRICK
GOVERNOR
JOHN W. POLANOWICZ
SECRETARY
CHERYL BARTLETT, RN
COMMISSIONER

Tel: 617-624-5000
Fax: 617-624-5075
www.mass.gov/dph

105 CMR 201.000: Head Injuries and Concussions In Extracurricular Athletic Activities

YEAR END REPORTING FORM FOR SCHOOLS, 2013-2014

This is a two page form.
Instructions for completing this form and other frequently asked questions begin on **page 3.**

This form should be completed and returned via email to DPH-ConcussionPolicies@MassMail.State.MA.US
Or mailed in hard copy to: Linda Brown, Division of Violence and Injury Prevention,
4th Floor, Massachusetts Department of Public Health; 250 Washington Street; Boston, MA 02108
Due by August 31, 2014

Person Completing this Form, Name: _____ Title: _____

Email: _____

School District: _____

School Name: _____

Grades included in the School (check all that apply): 6☐ 7☐ 8☐ 9☐ 10☐ 11☐ 12☐

Required Reporting Information (All counts should be for *individual schools* and for school year 2013-2014 only):

1) Please indicate the total number of Report of Head Injury Forms received by this school in school year 2013-2014: _____

2) Please indicate whether the Report of Head Injury Forms are required to be submitted to this school only for students participating in extracurricular athletics/school sports or for all students.

Student Athletes Only ☐
All Students ☐
Unknown ☐

3) Please indicate how many Report of Head Injury Forms this school received which indicated that the injury occurred w*hen engaged in school sports*: ☐

Optional Reporting Information:

4) Total number of Medical Clearance/Return to Play Forms this school received in school year 2013-2014: ☐

5) Total school enrollment
   Middle School: ☐ High School: ☐

If there is any additional information collected by your school on student concussion that you wish to provide, please provide below or attach.

APPENDIX G

RAFFLE PRIZES

Four winners received $50 gift cards to Amazon.com

One Grand Prize winner received a $100 gift card to Amazon.com

APPENDIX H

COVER LETTER TO PARTICIPANTS

Date:

University of Massachusetts Boston
Department of Nursing and Health Sciences
100 Morrissey Boulevard
Boston, MA 02125

Implementation of the Massachusetts Policy on Youth Sport-Related Mild Traumatic Brain Injuries: Perceptions of Key Personnel at MA Public and Charter Schools

Dear School Principal/Superintendent,

I am a doctoral candidate in Nursing at the University of Massachusetts Boston. As I'm sure you are aware, sport-concussions (often called mild traumatic brain injuries) are a serious public health concern that is of particular concern to the population you educate. Between 1999-2009 emergency department visits for sport-related concussions in youths under the age of 19 have increased by a whopping 60%. In the interest of improving the outcomes of our youth athletes in the state of MA, I'm asking for your help in conducting a research study to explore experiences with the implementation of the MA Policy on youth sport-related mild traumatic brain injuries. I'm hopeful you will complete the very brief survey found at the end of this email **and** that you will please forward this email to any and all of the following staff at your institution: **athletic directors, athletic trainers, school nurses, and coaches** so that I may obtain their perspectives as well.

Your participation with this survey is voluntary and refusal to participate or withdraw from participation will involve no penalty. Participants who complete the survey will be entered into a raffle to win Amazon gift cards. Four winners will receive a $50 Amazon.com gift card, and 1 Grand Prize winner will earn a $100 Amazon.com gift card. All information obtained from the surveys will be reported in the aggregate without any identifying information. An executive summary of the survey results will be provided for participants.

Completion of the web-based survey will indicate consent to participate in this study. This study (has been) deemed exempt by the University of Massachusetts Boston Institutional Review Board (IRB). Please contact me directly at or my advisor, Dr. Laura Hayman at (617) 287-7504 for any questions you may have about this research. Thank you for your time and participation.

Gretchen A. Kilbourne, BSN, MS, PhD(c), RN
Doctoral Candidate
College of Nursing and Health Sciences - University of Massachusetts Boston
Link to survey: https://www.surveymonkey.com/s/sportconcussions

APPENDIX I

FOLLOW-UP LETTER TO PARTICIPANTS

Date:
University of Massachusetts Boston
Department of Nursing and Health Sciences
100 Morrissey Boulevard
Boston, MA 02125

Implementation of the Massachusetts Policy on Youth Sport-Related Mild Traumatic Brain Injuries: Perceptions of Key Personnel at MA Public and Charter Schools

Dear School Personnel,

Recently I sent you an invitation to participate in a brief survey about your experiences with the implementation of the MA Policy on youth sport-related mild traumatic brain injuries, commonly called concussions. I also asked that you forward the survey link to athletic directors, athletic trainers, coaches, and/or school nurses at your institution.

If you have already completed the survey and/or forwarded the link, thank you.

If you have not yet had a chance to complete the survey, please try to find 5-6 minutes of your time to do so at the following link:

https://www.surveymonkey.com/s/sportconcussions

Your responses will greatly benefit this study.

Thank you very much for your time and attention.

Sincerely,

Gretchen A. Kilbourne, MS, PhD(c), RN
Doctoral Candidate
College of Nursing and Health Sciences
University of Massachusetts Boston

APPENDIX J

SURVEY ON THE FACILITATORS AND BARRIERS TO IMPLEMENTATION OF THE MA POLICY ON YOUTH SPORT-RELATED CONCUSSION

Page 1

Survey on the Facilitators and Barriers to Implementation of the MA Policy on Youth Sport-Related Concussions

Participation in this survey is voluntary. Your answers are confidential and no information linking your answers to you will be kept. You may terminate participation at any time by closing the web browser. If you complete the entire survey then you will automatically be entered into the raffle for the Amazon gift cards.

