5-9-2015

Collaboration for Athletic Training Coverage in High Schools - An Ongoing National Survey: The Prevalence of Athletic Training Services in Private Secondary Schools

Alicia M. Pike
College of Agriculture, Health, and Natural Resources, alicia.pike@uconn.edu

Collaboration for Athletic Training Coverage in High Schools – An Ongoing National Survey: The Prevalence of Athletic Training Services in Private Secondary Schools

Alicia Marie Pike

BS High Point University, 2013

A Thesis

Submitted in Partial Fulfillment of the

Requirements for the Degree of

Master of Science

At the

University of Connecticut

2015

APPROVAL PAGE

Master of Science Thesis

Collaboration for Athletic Training Coverage in High Schools –
An Ongoing National Survey:
The Prevalence of Athletic Training Services in Private Secondary Schools

Presented by

Alicia Marie Pike, B.S.

Major Advisor _____
Douglas J. Casa, Ph.D., ATC, FNATA, FACSM

Associate Advisor _____
Stephanie M. Mazerolle, Ph.D., ATC

Associate Advisor _____
Rebecca L. Stearns, Ph.D., ATC

University of Connecticut
2015

ACKNOWLEDGEMENTS

Dr. Douglas Casa: Thank you, first and foremost, for giving me the opportunity to receive my Master's degree at the University of Connecticut. Ever since your visit to High Point, I knew this was the program I wanted to be a part of. Your enthusiasm and energy were contagious! You have taught me more than I ever thought I could learn about heat-related illness and preventing sudden death in sport! Thank you for taking me under your wing and allowing me to become a part of the Kinesiology family. This has been an experience I truly will never forget.

Dr. Stephanie Mazerolle: Thank you for our countless life chats and for your willingness to be a major part of my support system. Although not too far from home, you've been my "mom away from home" and I am so grateful for that. Thank you for making me aware of areas of research I had a hidden interest in, but had yet to discover. I am incredibly excited to work alongside you for the next four years!

Dr. Rebecca Stearns: Thank you for serving on my committee and being there for me for the most random things throughout these last two years. From creating flyers to learning the basics of Excel, Microsoft Word, and PowerPoint, I knew I could turn to you with any question or concern. I greatly appreciate your advice and guidance in making my thesis the best it can be.

Riana Pryor: Thank you for your endless patience, mentorship, and assistance throughout this entire thesis process. You were an SPSS God for me and taught me things that I never thought I'd be able to comprehend. Thank you for letting me take over your office on a daily basis to make phone calls and for answering every question I had, no matter how big or small. I couldn't have asked for a better mentor to guide me through this two-year journey. We ARE birthday buddies after all!

My Family: Where do I even begin? It's safe to say that I would be nowhere without your continuing love, support, and guidance. I can't count the number of times you have been there for me, through the good times and the bad, through the highs and the lows. Thank you for encouraging me to continue my dreams and for instilling in me the belief that anything is possible. A simple "thank you" is truly not enough. I love you!

TABLE OF CONTENTS

ABSTRACT

Athletic Training Services in Private Secondary Schools
Alicia M. Pike, University of Connecticut

Context: Athletic training (AT) services in secondary schools have recently been reported as high as 70%, but this only extends to the public sector. The extent of AT coverage in private secondary school settings has yet to be investigated. This may differ from the public secondary school setting for several reasons, including differences in funding sources. **Objective**: Determine level of AT services in private secondary schools. **Design**: Concurrent mixed-methods. **Setting**: Private secondary schools in the United States. **Patients or Other Participants**: 2,045 (38%) of all 5,414 private secondary schools responded to the survey. **Intervention**: School administrators responded to a survey via telephone or email. This instrument was previously used in a study examining AT services among public secondary schools. **Main Outcome Measures**: Descriptive statistics depict national data**.** Open-ended questions were analyzed through content analysis. **Results**: Of those 2,045 schools that responded, 57% (1,169/2,045) had AT services, including 28% (574/2,045) full-time, 24% (501/2,045) part-time, 4% (78/2,045) per diem, and 20% (409/2,045) from a hospital or clinic. Eighty-four percent (280,417/335,814) of athletes had access to AT services. Larger private secondary schools were more likely to have AT services. Barriers to providing AT services in the private sector included budgetary constraints, school size, and lack of awareness of the role of an athletic trainer. **Conclusions**: More than half of the surveyed private secondary schools in the United States have AT services; however, only 28% have a full-time athletic trainer. This demonstrates a need for increased medical coverage in this setting to provide athletes with the appropriate level of care. Budgetary issues and misconceptions related to the importance of the athletic trainer continue to be barriers in the secondary school setting. **Key Words:** athletic trainers, medical coverage, private high school, secondary school

CHAPTER 1

REVIEW OF THE LITERATURE

I. Introduction

The secondary school population leads the nation in athletic-related deaths. [1-4] Due to increasing numbers in athletic participation, the number of high school sport injuries is on the rise. An estimated 7.2 million individuals participated in athletics during the 2005-2006 school year, surpassing the 4 million athletes during the 1971-1972 school year. [5] Although catastrophic injuries can occur, a majority of injuries resulting form athletic participation are general and non-catastrophic. A study looking at nine secondary school sports reported that during both practice and competition, more than half of reported injuries were minor, including sprains, strains, and contusions. [5] The other most common sustained injuries included concussion, fracture, and other, consisting of lacerations, dislocations, heat illness, skin infection, or asthma attacks.[5]

There is a sizeable proportion of life-threatening and catastrophic injuries due to athletic participation. [6] Meehan et al. [6] found that 40% of all life-threatening injuries sustained by children ages 6 to 18 are sport-related, and when compared to adults, children fall victim to a higher percentage of life-threatening injuries. This age range is crucial as it targets a majority of secondary school student-athletes. Annually, secondary school sports are responsible for 2 million injuries, 500,000 doctors visits, and 30,000 hospitalizations. [5] Furthermore, an estimated 90,000 sport-related, life-threatening injuries occur annually. [6] Injuries can range from mild to severe, but the number and likelihood of sustaining an injury dictates the level of risk for each respective sport. Overall risk for injury in secondary school sports is an estimated 2.44 per 1,000 athlete exposures. [5] The Center for Disease Control and Prevention reports the highest injury rate in football, followed by wrestling and boys' soccer to be 4.36, 2.50, and 2.43, respectfully (Table

1). Similarly, the National Athletic Trainers' Association (NATA) has identified high-risk sports based on injury rates and the potential for life-threatening situations. These sports include football, men's basketball, wrestling, ice hockey, gymnastics, and skiing.[7]

Table 1. Sport-specific injury rates during 2005-2006 school year – High School Sports-Related Injury Surveillance Study[5]

	Rate		
Sport	**Practice**	**Competition**	**Overall**
Boys' football	2.54	12.09	4.36
Boys' wrestling	2.04	3.93	2.50
Boys' soccer	1.58	4.22	2.43
Girls' soccer	1.10	5.21	2.36
Girls' basketball	1.37	3.60	2.01
Boys' basketball	1.46	2.98	1.89
Girls' volleyball	1.48	1.92	1.64
Boys' baseball	0.87	1.77	1.19
Girls' softball	0.79	1.78	1.13
Total	**1.69**	**4.63**	**2.44**

* Per 1,000 athlete exposures (i.e., practices or competitions).

Football, the most popular sport in the United States, is accountable for the most sport-related injuries.[5] A study by Boden et al.[2] looking at fatalities in secondary school and collegiate football players, found a rate of 1.0 football fatalities per 100,000 participants. The most common causes were cardiac and brain injuries, which when combined, totaled 66.7% of all football fatalities during the study period. An even more substantial finding regarding heart, head, heat, and hemoglobin-related injuries (the four H's), is that these causes of death in athletes account for approximately 90% of all football fatalities (See Figure 1).[2] Knowing all but 10% of football injuries are from four of the top ten causes of sudden death in sport, an athletic trainer with knowledge of these pathologies and conditions has the ability to prevent a majority of athlete fatalities through prompt recognition and appropriate treatment.

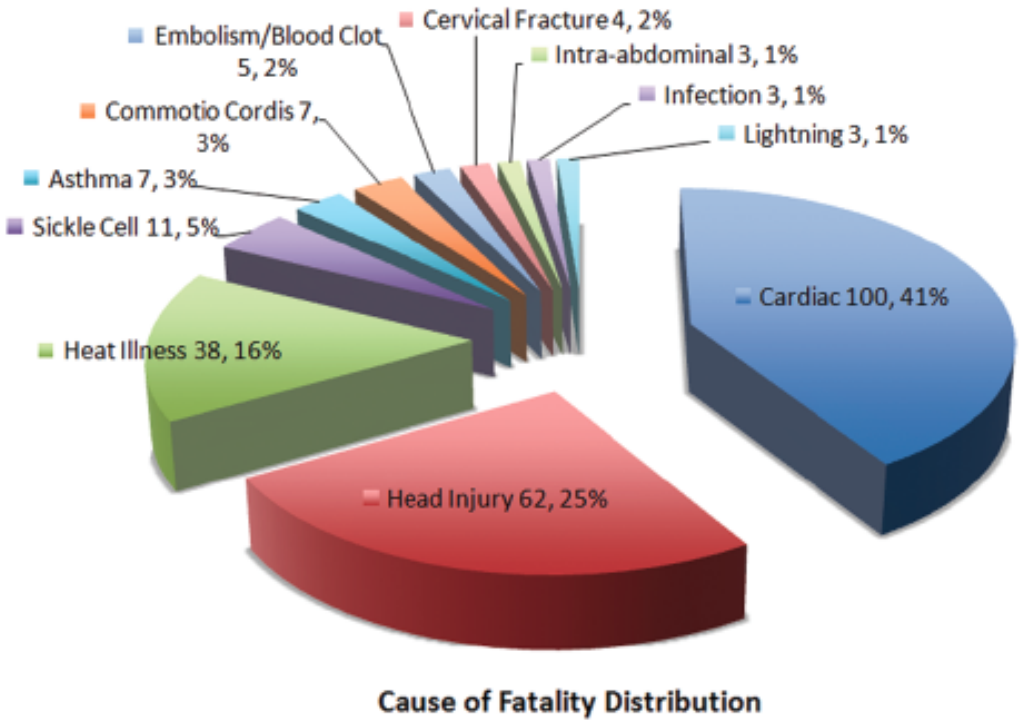

Figure 1. Number and percentage of high school and collegiate football fatalities by diagnosis.[2]

Football fatalities at the high school level, regardless of cause or type of injury, are seen much more frequently when compared to the number of reported deaths at the collegiate level. There is not a single year from 1990 to 2010 where the number of collegiate football fatalities surpasses those at the high school level.[2] (Figure 2) Although this study only takes into account football fatalities, it is more than enough to illustrate the need for athletic trainers at every secondary school. Most collegiate football programs are covered by an athletic trainer. Where is the coverage for younger student-athletes whose risk of sustaining a football related fatality is higher?

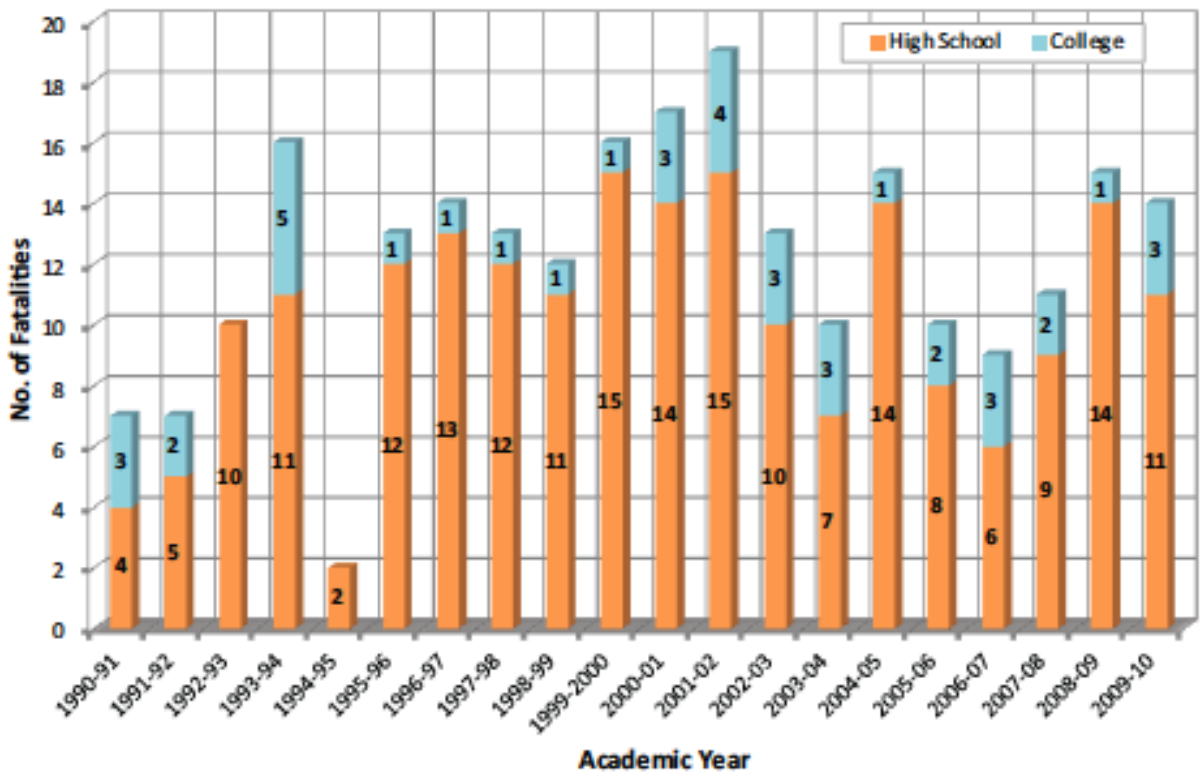

Figure 2. Football fatalities annually at the high school and college levels, 1990-1991 through 2009-2010.[2]

As secondary school athletic participation continues to rise, with participation reported in 2007 to be nine times greater than collegiate involvement, there is a need for improvements in medical care for athletes. [8] Enhancing medical coverage by employing athletic trainers in every secondary school is one way to improve care for student-athletes. There is an inherent increase in the demand of athletic trainers at the secondary school setting to ensure that all athletes are provided with safe playing environments. As of 2012, 50% of secondary schools did not have on-site medical staff to implement policies and procedures related to the top ten causes of sudden death in sport. [1] Their "on field" expertise puts athletic trainers at the front line of defense against serious consequences of athletic injury, especially those that are catastrophic in nature.[8]

This literature review will outline, in further detail, the top causes of sudden death in sport and highlight the importance of an athletic trainer at the secondary school level. The

athletic trainer plays a role in the prevention, recognition, and treatment of all injuries, both catastrophic and non-catastrophic that could occur at this level of competition. The medical coverage currently being provided to secondary school student-athletes will also be reviewed and will show how athletes are still receiving less than adequate medical care.

II. Top Causes of Sudden Death in Sport

Cases of death in sport have been due to a variety of causes. The most common causes of sudden death include heat illness, cardiac conditions, head injury, and exertional sickling. However, death in sport has been associated with other causes including cervical spine injuries, asthma, traumatic internal organ injuries, and lightning. Incidences of sudden death may vary depending on type of sport, environmental conditions, and individual characteristics, among other factors. Having an athletic trainer onsite with knowledge of prevention, recognition and treatment of such causes will mitigate risk of death and provide athletes with proper medical care.

Exertional Heat Stroke

Exertional heat stroke (EHS) is the second leading cause of death in sport, after cardiac conditions.[9] The National Center for Catastrophic Injury Research at the University of North Carolina looked at EHS death rates in football from the 1970's to 2009 and found that from 2005-2009, deaths in football from EHS were at the highest rate yet.[9] EHS is a fatal condition, but the incidence of death can be dramatically reduced when risk factors are known and accounted for, it is quickly diagnosed, and appropriately treated.[10] Recognizing intrinsic and extrinsic factors for developing EHS while exercising in the heat will lower the risk and enhance prevention strategies for EHS.[10] Employing an athletic trainer whose knowledge of predisposing

factors of EHS will assist in the identification of athletes most at risk serves to create a safer playing environment for those involved.

The ability to tolerate exercise in the heat is dependent on the physical fitness level of the athlete. Athletes less fit than their teammates need to work harder and at a higher intensity to create the same performance outcome. Thus, poor physical condition is related to a higher relative intensity to achieve equal performance. [11] A study by Rav-Acha et al. [12] found that 83% of the six fatal EHS death cases presented with low physical fitness levels, and 100% demonstrated physical effort unmatched to physical fitness. Altering exercise intensity and rest breaks with dangerous environmental conditions lowers risk for athletes with poor physical fitness. [11] In addition to ensuring physical fitness is matching exercise intensity, implementation of an appropriate heat acclimatization plan is paramount in every athletic program. This mitigates the risk of developing a heat-related illness specifically during the preseason practice period, when athletes are not yet acclimatized to exercising in the heat. [11] The preseason heat acclimatization guidelines for secondary school athletics were created and recommended to place the health and safety of the student-athletes as top priority, and provide these secondary school athletes with a means of training safely and effectively during the preseason practice weeks. [11]

One of the top extrinsic risk factors that athletic trainers have a role in is monitoring wet-bulb globe temperature (WBGT) and the environmental conditions to determine if practice or game play would jeopardize the health of the student-athletes. Environmental conditions can negatively affect an athlete's ability to tolerate exercise in the heat. [13,14] Checking environmental conditions, measuring WBGT before and during activity, and controlling exercise intensity all decrease the risk for developing heat illnesses. Altering practice schedules and work-to-rest ratios can enhance an athlete's ability to exercise in hotter conditions. [14] In addition to altering

frequency of breaks and the way practices are conducted, athletic trainers play a key role in making sure that the athlete's sport equipment matches the weather conditions.

Clothing and equipment, especially that which is used in football, have been proven to increase physiologic strain, which is heightened further when exercising in the heat. [15,16] Presence of a uniform, with or without padding, decreases the amount of exercise an individual can perform safely without increasing risks of EHS. [16] All of these responsibilities should be acted on by an athletic trainer, as a hot environment is not the sole indicator of an athlete suffering from EHS. Grundstein et al. [17] illustrates this principle with 45% of American football hyperthermia deaths occurring on days with no safety warning or the lowest risk level for heat-related illness, and zero deaths occurring on days categorized as the most dangerous. Figure 3 below demonstrates that even on days with lower temperature and relative humidity readings, death from exertional heat stroke is possible.

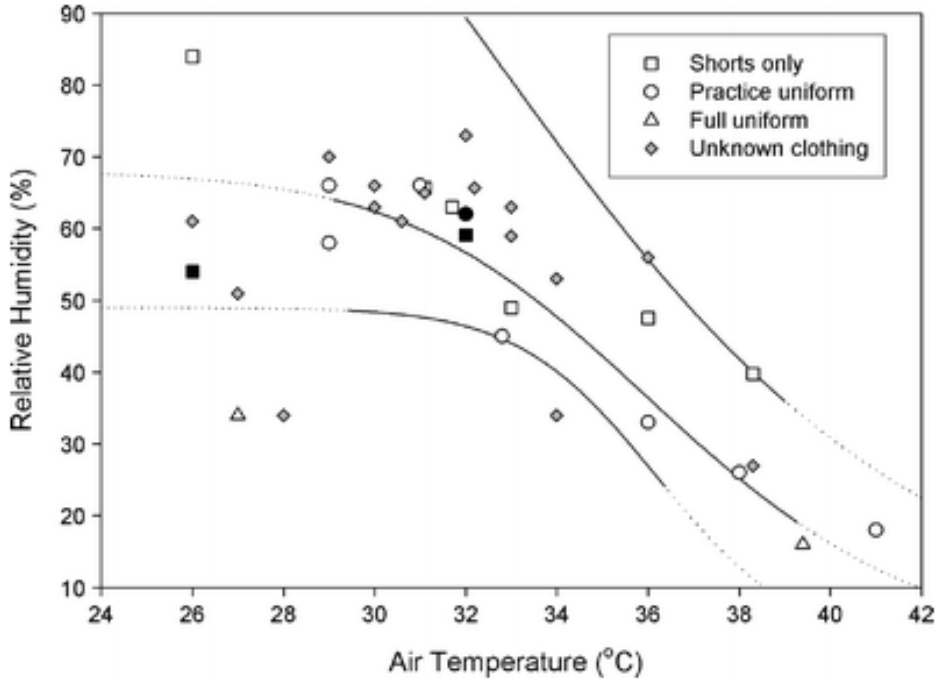

Figure 3. Football hyperthermia deaths during 1980-2009 in the context of uncompensable heat stress limits for different levels of clothing.[17]

Therefore, WBGT is a factor, but should not be the only focus when assessing EHS risk in athletes. WBGT, in combination with other predisposing factors for EHS, should be collectively monitored for risk assessment.

The quicker EHS is accurately recognized, the likelihood of survival substantially increases. The two main criteria for diagnosis of EHS are core temperature greater than 104/105 degrees Fahrenheit (40 to 40.5 degrees Celsius) taken via a rectal thermometer immediately after collapse or suspicion of EHS and CNS dysfunction. [18] Proper assessment of core temperature is crucial in effectively determining whether or not an athlete is suffering from EHS. Hyperthermia should be determined through this method only as all other temperature measurement devices are invalid and/or inaccurate in exercising individuals. [19-21] The mean bias for external thermometers when compared to core temperature was reported to range from -1.31°C to -3.28℃. [20] Ganio et al. [19] supports this finding in concluding that measurement of intestinal temperature was the only device considered to be valid for assessing core temperature.

The most crucial factor in EHS treatment is minimizing the length of time from collapse or onset of EHS to the start of cooling. The length of time that an athlete's core temperature remains over the threshold for EHS is directly correlated to the extent of multisystem tissue injury and long-term sequelae. [10] Cold-water immersion (CWI) is the gold standard and most powerful treatment for EHS. Immersing the hyperthermic athlete in circulating ice water cools the body approximately 2- to 17-fold faster than other cooling modalities including application of wet towels, ice or cold packs, evaporative cooling, and temperate water immersion. [22] All schools should have a cold-water immersion tub on site, but in the event that CWI is not available, the athletic trainer still plays a vital role in cooling the athlete through means of cold-water dousing, wet ice towel rotation, or getting the athlete in a cold shower. [18] Having an athletic

trainer employed at the secondary school level also allows for adherence to the "cool first, transport second" method since an appropriate medical professional would already be onsite treating the student-athlete. [23] Once cooling has begun, the athletic trainer will monitor core temperature and decide when the athlete's core temperature has dropped enough to be safely transported. Without an athletic trainer present to ensure that cooling before transport is adhered to, the risk of death from EHS increases as the travel time and inadequate cooling causes the athlete's core temperature to remain elevated above the critical threshold. From prevention to treatment, an athletic trainer at every secondary school is vital to fulfill the key roles and responsibilities that warrant the safety of student-athletes in cases of extreme environmental conditions.

Cardiac Conditions

Sudden cardiac death (SCD) is the leading cause of death in young athletes engaging in physical activity. [24] The incidence of SCD per year in young, competitive athletes ages 12-35 is estimated to be 1:160,000 to 1:300,000, however, due to the lack of a national reporting system, the numbers are most likely underestimated. [24] Figure 4 shows an increasing trend in the number of sudden deaths from cardiovascular causes compared to trauma injuries or other.[24]

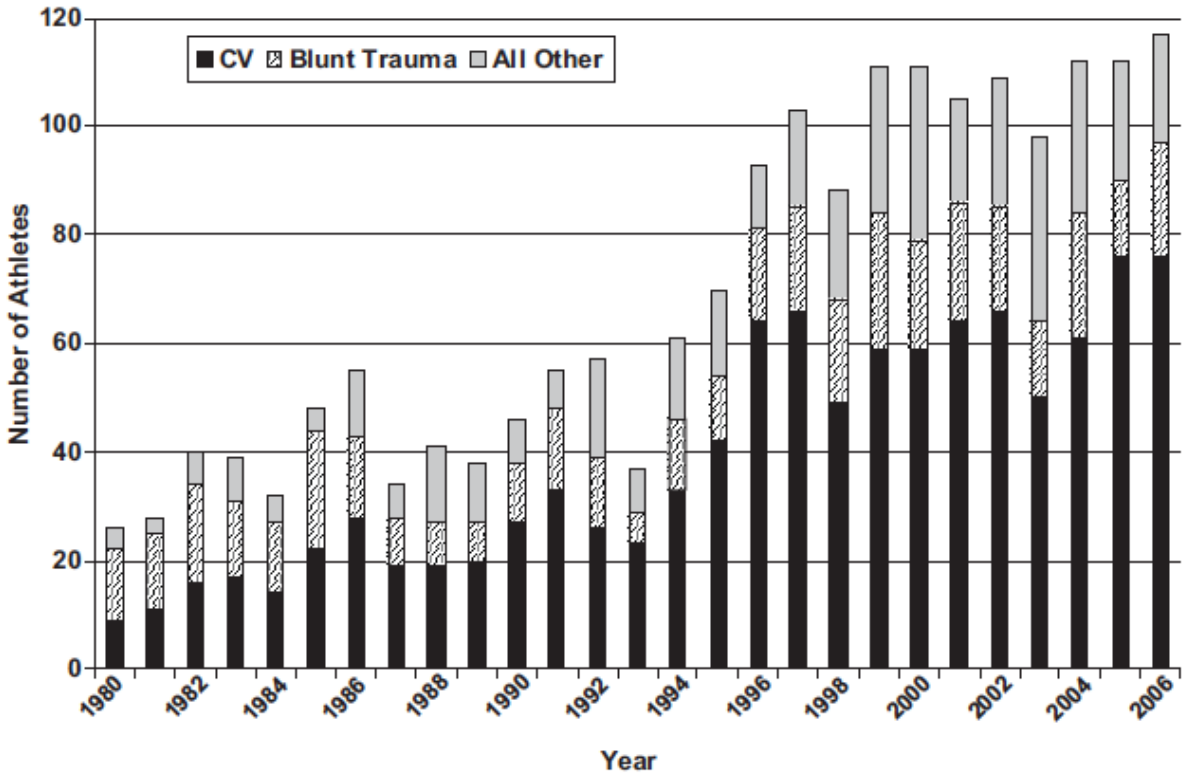

Figure 4. Number of cardiovascular (CV), trauma-related, and other sudden death events in 1866 young, competitive athletes, tabulated by year.[24]

Reports that show the greatest number of deaths from sudden cardiac arrest (SCA) estimate 110 deaths each year in young athletes, which amounts to about 1 death every 3 days in the United States. [25] Physical activity has been shown in the literature to be the exposure factor for SCA in individuals with underlying cardiac disorders/conditions. A study by Corrado et al. [26] illustrated a heightened relative risk by 2.5-fold for SCD in the athletic population versus an age-matched nonathletic population, whereas Asif et al. [27] found a 2.8-4.5-fold greater inherent risk. Drezner et al. [28] looked at 36 cases of SCA that occurred at various high schools in the United States and found that no cases were reported in student non-athletes, supporting the finding that physical exertion is a trigger for SCA episodes in exercising individuals.

Prevention of SCD in the athletic population is centered on knowledge of the extrinsic and intrinsic predisposing risk factors of SCA, pre-participation examinations and screening to

identify or confirm cases of cardiac abnormalities in athletes. In addition, an efficient EAP at every secondary school would ensure structured response to an emergency medical situation. The purpose of a pre-participation examination is to detect cardiovascular disorders that can lead to SCA episodes in athletes.[27] Studies demonstrate that a traditional history and physical examination has limited sensitivity and may therefore lead to false-negative findings Thus, when utilizing history and physical examination alone, some athletes with cardiac abnormalities will remain undetected.[27] Cardiovascular ECG screening greatly improves the sensitivity of the pre-participation examination, and knowledge of an underlying pathology reduces athlete risk through medical management, sport restrictions, and activity modification.[27] Athletic trainers are crucial in SCD prevention as they are the ones to review pre-participation examinations, make modifications for athletes with increased risk, and advocate for ECG screening as a means of early identification of potentially lethal cardiac disease. Without some sort of cardiac screening, there is an increased risk for SCD due to "silent" cardiac abnormalities that may not have produced signs or symptoms until the moment of collapse. An approved emergency action plan (EAP), often written and created by an athletic trainer, is crucial in preventing death from sudden cardiac arrest. This EAP should define what steps need to be taken, responsibilities of those involved (AT, administration, coaches, etc.), what equipment should be used and where its closest location is, and should be practiced at least once annually to ensure effective and immediate activation in a time of crisis.[29] An athletic trainer employed at every secondary school would provide and implement an emergency action plan for sudden cardiac arrest and actively rehearse this plan annually to provide student-athletes with a safe playing environment.

Recognition of SCA should be, first and foremost, the responsibility of a certified athletic trainer. SCA should be suspected until ruled out in any athlete who has collapsed and is

unresponsive. The individual's vital signs (airway, breathing, circulation, heart rhythm) should be assessed immediately and an AED should be applied within 1 to 3 minutes for rhythm analysis. [18] The chief determinant of survival from SCD is the time from collapse to defibrillation through the use of an automated external defibrillator (AED). [30] Survival rates decline by 7% to 10% per minute for every minute of defibrillation that is delayed. [30] AEDs need to be present at every secondary high school, athletic venue, or with a certified athletic trainer during practices and games in a remote location to allow for quick retrieval. To increase the chances of survival of the athlete, retrieval and initiation of defibrillation should be done within 3 minute of collapse, although 1 minute is the ideal time frame. [23] Early recognition of SCA, early activation of EMS, early CPR, and early defibrillation with immediate retrieval of an AED enhances chance of survival. [28,31] A study by Drezner et al. [28] found that prompt recognition and treatment produces survival rates from 41% to 74% and would likely be higher if treatment was initiated within 1 minute of collapse. The presence of an onsite athletic trainer increases survival likelihood simply by ensuring that all of the aforementioned steps for prompt recognition and treatment of a cardiac episode are executed properly. The athletic trainer's education background places him/her as the most qualified on the field to recognize signs of a SCA. If an athlete collapses, the athletic trainer can quickly assess the individual and begin CPR, while instructing bystanders to activate EMS and retrieve the AED simultaneously. [23] This allows for a smooth, concurrent treatment of the athlete, and therefore decreases the time from collapse to defibrillation, which increases the student-athlete's chance of survival.