Next

Page 2

1. Do you currently work in an institution that offers sports to middle or high school aged students?

- ◯ Yes
- ◯ No

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Note: If answer selected to question #1 is "no", respondent will skip to end of survey.

Page 3

2. Are you aware of an existing policy in your institution regarding concussion prevention and management?

- ◯ Yes
- ◯ No

3. Have you completed an approved concussion education training?

- ◯ Yes
- ◯ No

4. Does your institution offer concussion education to parents?

- ◯ Yes
- ◯ No
- ◯ Unsure

5. Does your institution offer concussion education to athletes?

- ◯ Yes
- ◯ No
- ◯ Unsure

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Page 4

6. Are you aware of existing Massachusetts legislation regarding youth sport-related concussions?

- ○ Yes
- ○ No

7. Are you aware the Department of Public Health has created regulations to enforce the Massachusetts Policy on youth sport-related concussions in public and charter middle and high schools?

- ○ Yes
- ○ No

Note: If answer selected to question #7 is "no", respondent will skip to page 7.

Page 5

8. Are you aware the Department of Public Health's regulations on sport-related concussions require: (please check all that apply)

- ☐ Policies and procedures governing the prevention and management of sport-related concussions within the school or school district
- ☐ Concussion education for parents
- ☐ Concussion education for athletes
- ☐ Concussion education for coaches
- ☐ Collecting and maintaining pre-participation documentation from athletes
- ☐ Collecting and maintaining documentation for all SUSPECTED or ACTUAL concussions that occur during extracurricular activities
- ☐ The immediate removal from play of any athlete with a SUSPECTED or ACTUAL concussion that occurs during extracurricular activities
- ☐ An athlete to receive medical clearance from an approved clinician before returning-to-play after a SUSPECTED or ACTUAL concussion
- ☐ Sport-related concussion documentation to be submitted to the Department of Public Health at the conclusion of each school year
- ☐ None of the above

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Note: If answer selected to question #8 is "none of the above", respondent will skip to page 7.

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9. The following questions are about implementation of the Department of Public Health's sport-related concussion regulations (DPH Regulations). Please rate each statement on a scale from strongly disagree to strongly agree.

	Strongly disagree	Disagree	Unsure	Strongly Agree	Agree
My peers are aware of the DPH Regulations	○	○	○	○	○
The DPH Regulations are easy to understand	○	○	○	○	○
The DPH Regulations are easy to implement	○	○	○	○	○
Implementing the DPH Regulations is too time consuming	○	○	○	○	○
The DPH Regulations are effective at their aim to provide standardized procedures for sport-related head injuries in order to protect the health and safety of students	○	○	○	○	○

10. Please answer the following questions about the willingness of parents, students, and coaches to complete the requirements of the concussion regulations.

	Strongly disagree	Disagree	Unsure	Agree	Strongly agree
Parents are cooperative with participating in required trainings / completing required documentation	○	○	○	○	○
Students are cooperative with participating in required trainings / completing required documentation	○	○	○	○	○
Coaches are cooperative with participating in required trainings / completing required documentation	○	○	○	○	○

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Page 7

11. What has made implementation of the policy on sport-related concussions easy?

12. What has made implementation of the policy on sport-related concussions difficult?

13. What would you recommend to improve implementation of the policy?

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Page 8

14. What is your professional title?

- ◯ Athletic Director
- ◯ Athletic Trainer
- ◯ Coach
- ◯ Principal
- ◯ School Nurse
- ◯ Superintendent

Other (please specify)

15. For how many years have you been employed in this role?

16. For how many years have you been employed, in any role, in an institution working with middle school or high school aged students?

17. What is the zip code of the town where your institution is located? (Please provide the name of the town if the zip code is unknown).

18. Approximately how many middle and/or high school students are enrolled in your institution?

19. What is the highest level of education you have completed?

- ◯ High School Diploma / GED
- ◯ Associates Degree
- ◯ Bachelors Degree
- ◯ Masters Degree
- ◯ Doctoral Degree (PhD, DNP, EdD, etc.)

Other (please specify)

20. What year were you born?

21. What is your gender?

- ◯ Male
- ◯ Female

22. What is the race/ethnicity you most identify with?

- ◯ American Indian or Alaska Native
- ◯ Asian
- ◯ Black or African American
- ◯ Hawaiian Native or Other Pacific Islander
- ◯ Hispanic
- ◯ White

Other (please specify)

23. Are you responsible for overseeing compliance with the MA Policy on youth sport-related concussions (collecting prior head injury forms, ensuring coaches, parents and athletes attend head injury training, etc.) at your institution?

- ◯ Yes
- ◯ No

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Note: If answer selected to question #23 is "yes" respondent will skip to page 10.

Page 9

24. Who is responsible for overseeing compliance with the MA Policy on youth sport-related concussions (collecting prior head injury forms, ensuring coaches, parents and athletes attend head injury training, etc.) at your institution?

- ○ Athletic director
- ○ Athletic trainer
- ○ Coach
- ○ Principal
- ○ School nurse
- ○ Superintendent
- ○ Unsure
- ○ Other (please specify)

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Page 10

25. Thank you for completing this survey. Please enter your email address below to be entered into the raffle for the Amazon gift cards. For your privacy, your email address will not be linked to your responses. Winners will be notified via email. Thank you and good luck!

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