Head Injuries

According to the Centers for Disease Control and Prevention, there is an estimated 1.6 to 3.8 million sports-related concussive injuries that occur annually in the United States[32], and a

study by Boden et al.[2] reports a rate of 0.67 head injuries per 100,000 high school football participants. The incidence of catastrophic head injuries in football is dramatically higher at the high school level compared to the college level.[2] Although mild traumatic brain injury, such as concussion, is seen more often in the athletic population, rare and severe catastrophic brain injuries such as subdural and epidural hematomas and malignant cerebral edema (second-impact syndrome) result in more fatalities from direct trauma. Catastrophic brain injuries are the second highest cause of death in football players, behind cardiac-related injuries.[33] In a report on traumatic brain injury conducted by the Center for Disease Control, the number of nonfatal brain injuries has been on the rise. It has been estimated that 50,000 people die every year in the United States as a result of some form of traumatic brain injury.[5] According to the National Center for Catastrophic Sport Injury Research at UNC Chapel Hill, subdural hematoma remains the leading cause of brain-related deaths among athletes[34], and fatal brain injuries have occurred in almost every sport, including wresting, baseball, lacrosse, track, and soccer.[9] With catastrophic brain injury having such high mortality and morbidity rates, around 50% and 100% respectively, prevention is highly important and stems from the employment of an athletic trainer at every organization sponsoring an athletic program.[18]

Prevention of mild and catastrophic traumatic brain injuries involves a multifactorial approach that only when enacted by a certified health care professional, such as an athletic trainer, provides the most effective and efficient outcome. The first step to prevention is through education for athletes, coaches, and parents about traumatic brain injury and its manifestations.[18,35] The athletic trainer plays a major role in the education process by coordinating educational sessions with athletes, parents, and coaches about recognizing signs and symptoms of concussion, the seriousness of injuries to the brain, both mild and traumatic, as well as the

importance of immediate reporting of their injuries and not participating in athletics while symptomatic. [18,23,35] Education about the purpose of helmets and how they do not prevent concussion is also necessary. [18,23,35] Comprehensive preseason examinations and screenings should be conducted and reviewed by the athletic trainer to identify potential fatal conditions. This includes athletes with predisposing factors associated with traumatic brain injuries. [18,34] A history of subsequent concussive history, for example, should be noted on a preseason physical examination. This can be seen with observation of collegiate football players reporting one, two, or more than prior concussions, who were 1.5, 2.8, and 3.4 times more likely to sustain another concussion than athletes with no prior history of concussion, respectively. [34] Athletic trainers are responsible for identifying these athletes and providing counseling about the risk, concern, and possible long-term complications with sustaining subsequent injuries. [18] Another factor contributing to the prevention of traumatic brain injuries is properly fitted playing equipment as a means of limiting the impacts transmitted to the brain. [34,35] An ill-fitting helmet does not provide the athlete with proper protection and increases the risk for catastrophic injuries such as skull fractures and intracranial hematomas. [18,36] The importance of an athletic trainer lies in enforcing the standard use of helmets and that all equipment used meets NOCSAE, HECC, or ASTM standards. [18,23,34,35] Mitigating the risk of sport-related catastrophic brain injury and concussion starts with employing a full-time athletic trainer.

Since approximately 90-95% of concussions involve no loss of consciousness, recognition of a mild traumatic brain injury is not as obvious as other more life-threatening injuries. [34] Once again, education served as the basis for prevention, and so too will it serve as the foundation for recognition. Educational interventions by the athletic trainer are necessary to discuss signs and symptoms of concussion, the importance of reporting these symptoms, and the

policies enacted for injury management. [34,35] Athletic trainers are educated on the severity of concussions and are trained, when witnessing a collision that could potentially cause injury, to monitor that athlete and ask about the onset of concussive signs and symptoms. According to the Sports Medicine Handbook[37], studies reveal that 40-50% of athletes will not report concussion symptoms, especially if they have had a prior concussion. Therefore, it is imperative to have an on-site athletic trainer present to witness the collisions that take place and approach athletes, instead of waiting for athletes to approach them, about any symptoms that may have developed since the hit. Aside from on-field recognition, an athletic trainer plays a role off field by utilizing neurocognitive assessments and concussion measures during preseason and post-injury to identify deficits in cognition, balance, and other neurological factors. [18,35,37] Objective measures of balance and cognition, including the Balance Error Scoring System (BESS) and the SAC and SCAT 3 assessment tools should be used if concussion is suspected. [23,34,35,38] The Inter-Association Task Force for Preventing Sudden Death in Secondary School Athletics Programs states that when assessing for a suspected concussion, SCAT 3, Graded Symptom Checklist, Standardized Assessment of Concussion (SAC), and the BESS should be completed. [23] Consultations with neuropsychologists should also be scheduled if assistance is needed in interpreting neurocognitive tests. [23] Perhaps of more importance, this document states that schools without an athletic trainer should not be performing the above-mentioned screening tools without direct supervision by medical professionals. [23] This accentuates the benefit of an athletic trainer as it introduces a convenience factor for schools with athletic programs. Assessment of concussion will occur in-house, and any outsource assistance that is necessary would be the conducted by the athletic trainer, taking the responsibility off of the coaches and administrators.

In regards to treatment and return to play considerations following a brain injury, the athlete should be clinically evaluated on a regular basis throughout recovery. [18,34,35] The athletic trainer's presence at the school every day would allow for this continual assessment through the use of graded symptoms checklists and other objective measures. [34] Ensuring a full recovery following a concussion is crucial to protecting the athlete from catastrophic outcomes and secondary injury such as second-impact syndrome. An athletic trainer is the most qualified to create an EAP in response to mild and catastrophic brain injuries, and initiate this plan when unconsciousness or altered levels of consciousness are noted. [18,23] The athletic trainer's presence is paramount in making the decision of when an athlete is safe to return to play following a brain injury, as well as bring the athlete through a gradual return-to-play protocol to ensure full brain healing. [18,23,34] While the athletic trainer provides care to the athlete on school grounds, care needs to be continued at home. Athletic trainers, in conjunction with physicians are the individuals responsible for creating a standard concussion home instruction form for injured athletes. [18,23,35] Due to the multifactorial approach to prevention, recognition, and treatment of mild and catastrophic traumatic brain injuries, athletic trainers are a necessity at every school to mitigate potential risk to athletes by providing care to them and ensuring an appropriate and safe return to sport activity.

Exertional Sickling

Sickle cell trait (SCT) is generally a benign condition involving the inheritance of one gene for normal hemoglobin and one for sickle hemoglobin. [39,40] During a sickling episode, "stiff" and "sticky" sickle cells can "logjam" the small blood vessels supplying working muscles. This ultimately leads to collapse as the athlete tries to keep utilizing muscles that are not receiving blood.[39,40]

Although a sickling collapse is a medical emergency, the presence of SCT in an athlete is not a barrier to exercise, and no athlete should be denied participation in sport. [18,23,41-43] SCT itself may not be of greatest concern, but health care professionals are responsible for prevention, recognition, and treatment of a sickling episode to protect the athlete from debilitating conditions such as gross hematuria, splenic infarction, and exertional rhabdomyolysis. [42] Although a leading killer in NCAA Division I football[39], exertional sickling and SCT does not appear to be as big of an issue in high school athletes. [41] However, from 2000 to 2010, 16 sickling deaths occurred during football conditioning sessions, while no deaths were reported during practices and games. [39] This illustrates the importance of having athletic trainers present at all athletic events, especially conditioning sessions.

Prevention of a sickling event starts with the medical professional. The pre-participation examination reviewed by the athletic trainer is crucial in identifying those individuals with SCT. [18,23,41-43] If the presence of SCT is unknown, athletic trainers can encourage parents and guardians to obtain newborn screening reports, since all 50 states screen at birth. [23,43] Knowledge of those individuals at highest risk is also an important component of prevention. Multiple papers have reported an incidence rate of 7-8% for SCT in African Americans. [39,41,42,44] In addition to knowing predisposing factors, educating coaches, athletes, and parents on the signs and symptoms of exertional sickling play a key role in the prevention of a sickling episode. [23,39,41] The athletic trainer is in a unique position to distinguish working hard from exerting oneself to the point of collapse. When coaches are placed in an authoritative position, it is possible that an athlete may be pushed to continue despite what he/she is feeling. Athletic trainers are crucial for making sure coaches let the athlete with SCT set his/her own pace, allow for build-up and progression in training, excuse the athlete from extreme performance tests, encourage hydration

and adequate rest breaks, as well as discontinue exercise at the first sign of struggle and fatigue.[18,23,39,41-43]

Signs and symptoms of exertional sickling warrant immediate withdrawal from activity.[18,23,39,41,42] The key to lower mortality and morbidity from a sickling episode is the prompt recognition of the signs and symptoms, which include muscle cramping, pain, or weakness, inability to catch one's breath, appearing dazed or confused, and fatigue.[18,39,41] A coach with limited knowledge of exertional sickling may mistake a sickling episode for a heat-related pathology, whereas an athletic trainer would have the knowledge and expertise to be able to distinguish between the two and provide prompt treatment to prevent life-threatening complications.[18] The athletic trainer is more qualified in understanding patterns of exertional sickling and when it has become a true medical emergency.[18]

After prompt recognition and removal of the athlete, the athletic trainer properly assesses the individual and forms a treatment plan depending on the extent of the injury. Athletic trainers are responsible for monitoring vital signs, giving supplemental oxygen by a facemask if needed, cooling the athlete as necessary, preparing for cardiopulmonary resuscitation, as well as activating the EAP and summoning for advanced medical personnel to arrive at the scene.[18,23,39,42,43] The above responsibilities should be carried out by a certified health care professional, and communication with the athlete's physician should me made so that preparation to treat explosive rhabdomyolysis or metabolic complications is accounted for.[18,23,39] Exertional sickling is a true medical emergency that when promptly recognized and appropriately treated by an athletic trainer, could lead to a more favorable outcome.

Cervical Spine Injuries

Spinal injuries account for 2 to 3% of all athletic injuries. Although not as prevalent as head injuries, cardiac injuries, or heat-related illness, of the estimated 7,000 to 10,000 spinal injuries that occur annually in the United States, up to 15% occur during athletic activities. [45] According to Banerjee et al. [46], sporting events are the fourth most common cause of spinal cord injury. Specifically, American football is associated with the highest rates of sudden death from spinal cord injury, although rule changes have led to decreased mortality over the years. [47] A team effort of athletic trainers, physicians, and coaches can successfully prevent first-time and repeat cervical spine injuries. On-field recognition, transport, and treatment of an athlete suspected of a spinal injury should be the responsibility of an athletic trainer. Appropriate on-field management of a cervical spine injury by an athletic trainer can minimize morbidity and other potentially life-threatening complications.[45]

Despite the low incidence rate of catastrophic cervical spine injuries in sport, when they do occur, there is high morbidity and a potential for permanent loss of neural function. [47] Prevention of cervical spine injuries starts with educating coaches and athletes on sport-specific causes of catastrophic cervical spine injury, as well as the physiological responses that occur. [18,48] The athletic trainer ensures that football coaches are teaching athletes the proper form for hitting and tackling, as not to compromise the spine. [48] Safety rules should be established for coaches and athletes, and athletic trainers, in conjunction with equipment managers and coaches, should ensure that the equipment being used is certified and properly fitted for each individual athlete. [18,23,48,49] Athletic trainers communicate actively with emergency department personnel to review EAPs, review proper management of a cervical spine injury, as well as athletic equipment removal if the injured athlete is equipment-laden. [18,23] The athletic trainer is also responsible for

conducting annual meetings for all school staff who may assist in an emergency situation to go over on field rescue training and spine-boarding practice. [18]

Early recognition and assessment is crucial in initiating the management protocol. On-field primary survey of the injured athlete involves airway maintenance with cervical spine protection, and assessments of breathing, ventilation, circulation, disability, and exposure of the athlete. [48] Unconsciousness or altered level of consciousness, bilateral neurologic findings or complaints, midline spine pain with or without palpation, or an obvious spinal column deformity all warrant immediate activation of the EAP. [47] Findings from the primary survey determine how the player will then be managed. Table 2 illustrates three scenarios that can result from a cervical spine injury. [48] If altered mental status is noted, neurological function via Glasgow Coma Scale, pupillary response, eye movements and visual fields, and gross motor and sensory function of the extremities should be assessed. This also indicates early and rapid removal of a facemask if applicable. [48] It is imperative that an athletic trainer is present during contact sport practices and games to assess potential spine injuries so EAP activation and treatment is carried out in an appropriate manner. Quick recognition and early management by the athletic trainer can decrease morbidity and/or mortality rates, ultimately leading to better prognosis of the injured athlete.

Table 2. Potential scenarios that can result from a catastrophic cervical spine injury.[48]

Catastrophic Cervical Trauma: Potential Clinical Scenarios

Scenario	Level of Consciousness	Cardiorespiratory Status
1	Abnormal	Compromised
2	Abnormal	Normal
3	Normal	Normal

On-field examination of a suspected cervical spine injury is crucial to determining how to properly treat the athlete in a way that mitigates risk for potential long-term complications. Treatment method is dependent on a variety of factors discovered in the on-field examination. Banerjee et al.[46] provides an algorithm for on-field examination of a cervical spine injury (Figure 5). Knowing the possible diagnoses will give the athletic trainer indication on the most appropriate mode of treatment.

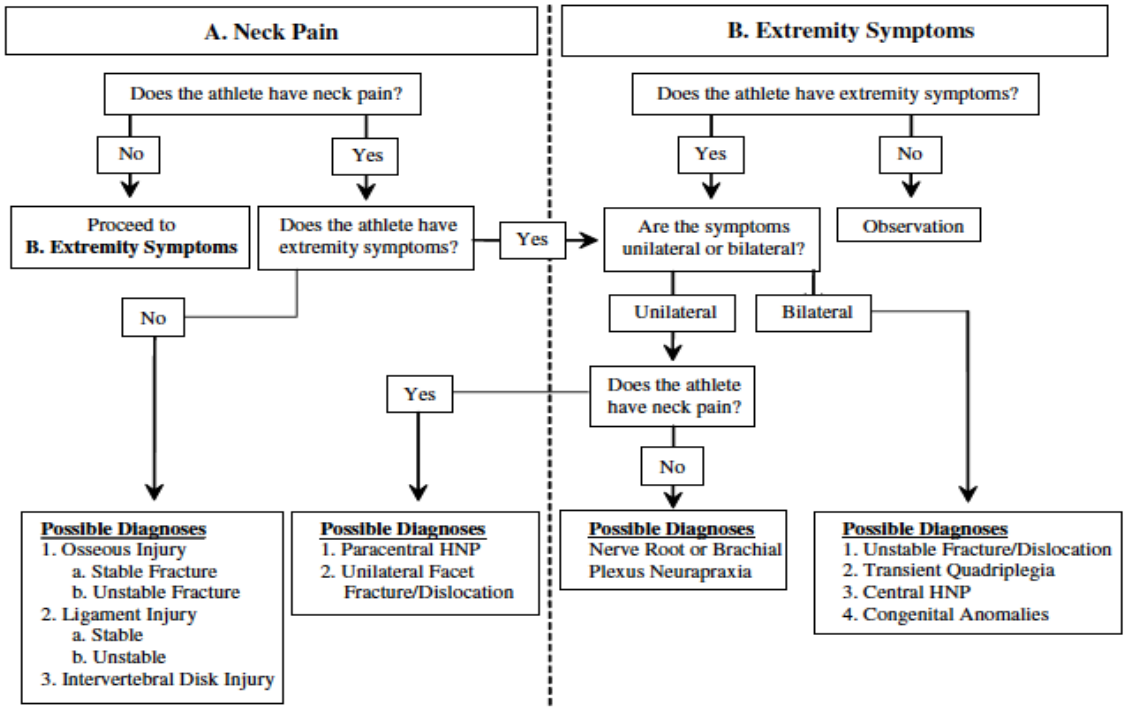

Figure 5. Algorithm for on-field examination of a cervical spine injury (HNP = herniated nucleus pulposus).[46]

Treatment of an athlete suspected of a spinal cord injury is beyond the scope of practice of a coach or other school staff member. A health care professional, preferably an athletic trainer, should be the person in charge of initiating care and management of the injury. Improper handling of the cervical spine on the field can worsen and even cause spinal cord dysfunction. [48] Beyond the spinal cord itself, failure to appropriately manage this injury can even lead to compromised cardiac or respiratory function. [46] Banerjee et al. [46] acknowledges the importance of

medical staff to act efficiently and effectively in this high-risk situation. The athletic trainer is responsible for maintaining neutral stabilization of the spine[50], providing rescue breathing and ensuring an open airway[51], as well as spine boarding the athlete for proper transport, all of which are key to the overall well-being of the athlete involved. [18,48]

Alternative treatments for spinal cord injury have been considered. Modest systemic hypothermia (MSH) has received attention as a possible effective treatment method for cervical spinal cord injury in sports. Levi et al. [52] illustrated improved outcomes on the American Spinal Injury Association and International Medical Society of Paraplegia Impairment Scale (AIS) after modest intravascular hypothermia was induced in 14 patients with acute cervical spinal cord injury. Furthermore, complete spinal cord injury of an NFL player was treated with moderate systemic hypothermia immediately and led to significant and rapid neurological improvement. [53] More commonly seen treatments such as surgical decompression and intravenous methylprednisolone were also used in conjunction with induced hypothermia. [53] Recently, 20 patients with neurologically complete spinal cord injuries were treated with combinations of surgical decompression, glucocorticoid administration, and regional hypothermia, and experienced a better recovery than could be expected with traditional forms of treatment.[54]

After proper transport and treatment, the athletic trainer plays a role in the proper return to play graduated progression. Following recovery, the athletic trainer creates and implements a supervised, 6-step return-to-participation protocol to prevent a premature return to play. [23] Any deviation from the above mentioned responsibilities of the athletic trainer could potentially lead to further complications and long-term catastrophic injuries for the involved athlete.

Asthma

Asthma is one of the most commonly seen diseases among individuals of the athletic population. In 2009, it was reported that asthma affected approximately 22 million people in the United States, 6 million of them being children. [55] A study looking at the diagnosis of asthma in athletes reported that there is a higher prevalence of airway hyperresponsiveness (AHR) and exercise-induced bronchoconstriction (EIB) compared with self-reported or physician-diagnosed asthma. As symptoms are most often rarely troublesome for athletes, with only 15 to 25% of athletes having signs and symptoms suggestive of asthma[56], it is possible that this disease is under-diagnosed in the athletic population, and medical staff needs to be present to effectively respond to an athlete experiencing an asthmatic episode who has otherwise been symptom-free.

Although an athletic trainer cannot prevent an athlete from having asthma, he/she does have the knowledge to prevent asthma attacks from occurring. First and foremost, the athletic trainers along with the school's nurse prohibit sports participation until a thorough health history and pre-participation examination have been completed. This notifies the athletic staff of the athletes most at risk for developing asthmatic symptoms and allows for proper preparation for such a case. A study by Bernhardt et al. [57] however, revealed that evaluation via health history alone might not be the best method for identifying asthma. The presence of an athletic trainer is even more crucial to ensure that teams are performing proper warm-up activities. [18,58] With a structured warm-up protocol, the athlete may experience a period of as long as 2 hours without asthma-related symptoms, potentially decreasing the risk of an exacerbation or decreasing reliance on medications. [58] The athletic trainer should also educate the athlete on recognizing signs and symptoms, the correct way to use the prescribed medicine, as well as knowing when to take breaks.[55,56]

The key to recognizing an asthmatic episode is knowledge of the common signs and symptoms including, but not limited to, confusion, sweating, use of accessory muscles for breathing, wheezing, coughing, inability to speak, or agitation. [55,56] If an athlete, whether previously diagnosed with asthma or not, is experiencing AHR or EIB, an athletic trainer is qualified to test the athlete by using a sport-specific and environment-specific exercise challenge protocol to determine triggers for the asthmatic episode. [58] This will give the athletic trainer insight on what factors exacerbate the individual's asthma, allowing for preventative measures to be taken in the future.

Treatment for asthmatic individuals consists of prompt recognition of the exacerbating factors, as well as proper use of the prescribed asthma medications. [18] The athletic trainer is responsible for making sure the individual's medication is readily available during an emergency episode. [59] Medication for asthma includes short-acting β-agonists, inhaled ipratropium bromide, or magnesium sulfate. First-line treatment for exercise-induced asthma exacerbations is often short-acting β-agonists, which should be carried with the athlete in the form of a metered dose inhaler. [59] Onset of action is 5 to 15 minutes, and the treatment can be repeated every 1 to 2 hours if needed. [59] Although less common, inhaled ipratropium and magnesium sulfate used in combination with other asthma therapies have improved lung function. [60] In addition to managing medications, the EAP for asthmatic episodes is initiated by the athletic trainer, and referral to an acute or urgent care center will be determined depending on the duration of the individual's signs and symptoms. In cases of extreme distress, the athletic trainer provides the athlete with supplemental oxygen to help maintain blood oxygen saturation levels. [59] The aforementioned actions are outside the scope and responsibility of sport coaches and should only be carried out by a certified health care professional.

Traumatic Internal Organ Injuries

Traumatic organ damage is not seen as frequently in sport compared to catastrophic head or neck injuries, with 10% of all abdominal injuries resulting from sport-related trauma. [61] The National Athletic Trainers' Association High School Injury Surveillance Study reported a total of 23,666 injuries, of which only 18 were to the kidney, and none of these categorized as catastrophic or requiring surgery. This illustrates the lower risk of organ damage compared to the study's findings of higher incidences of knee, head/neck/spine, and mild traumatic brain injuries. Injury to other internal organs, such as the pancreas, has been seen in athletic participation. Pancreatic laceration of a female collegiate soccer player was reported after sustaining a direct blow from an opponent's knee between the upper abdominal quadrants. [62] Despite such a low incidence rate, these more uncommon causes of death still merit attention. [63,64] Injuries to the thorax and abdomen can occur, most commonly in football more than any other sport, but are also seen in ice hockey, lacrosse, skiing, and snowboarding.[63,65]

Splenic injuries are the most common intra-abdominal organ injuries in sport. [61] Occurring from both direct and indirect trauma, splenic rupture is of increased concern when an athlete has or is recovering from mononucleosis. [66] Despite whether or not the athlete plays a contact or collision sport, it is crucial to refrain from athletic participation or other forms of physical exertion throughout the course of the illness. Due to the increased size of the spleen from mononucleosis, athletic trainer's advocate that the athlete receive imaging prior to return to play to ensure the spleen size appears "normal". [66] Even if the spleen is not enlarged, it may still be susceptible to injury as a result of the infectious virus itself, making return to play decisions controversial. [66] However, research has showed that splenic ruptures often occur within the first 3

weeks[67], so general principle is to prohibit activity during this time period. [66] This, along with other strategies, can heighten the prevention of internal organ injuries and rupture.

Preventing traumatic injuries is a challenging concept as they often occur spontaneously. In contact or collision sports, where protective equipment is a requirement, athletic trainers play a crucial role in ensuring proper fitting for optimal protection. Although complete prevention of a traumatic injury is often out of the hands of an athletic trainer, having appropriate medical staff onsite will reduce the overall mortality and morbidity rates that result from such an event by providing prompt recognition and treatment.

Recognition of traumatic injuries is key to reducing long-term complications and preventing death in athletes. The athletic trainer's knowledge of signs and symptoms is crucial for triage purposes and evaluating players on the sideline. [68] With traumatic injuries and blunt force trauma, being able to differentiate between benign and potentially life-threatening circumstances allows for proper disposition of the player. If there is concern or an observed mechanism leading to abdominal injury, and the athlete has hypotension, orthostatic changes, or significant abdominal findings, immediate referral to an emergency facility is warranted. [63]

Ultimately, the decision of whether or not the injured player should return to play, be removed from competition, or be transported to a hospital for further evaluation should be made by a health care professional. [68] Treatment of a traumatic internal organ injury depends on the presence of signs and symptoms, which include nausea, vomiting, referred pain, changes in blood pressure, abdominal distention, syncope and shock. Depending on the severity or extent of the injury, the athletic trainer then makes a decision regarding immediate care for the athlete. Pending transport to an emergency facility, the athlete should lie supine on the sideline to direct blood flow to the heart. [61] Activating the EAP, as well as monitoring vitals and controlling for

signs of shock, are key responsibilities of the athletic trainer in the proper treatment of a sport-related traumatic internal organ injury. [68]

Criteria for return to play (RTP) following an abdominal injury or mononucleosis have not been investigated in detail. Once cleared by a physician, an athletic trainer should carry out RTP decisions. Specifically regarding athletes returning from mononucleosis, a time frame of at least 3 weeks is commonly recommended. [66] Criteria for RTP include no remaining clinical symptoms, the athlete is afebrile, and has a normal energy level. Regardless of the type of internal organ injury, RTP decisions should be individualized on the basis of the athlete and sport.[66]

Lightning

An often-seen natural phenomenon, lightning is responsible for more than 60 fatalities and hundreds of injuries annually in the United States. [69] As probable as it is anywhere else, lightning fatalities can occur during athletic events and competition if proper prevention strategies are not implemented quickly. [18] The athletic trainer plays a key role in the overall safety of athletes and bystanders, as well as the prevention of lightning-related deaths and injuries.

Prevention of lightning injury begins with completely avoiding the risk of trauma by staying indoors in a substantial building for shelter during a thunderstorm. This is a simple solution if the athletic event or practice has not yet started. However, if already outside when the storm begins, it is necessary to ensure that everyone is moved quickly and safely to a previously identified 4-walled structure in which people live or work. [70] No place outdoors is completely safe from lightning, including dugouts, rain shelters, tents, and storage sheds, and should therefore not be used as a shelter from a lightning storm. [71] The athletic trainer is up to date on

new policies regarding lightning safety and is responsible for establishing an emergency action plan or policy specific to lightning safety. [18] On-site observations and use of federal weather monitoring web sites are encouraged, and it is the responsibility of the athletic trainer to call off a practice or game with the onset of thunder and/or lightning. [18] The lightning safety plan must allow sufficient time to move to the identified building. Once there, it is critical to remain within the building for at least 30 minutes after the list thunderclap or lightning strike. [72] Keeping track of time, the athletic trainer is the only one to announce when individuals can exit the building and when the game or practices may resume.

Treatment for an individual that has been struck by lightning involves the establishment and maintenance of normal cardiorespiratory status by a health care professional. [70] CPR is initiated while an AED is being retrieved, and although defibrillation with an AED may not be indicated, the health care professional knows to continue CPR. [18] After advanced cardiac care has been performed, any signs of shock have been treated and accounted for, and the individual's heart rhythm has normalized, recovery and return to sport participation is then monitored and controlled by the athletic trainer. He/she will work with a qualified physician in determining a return to play protocol for the athlete, depending on the extent of the injuries and neurologic sequelae that may have resulted from the lightning strike.[69,73]

III. Medical Coverage for Secondary Schools: Who is Providing the Care?

It has been reported that approximately 50% of secondary schools do not have medical staff on site to implement policies related to the conditions most likely to cause death described above. [1] Despite whether or not medical care is being provided, the bigger question is *who* is providing the care. If no athletic trainer is present, sport coaches, strength and conditioning

coaches, and the athletic director are often the individuals responsible for implementing these policies, and assume a obligatory position in the safety and prevention of injury for athletes. The responsibility is far too great for those not certified, trained, or educated in the prevention, recognition, and treatment of athletic injury. Furthermore, the individuals taking the place of athletic trainers are not qualified to be making decisions regarding the health and safety of athletes.

Coaches and administrators are not qualified to perform the duties of an athletic trainer. The National Federation of High School's (NFHS) certification requirements to become a coach only cover the very basic in preventing and treating athletic injury, and not all states require these to be followed. 36 state associations require at least a first aid certification, and out of the 36, only 23 states require certifications for both first aid and CPR. Currently there are 14 states that do not require coaches to obtain certifications in first aid or CPR. [74] According to NFHS guidelines, individuals should take "NFHS Fundamentals of Coaching", "Concussion in Sports – What You Need to Know", "NFHS First Aid, Health and Safety for Coaches", and a sport-specific "Fundamentals of Coaching" or "Teaching Sport Skills" course. [74] It is a strong recommendation for all coaches to be certified in first aid, CPR, and the use of an automated external defibrillator (AED).[1]

Even more unsettling is the thought that there are coaches responsible for the overall health and safety of athletes who are not certified in the basics of emergency care. A study assessing first-aid knowledge and decision making of high school athletic coaches found only 36% of athletic coaches achieved passing scores, and that when given a game situation, most coaches chose to return injured players to the game. [75] This addresses the need for an unbiased professional to provide medical care on the athletic field. [75] Barron et al. [76] further illustrates

coaches' insufficient knowledge with only 5.17% of participants earning a passing score on the first aid assessment. At minimum, being certified would allow coaches to provide appropriate immediate care, but it is crucial that an athletic trainer be present to assume responsibility from the coach within two minutes of the injury/illness.[1]

Strength and conditioning coaches should not take the place of an athletic trainer, as their certifications do not adequately support the injury prevention, recognition, and treatment spectrum. The National Strength and Conditioning Association requires that one must be certified in CPR, AED use, and pass the Certified Strength and Conditioning Specialist exam.[77] However, there are various options for strength and conditioning credentialing, all with different requirements, which are not equivalent to obtaining a medical degree. Strength and conditioning coaches appear to lack essential knowledge in the prevention and recognition of athletic injury. A recent study by Valdes et al.[78] investigating coaches' knowledge on the prevention and recognition of exertional heat stroke (EHS), reported that only 2.2% of total coaches who took the survey scored greater than 90%, and that 47% of all coaches scored less than 59%. This shows that almost half of the respondents failed when asked about preventing and recognizing EHS. In regards to recognition, perhaps the most important as it leads to prompt treatment and an even greater survival rate, 54% of coaches scored less than 59%.[78] This is cause for concern for just one medical condition, and does not take into consideration the other nine top causes of sudden death in athletics. Coaches should not have the responsibility of life-saving recognition to an emergency problem despite the level of sport, and at the secondary level specifically, parents of student-athletes would not want recognition and treatment of emergency situations to be in the hands of coaches who do not have the necessary education and training.[1]

Athletic trainers are licensed medical professionals specifically trained to prevent, recognize, and treat emergencies related to physically active individuals, and are therefore essential at the secondary school level to provide appropriate care to the student-athletes.[1] The education background, national certification by the Board of Certification, state licensure, and years of clinical practice at both the Bachelor and Master's levels provide an athletic trainer with the adequate skills and experience to assume responsibility of the lives of hundreds of athletes. [23] History of support for athletic trainers in high schools started in 1995, when the National Athletic Trainers' Association (NATA) issued a statement that secondary schools should provide the services of a full-time, certified athletic trainer. In 1997, steps were taken in the profession with Hawaii becoming the first state to employ full-time, athletic trainers in all public schools. One year later, the American Medical Association (AMA) recommended employment of athletic trainers in all high school athletic programs. [8] The literature supporting employment of an athletic trainer at the secondary school level is outstanding. The NATA, AMA, and the Inter-Association Task Force all acknowledge that a NATABOC certified athletic trainer be employed at every secondary school with an athletic program. In addition, a statement on appropriate medical care for the secondary school athlete acknowledged that a certified athletic trainer needs to be included in the health care team, and also to serve as on-site personnel, along with EMS, to respond promptly and efficiently to medical emergencies. [79] The most up to date best practice recommendations for secondary school athletic programs state that an athletic trainer should be physically present at the school and accessible for practices and competitive events. Ideally, the medical professional would be employed directly by the school district to increase likelihood that emergency planning is developed school-wide, and that state athletic association policies are strictly enforced. [23] With the number of individuals participating

in athletics increasing every year, which directly increases injury rates, the importance of an athletic trainer is paramount. A sports organization that fails to provide medical supervision at practices and games runs the risk of legal liability. [1,80] The school is obligated to provide participant safety to all student-athletes, which can be accomplished through the employment of an athletic trainer.

Athletic trainer penetration rates at the public secondary school level have recently been investigated through The Collaboration for Athletic Training Coverage at High Schools: An Ongoing National Survey (CATCH-ON) study.[81] Contrary to a 1999 publication reporting only 35% of United States' high schools using the services of a certified athletic trainer, CATCH-ON has found that 70% of surveyed public secondary schools in the United States have access to an athletic trainer, and 86% of athletes have some level of access to an athletic trainer. By region, northern states have the greatest access to an athletic trainer at 86%, whereas northwestern states have the lowest at 46%.[81] This distribution shows which areas of the United States need to be targeted to increase penetration rates for the profession. Surveyed schools reported reasons for not having an athletic trainer, which included cost and budget, not enough athletes, no need for one, remote location, or that one was not provided. If no athletic trainer was present, schools reported no medical coverage during games, or that a chiropractor, physical therapist, EMT, sports medicine student, doctor, nurse, etc. were assuming the role of the athletic trainer. The above-mentioned individuals do not specialize in prevention, recognition, and treatment of injuries in the active and athletic population and should therefore not have the responsibility of providing on-site medical coverage. Although athletic training coverage at the secondary school level has increased tremendously in the last few years, there is still a need for increased awareness.

A recent study by McLeod et al.[82] supports the CATCH-ON findings with an identified 85% of athletic training respondents working in the public secondary school setting. There is increasing knowledge on public schools, but the literature is still lacking on the extent of athletic training coverage at the private secondary school level in the United States. By extending the CATCH-ON study to private secondary schools, we will learn more about athletic training coverage in this setting. Upon comparing private to public school CATCH-ON data, we hope to identify areas of improvement and increase penetration rates, while simultaneously enhancing athlete safety in United States' private secondary schools.

References

1. Mueller FO CD. Fatal and catastrophic injuries in athletics: Epidemiologic data and challenging circumstances. In: Casa DJ, ed. *Preventing sudden death in sport and physical activity.* Burlington, MA: Jones and Bartlett; 2012:1-14.

2. Boden BP, Breit I, Beachler JA, Williams A, Mueller FO. Fatalities in high school and college football players. *Am J Sports Med*. 2013;41(5):1108-1116.

3. Kerr ZY, Casa DJ, Marshall SW, Comstock RD. Epidemiology of exertional heat illness among U.S. high school athletes. *Am J Prev Med*. 2013;44(1):8-14.

4. Mueller FO, Cantu RC. National center for catastrophic sport injury research. Twenty-Seventh Annual Report, Fall 1982- Spring 2009 Web site. . Updated 2010.

5. Center for Disease Control and Prevention. Sports-related injuries among high school athletes. *MMWR Weekly*. 2006;55(38):1037-1040.

6. Meehan WP 3rd, Mannix R. A substantial proportion of life-threatening injuries are sport-related. *Pediatr Emerg Care*. 2013;29(5):624-627.

7. National Athletic Trainers' Association. Recommendations and guidelines for appropriate medical coverage of intercollegiate athletics. http://www.nata.org/sites/default/files/AMCIARecsandGuides.pdf. Updated 2007. Accessed May/3, 2014.

8. Claiborne T, Su-I Hou, Cappaert T. Certified athletic trainers provide effective care in the high school setting. *Athletic Therapy Today*. 2007;12(2):34-38.

9. Mueller F CR. National center for catastrophic sports injury research. Twenty Sixth Annual Report of the National Center for Catastrophic Sports Injury Research Web site. http://www.unc.edu/depts/nccsi/. Updated 2009. Accessed March/5, 2014.

10. Stearns RL, O'Connor FG, Casa DJ, Kenny GP. Exertional heat stroke. In: Casa DJ, ed. *Preventing sudden death in sport and physical activity.* Burlington, MA: Jones and Bartlett; 2012:53-71.

11. Casa DJ, Csillan D, Inter-Association Task Force for Preseason Secondary School Athletics Participants, et al. Preseason heat-acclimatization guidelines for secondary school athletics. *J Athl Train*. 2009;44(3):332-333.

12. Rav-Acha M, Hadad E, Epstein Y, Heled Y, Moran DS. Fatal exertional heat stroke: A case series. *Am J Med Sci*. 2004;328(2):84-87.

13. Montain SJ, Coyle EF. Influence of graded dehydration on hyperthermia and cardiovascular drift during exercise. *J Appl Physiol (1985).* 1992;73(4):1340-1350.

14. Eichner ER. Toward ending fatal heat stroke in football players. *J Athl Train*. 2010;45(2):105-106.

15. Armstrong LE, Johnson EC, Casa DJ, et al. The American football uniform: Uncompensable heat stress and hyperthermic exhaustion. *J Athl Train*. 2010;45(2):117-127.

16. Johnson EC, Ganio MS, Lee EC, et al. Perceptual responses while wearing an American football uniform in the heat. *J Athl Train*. 2010;45(2):107-116.

17. Grundstein AJ, Ramseyer C, Zhao F, et al. A retrospective analysis of American football hyperthermia deaths in the united states. *Int J Biometeorol*. 2012;56(1):11-20.

18. Casa DJ, Guskiewicz KM, Anderson SA, et al. National athletic trainers' association position statement: Preventing sudden death in sports. *J Athl Train*. 2012;47(1):96-118.

19. Ganio MS, Brown CM, Casa DJ, et al. Validity and reliability of devices that assess body temperature during indoor exercise in the heat. *J Athl Train*. 2009;44(2):124-135.

20. Pryor RR, Seltz JR, Morley J, et al. Estimating core temperature with external devices after exertional heat stress in thermal protective clothing. *Prehosp Emerg Care*. 2012;16(1):136-141.

21. Casa DJ, Becker SM, Ganio MS, et al. Validity of devices that assess body temperature during outdoor exercise in the heat. *J Athl Train*. 2007;42(3):333-342.

22. Casa DJ, McDermott BP, Lee EC, Yeargin SW, Armstrong LE, Maresh CM. Cold water immersion: The gold standard for exertional heatstroke treatment. *Exerc Sport Sci Rev*. 2007;35(3):141-149.

23. Casa DJ, Almquist J, Anderson SA, et al. The inter-association task force for preventing sudden death in secondary school athletics programs: Best-practices recommendations. *J Athl Train*. 2013;48(4):546-553.

24. Maron BJ. Sudden death in hypertrophic cardiomyopathy. *J Cardiovasc Transl Res*. 2009;2(4):368-380.

25. Maron BJ, Doerer JJ, Haas TS, Tierney DM, Mueller FO. Profile and frequency of sudden death in 1463 young competitive athletes: From a 25 year U.S national registry, 1980-2005. .

26. Corrado D, Basso C, Rizzoli G, Schiavon M, Thiene G. Does sports activity enhance the risk of sudden death in adolescents and young adults? *J Am Coll Cardiol*. 2003;42(11):1959-1963.

27. Asif IM, Rao AL, Drezner JA. Sudden cardiac death in young athletes: What is the role of screening? *Curr Opin Cardiol*. 2013;28(1):55-62.

28. Drezner JA, Rao AL, Heistand J, Bloomingdale MK, Harmon KG. Effectiveness of emergency response planning for sudden cardiac arrest in united states high schools with automated external defibrillators. *Circulation*. 2009;120(6):518-525.

29. Dvorak J, Kramer EB, Schmied CM, et al. The FIFA medical emergency bag and FIFA 11 steps to prevent sudden cardiac death: Setting a global standard and promoting consistent football field emergency care. *Br J Sports Med*. 2013;47(18):1199-1202.

30. Guidelines 2000 for cardiopulmonary resuscitation and emergency cardiovascular care. part 4: The automated external defibrillator: Key link in the chain of survival. the american heart association in collaboration with the international liaison committee on resuscitation. *Circulation*. 2000;102(8 Suppl):I60-76.

31. Drezner JA, Courson RW, Roberts WO, et al. Inter-association task force recommendations on emergency preparedness and management of sudden cardiac arrest in high school and college athletic programs: A consensus statement. *Heart Rhythm*. 2007;4(4):549-565.

32. Langlois JA, Rutland-Brown W, Wald MM. The epidemiology and impact of traumatic brain injury: A brief overview. *J Head Trauma Rehabil*. 2006;21(5):375-378.

33. Mueller F CR. Football fatalities and catastrophic injuries: 1931-2008. *Carolina Academic Press*. 2010.

34. Mihalik JP GK. Brain injuries. In: Casa DJ, ed. *Preventing sudden death in sport and physical activity.* Burlington, MA: Jones and Bartlett; 2012:79-108.

35. Broglio SP, Cantu RC, Gioia GA, et al. National athletic trainers' association position statement: Management of sport concussion. *J Athl Train*. 2014;49(2):245-265.

36. Benson BW, McIntosh AS, Maddocks D, Herring SA, Raftery M, Dvorak J. What are the most effective risk-reduction strategies in sport concussion? *Br J Sports Med*. 2013;47(5):321-326.

37. National Collegiate Athletic Association. Guideline 21: Sports-related concussion. In: *NCAA sports medicine handbook.* Revised July 2013 ed.

38. McCrory P, Meeuwisse WH, Aubry M, et al. Consensus statement on concussion in sport: The 4th international conference on concussion in sport, Zurich, November 2012. *J Athl Train*. 2013;48(4):554-575.

39. Eichner ER. Sickle cell considerations in athletes. *Clin Sports Med*. 2011;30(3):537-549.

40. Eichner R AS. Exertional sickling. In: Casa DJ, ed. *Preventing sudden death in sport and physical activity.* Burlington, MA: Jones and Bartlett; 2012:131-140.

41. Martin D. Sickle cell trait. In: *NFHS sports medicine handbook.* ; 2011:113-115.

42. National Collegiate Athletic Association. Guideline 2R: The student-athlete with sickle cell trait. In: *NCAA sports medicine handbook.* ; 2013:93-95.

43. National Athletic Trainers' Association. Sickle Cell Trait and the Athlete Web site. http://www.nata.org/consensus-statements. Accessed March/25, 2014.

44. Harmon KG, Drezner JA, Klossner D, Asif IM. Sickle cell trait associated with a RR of death of 37 times in national collegiate athletic association football athletes: A database with 2 million athlete-years as the denominator. *Br J Sports Med*. 2012;46(5):325-330.

45. Purvines S, Groff MW, Feuer H. Cervical spine injuries in athletes. *Seminars in Neurosurgery*. 2003;14(1):031-038.

46. Banerjee R, Palumbo MA, Fadale PD. Catastrophic cervical spine injuries in the collision sport athlete, part 1: Epidemiology, functional anatomy, and diagnosis. *Am J Sports Med*. 2004;32(4):1077-1087.

47. Sanchez AR,2nd, Sugalski MT, LaPrade RF. Field-side and prehospital management of the spine-injured athlete. *Curr Sports Med Rep*. 2005;4(1):50-55.

48. Banarjee R, Palumbo MA, Fadale PD. Catastrophic cervical spine injuries in the collision sport athlete, part 2. *Amer J Sports Med*. 2004;32(7):1760-1764.

49. Swartz EE, Decoster LC, Norkus SA, Cappaert TA. The influence of various factors on high school football helmet facemask removal: A retrospective, cross-sectional analysis. *J Athl Train*. 2007;42(1):11-9, discussion 20.

50. Crosby ET. Airway management in adults after cervical spine trauma. *Anesthesiology*. 2006;104(6):1293-1318.

51. Gabbott DA, Baskett PJ. Management of the airway and ventilation during resuscitation. *Br J Anaesth*. 1997;79(2):159-171.

52. Levi AD, Casella G, Green BA, et al. Clinical outcomes using modest intravascular hypothermia after acute cervical spinal cord injury. *Neurosurgery*. 2010;66:670-677.

53. Cappuccino A, Bisson LJ, Carpenter B, et al. The use of systemic hypothermia for the treatment of an acute cervical spinal cord injury in a professional football player. *Spine*. 2010;35(2):E57-62.

54. Hansebout RR HC. Local cooling for traumatic spinal cord injury: Outcomes in 20 patients and review of the literature. *Journal of Neurosurgery*. 2014;20(5):550-561.

55. National Heart, Lung, and Blood Institute. What is asthma? http://www.nhlbi.nih.gov/health/dci/Diseases/Asthma/Asthma_WhatIs.html. Accessed March/9, 2014.

56. Miller MG, Weiler JM, Baker R, Collins J, D'Alonzo G. National athletic trainers' association position statement: Management of asthma in athletes. *J Athl Train*. 2005;40(3):224-245.

57. Bernhardt DT RW. Preparticipation physical evaluation. In: 4th ed. Elk Grove Village, IL: ; 2010.

58. Rundell KW, Wilber RL, Szmedra L, Jenkinson DM, Mayers LB, Im J. Exercise-induced asthma screening of elite athletes: Field versus laboratory exercise challenge. *Med Sci Sports Exerc*. 2000;32(2):309-316.

59. Dennis RJ, Solarte I, Fitzgerald M. Asthma in adults. In: *BMJ clinical evidence handbook.* London, England: BMJ Publishing Group; 2008:502-503.

60. Holley AD BR. Review article: Management of acute severe and near-fatal asthma. *Emerg Med Aus*. 2009;21:259-268.

61. Rifat SF GR. Blunt abdominal trauma in sports. *Curr Sports Med Rep*. 2003;2:93-97.

62. Powers ME, Tropeano M, Priestman D. Pancreatic laceration in a female collegiate soccer athlete: A case report. *J Athl Train*. 2013;48(2):271-276.

63. Putukian M TC. Traumatic injuries. In: Casa DJ, ed. *Preventing sudden death in sport and physical activity.* Burlington, MA: Jones and Bartlett; 2012:141-155.

64. Grinsell MM, Butz K, Gurka MJ, Gurka KK, Norwood V. Sport-related kidney injury among high school athletes. *Pediatrics*. 2012;130(1):e40-5.

65. Bergqvist D, Hedelin H, Karlsson G, Lindblad B, Matzsch T. Abdominal injury from sporting activities. *Br J Sports Med*. 1982;16(2):76-79.

66. Putukian M, O'Connor FG, Stricker PR, et al. Mononucleosis and athletic participation: An evidence-based subject review. *Clin J Sports Med*. 2008;18:309-315.

67. Johnson MA, Cooperberg PL, Boisvert J, et al. Spontaneous splenic rupture in infectious mononucleosis: Sonographic diagnosis and follow-up. *Am J Roentgenol*. 1981;136:111-114.

68. Intravia JM, DeBerardino TM. Evaluation of blunt abdominal trauma. *Clin Sports Med*. 2013;32(2):211-218.

69. Holle RL, Cummins KL, Demetriades NWS. Monthly distributions of NLDN and GLD360 cloud-to-ground lightning. *International Lightning Detection Conference*. 2010.

70. Walsh KM, Cooper MA, Holle R, et al. National athletic trainers' association position statement: Lightning safety for athletics and recreation. *J Athl Train*. 2013;48(2):258-270.

71. Rakov VA. Lightning protection of structures and personal safety. *International Lightning Detection Conference*. 2000.

72. Cherington M. Lightning injuries in sports: Situations to avoid. *Sports Med*. 2001;31(4):301-308.

73. Cherington M. Neurologic manifestations of lightning strikes. *Neurology*. 2003;60(2):182-185.

74. National Federation of State High School Associations. Pricing and State Requirements Web site. http://www.nfhslearn.com/StatePricingRegs.aspx. Updated 2014. Accessed May/5, 2014.

75. Ransone J DL. Assessment of first-aid knowledge and decision making of high school athletic coaches. *J Athl Train*. 1999;34(3):267-271.

76. Barron MJ, Powell JW, Ewing ME, et al. First aid and injury prevention knowledge of youth basketball, football, and soccer coaches. *Journal of Coaching*. 2009;3(1):55.

77. National Strength and Conditioning Association. Certification Web site. http://www.nsca.com/Certification/. Updated 2013. Accessed April/2, 2014.

78. Valdes AS, Hoffman JR, Clark MH, Stout JR. National collegiate athletic association strength and conditioning coaches' knowledge and practices regarding prevention and recognition of exertional heat stroke. *J Strength Cond Res*. 2014.

79. Almquist J, Valovich McLeod TC, Cavanna A, et al. Summary statement: Appropriate medical care for the secondary school-aged athlete. *J Athl Train*. 2008;43(4):416-427.

80. Lyznicki JM, Riggs JA. Certified athletic trainers in secondary schools: Report of the council on scientific affairs.. *Journal of Athletic Training*. 1999;34(3):272.

81. Pryor RR, Vandermark LW, Casa DJ, Attanasio SM, Fontaine GJ, Wafer AM. Athletic Training Services in Public Secondary Schools: A Benchmark Study. *Journal of Athletic Training*. (in press)

82. McLeod TC, Bliven KC, Lam KC, Bay RC, Valier AR, Parsons JT. The national sports safety in secondary schools benchmark (N4SB) study: Defining athletic training practice characteristics. *J Athl Train*. 2013;48(4):483-492.

CHAPTER II

INTRODUCTION

Over the years, there has been a rise in athletic participation, which has directly correlated to an increase in the number of high school sport injuries. Over a 30-year period, the National Center for Catastrophic Sports Injury Research reported 81% of all catastrophic injuries occurred at the secondary school level, a larger percentage than the college setting.[1] It is estimated that 90% of all football deaths are caused by one of four conditions: cardiac conditions, heat-related illnesses, head injuries, and exertional sickling.[2] Despite the high percentage of injuries at the secondary school level, conditions can be prevented, recognized early and managed appropriately if onsite medical coverage is available. As outlined by the American Medical Association and the National Athletic Trainers' Association (NATA), the most appropriate individual to provide this medical care is an athletic trainer.[3]

The demand for athletic trainers in the secondary school setting should be on the rise, as they are qualified medical care providers who can assist in the case of a life-threatening condition. However, studies have demonstrated less than adequate athletic training coverage in the secondary school setting.[4, 5] Dating back to 1994, 35% of secondary schools had athletic training (AT) services.[4] As of 2005, a study conducted by the NATA[5] revealed that 42% of high schools employed the services of an athletic trainer. In the span of 11 years, AT coverage in secondary schools in the United States had only increased by 7%. The low percentage of athletic trainers employed in secondary schools may provide some explanation to the increased incidence of sport injuries, both life threatening and catastrophic, that occur at this level. The most recent study investigating current AT services in public secondary schools showed a significant increase from what was previously investigated.[6] Data collection from 2011-2013 revealed that

70% of public secondary schools have AT services, whether that is full time, part time, per diem, or employed through a clinic, while 86% of all athletes have some access to AT services.[6] Furthermore, of the 70% providing services, 37% have full time AT services, and 55% provide AT coverage every afternoon.

Despite the apparent rise in employment of athletic trainers, there are still secondary schools that currently do not employ one, and are therefore relying on sport coaches, administrative staff, and other unqualified personnel to provide medical treatment to athletes.[6] First aid and CPR fulfills the medical aspect required for an individual to become a sport coach in some states, but a study investigating the level of medical services in secondary schools found school districts with a large number of their coaching staff not certified in either first aid or CPR.[7] This is especially of concern if these schools do not employ an athletic trainer. Coaches often do not have the proper knowledge to recognize common causes of medical emergencies and treat life-threatening medical conditions.[8-11] Although not as common as musculoskeletal injuries, life-threatening situations do occur in sport, and it is imperative that adequate medical professionals with training in the assessment and treatment of such conditions are onsite to take immediate action. Schools that do not employ athletic trainers are jeopardizing the health and safety of the athletes.

The private secondary school setting is unique and differs from public sector secondary schools. A major difference between private and public sector secondary schools is yearly budget and where money is generated to support the annual budget.[12] Public school budgets are often larger when compared to the private school setting because it is generated through federal, state, and local taxes, and are part of a larger school system. Private secondary schools, however, generate their own funding by charging tuition, and through grants and fundraising.[12] A main

barrier for providing medical coverage through the services of an athletic trainer is often fiscally related within the public secondary school setting. It is likely, that this barrier exists within the private sector, however this information is not available. As discussed previously, data exists[4-6] related to medical coverage within the public secondary school setting, however it is not available in the private sector. Our purpose, therefore, is to determine the presence of athletic trainers in the private secondary school setting, as well as to identify reasons why private secondary schools do not employ an athletic trainer.

CHAPTER III

METHODS

Our research design mimicked a previous study,[6] which examined the public sector for AT coverage at the secondary school setting. We used qualitative and quantitative research to seek a greater understanding of the AT coverage at the private secondary school level across the United States. One-on-one telephone interviews gained access to a large number of private secondary schools. The personal nature of the phone calls allowed for a greater follow-up with the schools and helped improve our response rate.[13]

Participants

A total of 5,414 secondary private schools in the United States were identified for the study. "Secondary school" was defined as any school comprising any variation of grades 9-12. "Secondary school" was used instead of "high school", because some of the participating schools included grades lower than 9. Contact information was obtained through searches done by Google Internet browser and the United States Department of Education website. Schools identified to participate in this study were private schools with an organized athletics program, containing at least one of grades 9-12. Schools were excluded if they were one of the following types: public, alternative, charter, magnet, technical, or vocational. Of the 5,414 schools, 2,046 responded to the structured interview (38% response rate). The participants in this study were school administrators, either the athletic director (AD) or the school's principal. Respondents to our phone calls represented wide geographical diversity across the United States, with representation from all 50 states (Appendix A).

Procedures

Our procedures were identical to Pryor et al.[6], and therefore we adopted the duplicate interview guide developed for the public sector. A structured interview guide was chosen to ensure the same information was collected, as multiple researchers were facilitating telephone interviews. All callers were trained prior to calls and instructed to follow the interview guide/script. The interview guide (Appendix B) contained questions on the school itself as well as several opinion/value-based questions related to the medical coverage provided to their student-athletes. Many of the questions were focused on the extent of athletic training services (full time, part time, per diem, etc.). Official hiring status and the athletic director's knowledge of hours worked at the school determined this information.

The school administrator of every private secondary school in the United States and District of Columbia was contacted by phone and/or email if it was provided. Callers made four attempts to reach the school administrator, and if on the 4th attempt no answer was made, the school was considered a non-respondent. A fifth call was made only to non-respondent schools in states that did not reach at least a 20% response rate. Having had difficulties contacting athletic directors in the private sector for various reasons, a 20% response rate was concluded to be a well-represented sample of the population. After a cursory search of survey publications, I found this to be comparable to other survey response rates. We felt it appropriate to take time to make the extra call to ensure we were collecting accurate, useful, unbiased data. Consent was conceded by completion of the interview. Data collection took place December 2013 – June 2014.

Data Analysis and Credibility

All qualitative data was analyzed following a general inductive, basic content analysis to examine trends and patterns in participant responses. An open coding procedure was used to identify key themes in the open-ended data. Similar responses were placed into categories, which then became the overarching themes regarding barriers to athletic trainer employment. Analysis of variance compared United States regions and NATA districts. Descriptive statistics portray individual state data and are reported as means and standard deviations. School size classifications were analyzed by student body populations and were divided into 100 student increments (e.g. 0-99, 100-199, etc.). Statistical analyses were performed in SPSS version 20.0 (SPSS, Inc., Chicago, IL, USA).

To establish credibility of the data we employed intercoder analysis[13] along with specific parameters suggested by researchers when designing a qualitative study. We completed intercoder reliability through the use of two researchers completing the coding of the data. After independent review, the two researchers compared their coding procedures to provide rigor to the analysis. A researcher with extensive knowledge and experience with qualitative research was consulted when developing the data collection procedures and interview guide development. Experience is considered to be an important aspect of a sound qualitative study.[13] Data inquiry is said to be on-going in qualitative research, due to the extensive nature of the study, those involved in the data collection process maintained open lines of communication, continually documenting and recording the findings of the interviews.[14] The instrument we used to gain information on the medical coverage within the private sector of the secondary school setting was previously used in a study examining the same research agenda, however with public

secondary schools. The use of this previously used interview guide helped provide consistency and rigor.

CHAPTER IV

RESULTS

Quantitative Findings

Out of all 5,414 private secondary schools in the United States, which was determined via an online database,[15] 2,045 responded to our survey, resulting in a 38% response rate. Of 2,045 secondary schools that participated, 57% (1,169/2,045) have AT services, while 84% (280,417/335,814) of all athletes have access to AT services. Twenty-eight percent (574/2,045) of our participating secondary schools have full time AT services, 24% (501/2,045) provide part time AT services, and 4% (78/2,045) have per diem AT services. Twenty percent (409/2,045) of all secondary schools have AT services outsourced from a clinic. Thirty-eight percent (767/2,045) of all schools have full practice coverage every afternoon. Nineteen percent (198/1,038) of schools with AT services also hire the athletic trainer to teach a health or sports medicine class at the school. A breakdown of extent of AT services by state and NATA districts can be found in Appendix B. Table 3 compares AT services in the public and private secondary school sectors.

Table 3. Comparison of Athletic Training (AT) Services Between Private and Public Secondary School Sectors

	Public[6]	**Private**
Full Time AT Services	37% (3,145/8,509)	28% (574/2,045)
Coverage Every Afternoon	55% (4,075/8,509)	38% (767/2,045)
Total AT Services	70% (5,930/8,509)	57% (1,169/2,045)
% Athletes with Access to AT Services	86% (2,394,284/2,787,595)	84% (280,417/335,814)

Larger private secondary schools, defined as schools comprised of a student body greater than 100, were more likely to have AT services. As school size increased, dictated by student enrollment numbers, the percentage of private secondary schools with AT services was higher. In schools with 399 students or less, 44% (583/1,312) had AT services, while 56% (729/1,312) did not. Regarding schools with 400 or more students, 92% (466/504) had AT services, while only 8% (38/504) did not. A more detailed presentation comparing AT services in the private and public sectors by school size can be found in Table 4.

Table 4. Athletic Training (AT) Services by Public and Private School Size

Student Enrollment	**Have AT Services**		**Do Not Have AT Services**		**Full Time AT Services**	
	Public[5]	**Private**	**Public[5]**	**Private**	**Public[5]**	**Private**
< 100 students	22% (119/550)	15% (65/448)	78% (431/550)	85% (383/448)	5% (6/123)	3% (15/448)
≥ 100 students	74% (5,322/7,166)	72% (984/1,368)	26% (1,844/7,166)	28% (384/1,368)	56% (2,979/5,309)	42% (568/1,364)
≥ 200 students	78% (5,061/6,453)	82% (826/1,005)	22% (1,392/6,453)	18% (179/1,005)	58% (2,948/5,045)	52% (523/1,002)
≥ 300 students	81% (4,716/5,789)	87% (634/726)	19% (1,073/5,789)	13% (92/726)	61% (2,875/4,697)	61% (443/724)
≥ 400 students	84% (4,383/5,226)	92% (466/504)	16% (843/5,226)	8% (38/504)	63% (2,756/4,361)	69% (347/502)
≥ 500 students	86% (4,027/4,702)	93% (345/370)	14% (675/4,702)	7% (25/370)	65% (2,603/4,003)	72% (266/368)

Note. Numerator represents number of schools that have the described AT services. Denominator represents total number of private secondary schools in that category. "Have AT Services" indicates full time, part time, and per diem services.

Secondary schools with athletic trainers averaged 269 athletes while schools without athletic trainers averaged 73 athletes (Appendix C). A breakdown of school size and extent of AT services in private secondary schools is presented in Table 5 and Figure 6.

Table 5. Extent of Athletic Training Coverage of All Private Secondary Schools Based on Student Enrollment.

Student Enrollment	Number of schools	Any AT service	% Schools with Full Time AT service	% Schools with Part Time AT service	% Schools with Per Diem AT service	% Schools with Clinic AT service
1-99	448	15%	3%	10%	2%	8%
100-199	363	44%	12%	28%	4%	21%
200-299	279	69%	29%	40%	6%	27%
300-399	222	76%	43%	35%	5%	28%
400-499	134	90%	60%	31%	7%	33%
500-599	103	91%	62%	37%	0%	26%
600-699	69	90%	55%	38%	7%	46%
700-799	49	92%	69%	31%	6%	39%
800-899	42	98%	79%	31%	5%	36%
900-999	28	93%	89%	39%	0%	21%
1,000-1,099	25	100%	100%	40%	8%	40%
1,100-1,199	10	100%	70%	40%	0%	20%
1,200-1,299	15	100%	100%	27%	0%	13%
1,300-1,399	11	100%	81%	36%	18%	18%
1,400-1,499	7	100%	86%	29%	0%	0%
≥ 1,500	10	90%	80%	30%	0%	20%
United States Average		**58%**	**32%**	**28%**	**4%**	**23%**

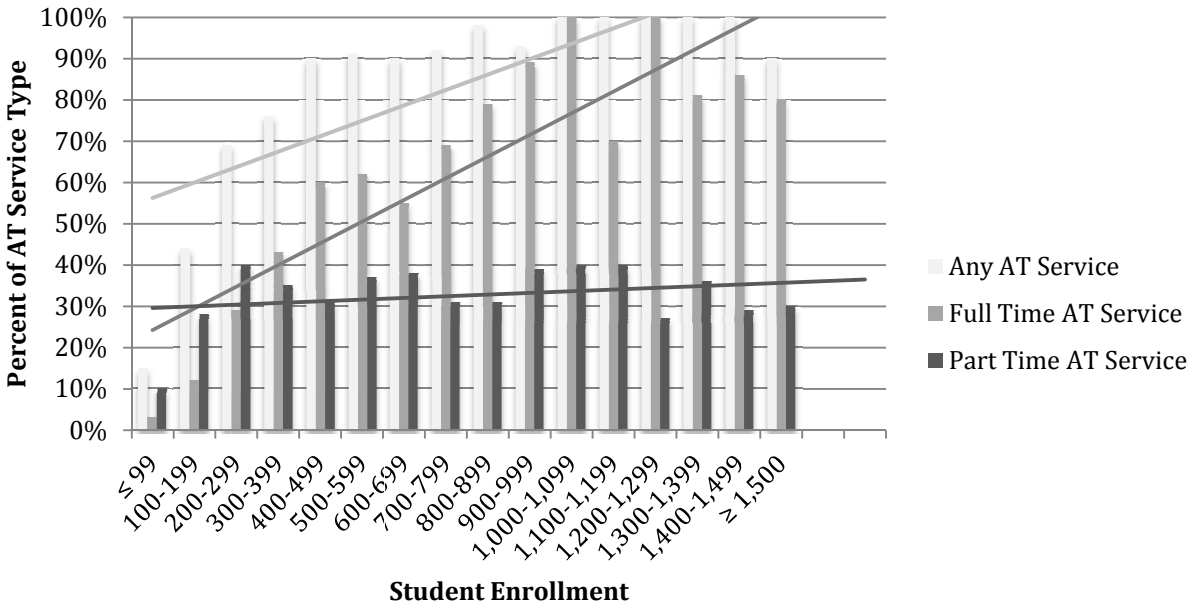

Figure 6. Prevalence of Athletic Training Services in Private Secondary Schools.

A breakdown of school size and extent of AT services in private schools with AT services is presented in Table 6 and Figure 7.

Table 6. Extent of Athletic Training Coverage of Private Secondary Schools with Athletic Training Services Based on Student Enrollment.

Student Enrollment	Full Time AT Service	Part Time AT Service	Per Diem AT Service	Clinic AT Service
1-99	23%	71%	19%	52%
100-199	28%	64%	10%	47%
200-299	42%	58%	9%	39%
300-399	57%	46%	6%	38%
400-499	67%	35%	8%	36%
500-599	68%	40%	0%	29%
600-699	61%	42%	8%	52%
700-799	76%	33%	7%	42%
800-899	80%	32%	5%	37%
900-999	96%	42%	0%	23%
1,000-1,099	100%	40%	8%	40%
1,100-1,199	70%	40%	0%	20%
1,200-1,299	100%	27%	0%	13%
1,300-1,399	81%	36%	18%	18%
1,400-1,499	86%	29%	0%	0%
≥ 1,500	89%	33%	0%	22%
United States Average	**56%**	**49%**	**7%**	**39%**

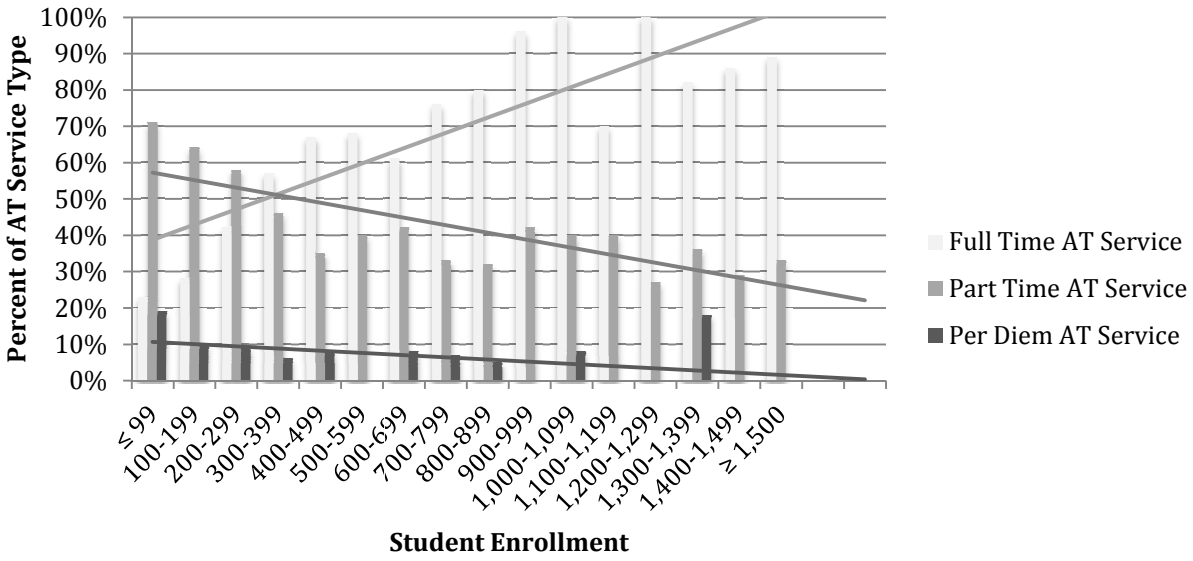

Figure 7. Private Secondary Schools with AT Services – Breakdown of Services.

Qualitative Findings

When assessing barriers to hiring an athletic trainer in the private secondary school setting, three major themes (Figure 8) emerged from the data: budgetary constraints, size of the school, and lack of awareness of the role of the athletic trainer. Each theme is discussed below in further detail with supporting quotes from participants.

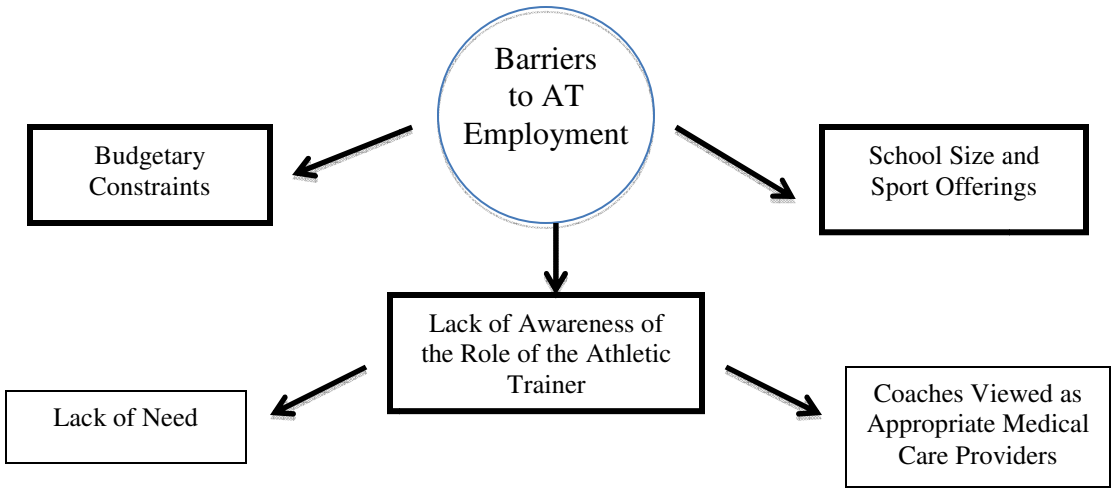

Figure 8. Barriers to Employing Athletic Trainers in the Private Secondary School Setting.

Budgetary Constraints. The data revealed that a majority of the private secondary schools are unable to provide AT services due to lack of funding. When asked why there was no

athletic trainer employed at the school, an AD from North Carolina stated, "That's a great question. I'd love to have one, but we just haven't been able to fit it in our budget." Another AD from New York shared his struggle with budget constraints when he replied, "Trainers are not cheap. We have 15 sports and to cover all of them would be difficult with our budget restraints." Representing the Midwest, a Wisconsin AD said, "We can't even afford our own gym." An AD from California reported, "There are so few students that we can't afford it." With representation from the Northwest region of the United States, an Oregon AD identified lack of budget as a barrier when stating, "We do not have the funding available to employ an athletic trainer." Budgetary constraints and limited resources were primary barriers to employing an athletic trainer in United States' private secondary schools.

School Size and Sport Offerings. The data demonstrate a small student enrollment number as a barrier to providing AT services in the private secondary school setting. For example, an AD from a Florida school provided reasoning for not having an athletic trainer due to the fact that "this is a very small school, with very few sports teams and athletes." Small school size and not having many organized sports teams were among the reasons for not employing an athletic trainer, which is reflected in the quote above. An AD from a Connecticut school supported this theme when he briefly stated, "We're not big enough for an athletic trainer." A Midwestern private school also identified school size as a barrier when an AD from Missouri explained, "We don't really need one because of the size of our school." Similarly, a Colorado school from the Southwest region justified not having an athletic trainer with, "The numbers don't support the cost." A respondent from California continued to express school size as a barrier with the response that the school is "…so small that myself, the coaches, and the parents can take care of everything." The latter part of the quote demonstrates a lack of

understanding of the role of an athletic trainer in the secondary school setting, which was identified as another overarching theme in this study.

Lack of Awareness of the Role of the Athletic Trainer. The data show that ADs and principals do not hire athletic trainers, because they are unaware of their role in secondary school athletics. Respondents often reported coaches' abilities to perform normal athletic training tasks, mistaking them as adequate medical providers. Similarly, this lack of awareness of the AT profession was seen in AD's and principals who responded there was simply no need for an athletic trainer at their school.

Coaches Viewed as Appropriate Medical Providers. Due to first aid and CPR certification requirements to become a coach in a majority of the 50 states, AD's do not hire athletic trainers because they feel coaches are an adequate means of medical coverage. An AD from Georgia reported, "The coaches can handle normal athletic training tasks." A participant from an Ohio school said, "Our coaches take care of minor injuries…bigger injuries the kids need to see their doctor anyways." A Michigan school AD illustrated the belief that coaches are appropriate medical care providers when concluding that the "basketball coach is sufficient coverage." Representing New Mexico, a respondent spoke about having a coach who has a lot of experience with injury prevention and treatment, but further explained that although he acts like an athletic trainer, he is not officially employed at the school to fulfill that position. Surprisingly, not only were coaches seen as appropriate medical providers, but some AD's were also viewed as competent. An Oregon school spoke about the AD doing it all, because he/she has a lot of experience. Many respondents believe coaches or ADs are acceptable substitutions for athletic trainers at their respective schools.

Lack of Need. Many participants, when asked why no AT services were provided at the school, responded that there was no need for an athletic trainer. Representing the Southern states,

an AD from Alabama stated that an athletic trainer is “not a necessary staff member,” and similarly, a Pennsylvania AD revealed that the school does not find it necessary. An AD from a school in Virginia reported he/she “would never hire someone to just do one job.” Expanding a little further on this theme, a California school expressed, “We haven’t had a need for it yet. We have a couple parents that are doctors and act as athletic trainers if we need them.” Furthermore, an AD representing a private secondary school in Iowa expanded on their lack of need for an athletic trainer by identifying that local people in the community can help care for athletes when there are injuries. This barrier to employment also extends to the Northwest region and is illustrated when a Montana school concisely stated, “A need for it hasn’t come up.” The belief in lack of need for an athletic trainer has kept athletic directors from pushing to hire one.

CHAPTER V

DISCUSSION

The purpose of this study was to examine the extent of AT services in United States' private secondary schools. Although recent studies have revealed the presence of athletic trainers in public secondary schools, [6, 16] little is known about medical coverage in the private secondary school setting, as well as barriers or reasons to why these schools do not hire an athletic trainer. A study by Lyznicki et al.[4] revealed that in 1994, only 35% of schools employed an athletic trainer, but in 2005, the NATA reported an increase in employment to 42%.[5] A most recent investigation of AT coverage in public secondary schools reported 70% of schools with some extent of AT service.[6] The rise in medical coverage at the secondary school setting is paramount in ensuring the health and safety of student-athletes. The presence of athletic trainers in the public secondary school setting has recently been investigated[6], but much remains unknown about the private secondary school sector. This population needed to be included to gain a holistic view of AT coverage in the secondary school setting, as well as provide us with a better understanding of why differences are seen between public and private sectors. The results of this study, although focused solely on the private secondary school setting, show an increase in the overall percentage of AT services offered. Current literature shows that AT services in secondary schools continue to rise with increased education and student-athlete enrollment.[6, 16]

AT Services in the Private Sector

Those surveyed revealed that 57% of private secondary schools have some extent of AT services, but this also means that 43% of private secondary schools do not employ an athletic trainer. Therefore, some student-athletes still do not have proper medical coverage, as outlined by the AMA and NATA consensus and official statements.[3] This holds true for both private and

public sectors, as only 70% of surveyed public secondary schools have AT services.[6] Despite increases in medical care over the years, there is still a lack of appropriate medical coverage in both private and public sectors.

Although more than half of all private secondary schools in the United States provide AT services, the majority of the positions are not full time. Out of the private secondary schools with AT services, only 28% of them employ a full time athletic trainer. Furthermore, 62% of schools with athletic trainers do not cover practices every afternoon. This takes away valuable time that the athletic trainer could be using to prevent, recognize, and treat athletic injuries. It is crucial to provide medical coverage for competitions and games, but student-athletes are often active for longer periods of time during daily practices. It is of great concern that only 28% of private secondary schools are providing their student-athletes with adequate care and not adhering to the recommendations of the AMA and NATA.[3]

Without appropriate medical personnel present for practices, a majority of time athletes are placing themselves at risk for injury when there is no athletic trainer in attendance to take action. This ultimately increases an athlete's risk of sudden death in sport. Examples include Max Gilpin[17] and DJ Searcy[18], secondary school athletes who died from complications of exertional heat stroke during football practice. An athletic trainer was not available in either case, resulting in inappropriate care, highlighting the need for appropriate medical staff at both practices and games.

Barriers to AT Services in the Private Sector

When identifying barriers to hiring an athletic trainer in private secondary schools, most respondents acknowledged budget and school size as primary hindrances. Budget issues continue to be a major barrier, as previously indicated by Mazerolle and peers[19], in the public secondary

school level. Funding sources for private schools differ from those of public schools, which can provide some preliminary support for our findings.[12] Private secondary schools are responsible for generating their own funding, which is juxtapose to public schools, who receive their funding from state and federal tax payers. Thus, budget development and decision-making related to the dissipation of funds is heavily based upon revenue generated by student enrollment and recruitment of students. We found that larger private secondary schools were more likely to have AT services than the smaller schools, which indicates that these schools may have larger budgets to work with, increasing the plausibility of AT services.

Unlike the public school sector, private schools can increase tuition as a means of increasing funds to support AT services. Like many colleges and universities that increase tuition rates to accommodate an increase in faculty salaries or hiring of new faculty, private secondary schools can increase their tuition rates as a means to support the salary of an athletic trainer. This is a unique aspect of the private sector in comparison to the public, which requires an increase in taxes to increase funding. Also, some private schools offer boarding for students and could provide boarding to an athletic trainer to both be an attractive benefit and to offset salary costs for the school. Another suggestion to navigating budget constraints, regardless of school type, is using 'pay-to-play' to support AT services. Currently, secondary schools face budget deficits and need to find means to fund activity programs, which has lead to the concept of 'pay-to-play'[20], whereby parents pay a flat rate to allow their children to play sports. The fee could help fund AT services.

As previously noted, budgetary constraint was reported as the largest barrier to employing an athletic trainer in the private secondary school setting. Not having enough money in the budget should not be reason alone for providing poor medical care or no medical coverage

at all. Taking into consideration cost analysis of an athletic trainer, previous literature has shown that implementing athletic trainers in secondary schools has potential cost savings, and that schools employing athletic trainers are actually saving money compared to those that do not employ one. According to the 2014 NATA Salary Survey, the average total annual wage for a certified athletic trainer at the private secondary school level is approximately $49,000.[21] Although the school is responsible for covering this cost, money is saved by reducing liability and medical insurance costs. In one study[22] of a Michigan public secondary school, reimbursable procedures and treatments of an athletic trainer yielded a total cost savings of $17,213 per school year. By generalizing this to all public high schools in Michigan, it is worth an incredible $7,849,018 in cost savings a year.[22] This principle can be applied to every state public and private sectors. It is speculated that private secondary schools' cost savings may even be higher as some provide boarding to athletic trainers to decrease salary expenses. Therefore, instead of searching for ways to increase school budget, simply implementing athletic trainers could be more cost effective to secondary schools. In addition to the potential cost savings of hiring an athletic trainer, the student-athletes are also guaranteed adequate medical care from healthcare professionals that are educated and trained in prevention and care of athletic injuries.

Coaches were often reported to be in charge of the medical care of student-athletes since athletic directors viewed them as competent due to their certification requirements to become a coach. Our participants' lack of knowledge regarding the value of the athletic trainer, as well as the necessary training required to become an athletic trainer is alarming. In several high profile cases, such as Max Gilpin[17] and DJ Searcy[18], coaches were considered major factors related to their deaths. Both athletes were exercising in extreme heat and not treated appropriately when heat stroke conditions developed. An athletic trainer was not available in either case,

highlighting the need for them at games and practices. Research indicates that coaches are deficient in knowledge regarding appropriate medical care of athletic injuries and therefore are not equivalent substitutions for an athletic trainer.[8-11] In a study by Barron et al.,[9] secondary school athletic coaches were unable to achieve passing scores when retaking their basic emergency care exams. Moreover, when given the chance to return an athlete to play, the decision was made regardless of athlete readiness.[8] Coaches are not qualified health care professionals and are often guided by the desire to win and follow the mantra to 'win at all costs'. It is important to make sure the person making the medical decision is unbiased, basing these decisions solely on the health and safety of the athlete. The barrier that a coach can provide medical care in lieu of an athletic trainer is not uncommon, as Mazerolle and peers[19] found the same for public secondary schools; however this does not dismiss the fact that athletic trainers are necessary at this level.

The results of this study can ultimately be used to make changes in the medical care currently provided to student-athletes in private secondary schools. It was revealed that just under three quarters of the surveyed private secondary schools do not provide full time athletic trainers. This means that there is still much room for improvement in employing athletic trainers in the secondary school setting. The Inter-Association Task Force and governing bodies, such as the NATA, recommend that an athletic trainer is present in every secondary school for all games and practices to mitigate the risk of sudden death in sport.[23, 24] An increase in employment would ensure more student-athletes are provided with adequate medical care.

Limitations

As with all research, we recognize that there are several limitations to this study. One involves defining AT services. The school administrator determined full or part time athletic

training employment status at the school. Some school administrators were unsure of who qualifies as an athletic trainer, as some responded that they themselves were the athletic trainers, or that a coach fulfilled that position. These factors could alter the final calculation of AT services and breakdown of services offered, thus we caution interpretation.

Although there was representation from all 50 states and the District of Columbia, and the response rate was higher than other survey-based research studies, only 38% of private secondary schools responded to our survey. Despite a strong belief that this accurately portrays AT services in the private secondary school setting, the actual percentage could be higher or lower. Our response rate could be explained by the varying structure of the secondary schools' athletics departments and the availability of the athletic director during the day. A full time athletic director is not mandatory within this level of competition and can be challenging to directly speak to them.

In circumstances where there was no athletic director employed at the school, or if one was not available, the school's principal responded to the survey. Speaking to both athletic directors and principals may have altered the results slightly, as their understanding of AT services could be contrasting. Some of the surveyed participants were unsure of definite numbers for students and/or athletes and therefore gave us a rough estimate of enrollment, which could have affected our results for AT services by school size and student enrollment.

Directions for Future Research

As recent studies[6] have assessed the extent of AT services in public and private secondary schools, it is important to investigate the presence of athletic trainers in specialty secondary schools including charter, magnet, vocational, technical, and alternative. Athletic training services may differ for these school types due to funding and enrollment differences, yet

these services are still necessary to ensure the well being and safety of student-athletes participating at this level. Exploring medical coverage in the specialty sector will complete a collective representation of AT services in United States' secondary schools. Having the most accurate information of AT coverage in secondary schools will help identify which setting(s) are lacking appropriate medical care and how best to increase the employment of athletic trainers.

Since a major barrier to hiring athletic trainers in the private secondary school setting was budgetary restraints, future research should be focused on ways to advance funding to ensure appropriate medical care is provided to all student-athletes. In addition, to better understand how the role of an athletic trainer is viewed at the secondary school setting, conducting a study that surveys school boards, examining their level of understanding of an athletic trainer's role will add to the existing literature of barriers to employment.

Conclusion

Based on our findings, private secondary schools do not provide adequate AT services to their student athletes. In comparison to the public sector,[6] services offered are even less at the private secondary school setting. Larger private secondary schools were more likely to have AT services. Regardless of setting, barriers to employing an athletic trainer are budgetary concerns, school size, and lack of understanding of the role of an athletic trainer in secondary schools.

Appendix A. Athletic Training (AT) Services in All Private Secondary Schools in the United States.

NATA District	State	Response Rate (n)	% Schools with AT Service	% Schools with Full Time AT Service	% Schools with Part Time AT Service	% Schools with Per Diem AT Service	% Schools with AT from Hospital or Clinic	% Schools with AT Teaching Health Class	% Schools with Practice Coverage Every Day
1	Connecticut	37% (28)	75%	46%	29%	4%	14%	18%	64%
	Maine	38% (18)	67%	33%	44%	6%	22%	22%	50%
	Massachusetts	49% (62)	87%	48%	31%	23%	7%	18%	66%
	New Hampshire	35% (14)	71%	64%	21%	0%	0%	36%	57%
	Rhode Island	39% (9)	44%	44%	0%	0%	0%	0%	44%
	Vermont	37% (11)	64%	55%	0%	9%	9%	9%	55%
	District 1 Average	**41% (142)**	**76%**	**48%**	**27%**	**12%**	**9%**	**18%**	**61%**
2	Delaware	70% (19)	74%	53%	32%	0%	32%	26%	68%
	New Jersey	50% (80)	68%	36%	10%	5%	3%	8%	38%
	New York	30% (94)	51%	22%	22%	9%	15%	4%	30%
	Pennsylvania	40% (114)	63%	44%	22%	2%	29%	9%	54%
	District 2 Average	**39% (307)**	**61%**	**36%**	**20%**	**5%**	**18%**	**8%**	**43%**
3	District of Colombia	50% (9)	78%	56%	44%	0%	0%	22%	67%
	Maryland	34% (56)	64%	48%	21%	2%	4%	25%	59%
	North Carolina	23% (46)	41%	17%	22%	4%	9%	9%	28%
	South Carolina	21% (25)	100%	36%	16%	0%	20%	36%	40%
	Virginia	51% (80)	58%	32%	27%	4%	9%	16%	45%
	West Virginia	32% (12)	42%	0%	8%	0%	0%	0%	0%
	District 3 Average	**33% (228)**	**61%**	**33%**	**23%**	**3%**	**8%**	**18%**	**43%**
4	Illinois	42% (68)	60%	34%	25%	4%	29%	7%	43%
	Indiana	46% (51)	57%	14%	24%	0%	24%	2%	25%
	Michigan	55% (81)	44%	14%	22%	1%	19%	5%	23%
	Minnesota	45% (35)	57%	11%	23%	3%	29%	0%	20%
	Ohio	51% (86)	77%	48%	27%	8%	56%	6%	63%
	Wisconsin	35% (37)	62%	19%	46%	3%	30%	3%	24%
	District 4 Average	**46% (358)**	**60%**	**26%**	**27%**	**4%**	**32%**	**4%**	**37%**
5	Iowa	45% (19)	63%	16%	42%	5%	37%	0%	26%
	Kansas	49% (23)	52%	13%	17%	0%	26%	0%	9%
	Missouri	48% (59)	47%	19%	19%	0%	25%	3%	24%
	Nebraska	46% (17)	88%	24%	59%	12%	65%	0%	53%
	North Dakota	40% (4)	100%	25%	75%	0%	100%	0%	75%
	Oklahoma	49% (22)	45%	18%	14%	0%	14%	5%	23%
	South Dakota	46% (6)	67%	17%	50%	0%	67%	17%	17%
	District 5 Average	**47% (150)**	**57%**	**18%**	**28%**	**2%**	**33%**	**3%**	**26%**
6	Arkansas	27% (13)	46%	31%	8%	8%	23%	8%	38%
	Texas	45% (121)	52%	22%	26%	2%	14%	8%	28%
	District 6 Average	**42% (134)**	**51%**	**23%**	**24%**	**3%**	**15%**	**8%**	**29%**
7	Arizona	21% (12)	42%	25%	17%	8%	8%	17%	33%
	Colorado	28% (17)	47%	24%	29%	0%	18%	12%	29%
	New Mexico	31% (11)	45%	18%	0%	0%	0%	0%	27%
	Utah	21% (5)	80%	40%	20%	0%	40%	20%	60%
	Wyoming	33% (1)	0%	0%	0%	0%	0%	0%	0%
	District 7 Average	**26% (46)**	**58%**	**24%**	**17%**	**2%**	**13%**	**11%**	**33%**
8	California	29% (163)	51%	27%	24%	2%	4%	17%	36%

	Hawaii	40% (13)	62%	36%	43%	8%	14%	31%	69%
	Nevada	25% (5)	60%	40%	20%	0%	15%	0%	20%
	District 8 Average	**29% (181)**	**52%**	**28%**	**25%**	**3%**	**5%**	**17%**	**38%**
9	Alabama	32% (45)	62%	13%	40%	4%	47%	11%	38%
	Florida	26% (110)	50%	22%	28%	3%	14%	7%	35%
	Georgia	35% (62)	53%	29%	26%	2%	21%	3%	50%
	Kentucky	37% (30)	30%	13%	10%	7%	10%	0%	20%
	Louisiana	76% (98)	50%	19%	12%	2%	15%	10%	27%
	Mississippi	35% (32)	66%	13%	31%	3%	41%	0%	22%
	Tennessee	27% (36)	78%	42%	39%	3%	56%	11%	67%
	District 9 Average	**35% (413)**	**54%**	**22%**	**25%**	**3%**	**24%**	**7%**	**36%**
10	Alaska	50% (6)	33%	0%	33%	0%	17%	33%	33%
	Idaho	31% (5)	0%	0%	0%	0%	0%	0%	0%
	Montana	25% (6)	33%	0%	33%	0%	33%	0%	17%
	Oregon	34% (22)	32%	9%	18%	14%	9%	5%	14%
	Washington	63% (47)	34%	23%	17%	0%	23%	21%	9%
	District 10 Average	**45% (86)**	**31%**	**15%**	**19%**	**3%**	**19%**	**13%**	**12%**
United States Average		**38% (2045)**	**57%**	**28%**	**24%**	**4%**	**20%**	**10%**	**51%**

Appendix B. Interview Guide

Hello, may I speak to the Athletic Director?
(if no athletic director, ask if they have an athletics program or for principal)

Hello, this is XX from the Korey Stringer Institute with the University of Connecticut. We are calling with regards to a study about athletic trainers in the high school setting. May I ask you a few quick questions?
(should only take 1 minute)

How many athletes are in your school?
(total athletes, not per season)

How many students are in your school?
(grades 9-12)
Do you have an athletic trainer at your high school?

If No: May I ask why you do not have one?

What is the medical coverage during home games? (ambulance, EMT, MD)
(make sure this is at all games, not just football)
If Yes: How many do you employ?

Are they full time, part time, from a clinic full or part time, or per diem?

Do they teach a sport medicine, athletic training, or health class?

Do they work all practices between approximately 2-6pm every day?
(as long as it sounds like they cover all practices)

If No: When do they work?
How often do they work?

If Yes: Do they work all home games for Football? Wrestling? Men's Basketball? Ice Hockey? Gymnastics? Skiing?

Thank you for your time.

Appendix C. Athletic Training (AT) Services by Number of Athletes in Secondary Schools.

NATA District	State	Overall Average Number Students	Overall Average Number Athletes	Average Number Athletes for Schools with AT Service	Average Number Athletes for Schools without AT Service	Average Number Athletes per Full Time AT
1	Connecticut	369	282	352	62	368
	Maine	327	195	261	62	301
	Massachusetts	441	287	319	83	405
	New Hampshire	312	210	263	80	289
	Rhode Island	532	285	534	85	534
	Vermont	273	141	208	23	233
	District 1 Average	**392**	**255**	**314**	**68**	**366**
2	Delaware	371	235	300	55	356
	New Jersey	432	274	349	101	354
	New York	329	159	221	97	291
	Pennsylvania	344	192	276	41	320
	District 2 Average	**357**	**199**	**278**	**74**	**327**
3	District of Colombia	493	360	421	148	505
	Maryland	394	226	312	54	370
	North Carolina	208	125	200	70	272
	South Carolina	169	115	115	----	247
	Virginia	343	180	265	68	355
	West Virginia	86	61	130	47	----
	District 3 Average	**306**	**175**	**245**	**67**	**347**
4	Illinois	375	242	338	75	341
	Indiana	335	213	313	51	483
	Michigan	238	155	270	61	373
	Minnesota	288	183	317	69	605
	Ohio	403	247	305	56	353
	Wisconsin	231	136	202	28	291
	District 4 Average	**326**	**205**	**295**	**59**	**368**
5	Iowa	227	161	217	48	253
	Kansas	211	148	263	50	408
	Missouri	290	203	332	74	385
	Nebraska	278	181	194	85	165
	North Dakota	249	179	179	----	95
	Oklahoma	240	158	256	44	338
	South Dakota	276	188	254	56	500
	District 5 Average	**261**	**179**	**254**	**62**	**321**
6	Arkansas	190	95	151	47	169
	Texas	258	148	200	95	287
	District 6 Average	**251**	**141**	**195**	**89**	**271**
7	Arizona	306	164	286	77	397
	Colorado	312	193	271	83	375
	New Mexico	262	188	306	69	475
	Utah	428	313	410	120	410
	Wyoming	5	5	----	5	----
	District 7 Average	**298**	**187**	**299**	**75**	**411**
8	California	367	216	331	102	422
	Hawaii	429	266	396	56	552
	Nevada	493	264	413	41	600
	District 8 Average	**375**	**221**	**339**	**98**	**442**
9	Alabama	194	95	123	49	197
	Florida	290	169	276	65	367
	Georgia	209	144	221	57	287
	Kentucky	240	135	314	59	431
	Louisiana	394	206	263	131	319
	Mississippi	194	111	141	64	198
	Tennessee	289	178	215	29	222
	District 9 Average	**270**	**156**	**227**	**69**	**300**
10	Alaska	71	45	80	28	----
	Idaho	90	46	----	46	----
	Montana	104	78	120	58	----
	Oregon	235	131	216	92	243
	Washington	250	149	279	84	275
	District 10 Average	**215**	**127**	**235**	**77**	**270**
United States Average		**313**	**187**	**269**	**73**	**345**

Note. N/A = not applicable. "Average Number Athletes per Full Time AT" column only includes schools with full time athletic trainers. "----" = Schools in state did not meet qualifications of column

References

1. Mueller FO, Kucera KL, Cox LM. Catastrophic Sports Injury Research Thirtieth Annual Report: Fall 1982 – Spring 2012. 2012; www.unc.edu/depts/nccsi, Accessed September 9, 2014.

2. Boden BP, Breit I, Beachler JA, Williams A, Mueller FO. Fatalities in high school and college football players. *Am J Sport Med.* 2013;41(5):1108-1116.

3. National Athletic Trainers' Association. *Official Statements*. Available at http://www.nata.org/official-statements, Accessed January 7, 2015.

4. Lyznicki JM, Riggs JA, Champion HC. Certified athletic trainers in secondary schools: report of the Council on Scientific Affairs, American Medical Association. *J Athl Train.* 1999;34(3):272-276.

5. National Athletic Trainers' Association. Athletic trainers fill a necessary niche in secondary schools. 2009; www.nata.org/NR031209, Accessed September 8, 2014.

6. Pryor RR, Casa DJ, Vandermark LW, et al. Athletic Training Services in Public Secondary Schools: A Benchmark Study. *Journal of Athletic Training*. 2015;50(2):156-162.

7. DeWitt TL, Unruh SA, Seshadri S. The level of medical services and secondary school-aged athletes. *J Athl Train.* 2012;47(1):91-95.

8. Ransone J DL. Assessment of first-aid knowledge and decision making of high school athletic coaches. *J Athl Train*. 1999;34(3):267-271.

9. Barron MJ, Powell JW, Ewing ME, et al. First aid and injury prevention knowledge of youth basketball, football, and soccer coaches. *Journal of Coaching*. 2009;3(1):55.

10. Valdes AS, Hoffman JR, Clark MH, Stout JR. National collegiate athletic association strength and conditioning coaches' knowledge and practices regarding prevention and recognition of exertional heat stroke. *J Strength Cond Res*. 2014.

11. Adams WM, Mazerolle SM, Casa DJ, et al. The secondary school football coach's relationship with the athletic trainer and perspectives on exertional heat stroke. *J Athl Train*. 2014;49(4):469-477.

12. Great Schools. *Private Versus Public.* Available at http://www.greatschools.org/find-a-school/defining-your-ideal/59-private-vs-public-schools.gs, Accessed September 10, 2014.

13. Pitney WA, Parker J. Qualitative Research in Physical Activity and the Health Professions. Human Kinetics; 2009.

14. Patton MQ. Qualitative Research & Evaluation Methods. 2nd ed. Sage Publications; 1990.

15. Institute of Education Sciences. National Center for Education Statistics. *Private School Universe Survey.* Available at http://nces.ed.gov/surveys/pss/privateschoolsearch/, Accessed December 2013.

16. McLeod TC, Bliven KC, Lam KC, Bay RC, Valier AR, Parsons JT. The national sports safety in secondary schools benchmark (N4SB) study: Defining athletic training practice characteristics. *J Athl Train*. 2013;48(4):483-492.

17. Telegraph Media Group Limited. The Telegraph. *American football coach cleared in death of teenager Max Gilpin*. 2014. Available at http://www.telegraph.co.uk/sport/othersports/americanfootball/6205261/American-football-coach-cleared-in-death-of-teenager-Max-Gilpin.html, Accessed December 7, 2014.

18. CBS News. CBS This Morning. *Parents of dead high school football stars suing*. July 31, 2012. Available at http://www.cbsnews.com/news/parents-of-dead-high-school-football-stars-suing/, Accessed December 7, 2014.

19. Raso S. Athletic Directors' Barriers to Hiring Athletic Trainers in High Schools. Unpublished master's thesis, University of Connecticut, Storrs, Connecticut.

20. National Federation of State High School Associations. High School Today. *Education Funding Crisis Affects Activity Programs.* Available at https://nfhs.org/media/9730/high_school_today_may_11.pdf, Accessed December 7, 2014.

21. National Athletic Trainers' Association. NATA 2014 Salary Survey Query Results. Available at http://members.nata.org/members1/salarysurvey2014/results2.cfm, Accessed January 7, 2015.

22. Hambleton MD, Smith S, Eyers C, et al. High School Athletic Trainer Cost Savings Analysis. *Interscholastic Athletic Administration*. 2012;39(2):8-12.

23. Casa DJ, Guskiewicz KM, Anderson SA, et al. National Athletic Trainers' Association Position Statement: Preventing Sudden Death in Sports. *J Athl Train*. 2012;47(1):96-118.

24. Casa DJ, Almquist J, Anderson SA, et al. The inter-association task force for preventing sudden death in secondary school athletics programs: Best-practices recommendations. *J Athl Train*. 2013;48(4):546-553.