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Sudden Death in Sport at the Secondary School Level: A Perspective of the Head Football Coach

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**Sudden Death in Sport at the Secondary School Level: A Perspective of the Head
Football Coach**

Benjamin Todd McGrath

B.A., Capital University, 2010

A Thesis

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Sudden Death in Sport at the Secondary School Level: A Perspective of the Head
Football Coach

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The Secondary School Football Coach's Perspective of Sudden Death in Sport

McGrath BT, Adams WM, Mazerolle SM, Pagnotta KD, Casa DJ. University of Connecticut.

Context: Prior research has examined the first aid knowledge and decision making among high school coaches, but little is known about their knowledge of sudden death in sport or their relationship with an athletic trainer. **Objective:** Evaluate the knowledge of the secondary school football coach regarding sudden death in sport and their relationship with their athletic trainer. **Results:** There were four themes from the data: *level of preparedness, misconceptions about sudden death in sport, activity modification strategies, and positive coach/athletic trainer relationships.* **Conclusion:** The secondary coach is unaware of the potential causes of sudden death in sport and symptoms associated with conditions of sudden death. Athletic trainers working with the secondary coach can have a positive influence on their implementation of strategies to prevent sudden death

Review of the Literature

Introduction

Sudden death in sport has gained increasing attention from the media in recent years, especially in the high school in which many cases of death could have been prevented. Ten of the most common causes of sudden death in sport include: cardiac complications, cervical spine trauma, head trauma, exertional heat stroke, exertional hyponatremia, anaphylaxis, asthma, lightning, and traumatic injuries.¹ One the causes of sudden death that has gained an exceptionally large amount of attention from the media in recent years is exertional heat stroke (EHS).

Between 1995-2009, it is estimated that 42 deaths have occurred as a result of EHS.¹ It has been shown that majority of these deaths occur during the preseason training months of July and August, mainly in high school football. A recent case that has gained national attention is that of Max Gilpin, a 15 year old football player from Kentucky that died from EHS during a practice session in late August of 2008. The head football coach was charged with reckless homicide of Max's death because it was shown that his death was preventable had proper precautions been taken.²

Despite recommendations by the National Athletic Trainers' Association (NATA), many high schools do not employ an ATC, leaving the health and well-being of the athletes to the coaches.² All high schools require some form of medical coverage during competitions, but practices and training sessions are not always covered. This coverage in some cases may come from the coach, parent, or at best an emergency medical technician (EMT). Although coaches are required to undergo general first aid

and CPR training, care for EHS is not a main focus of the curriculum. Because of this lack of training, it is unclear on whether or not a coach is adequately prepared to handle an emergency situation regarding EHS.

The NATA⁶ in 2002 released a position statement on Exertional Heat Illnesses (EHI), which outlines proper assessment and treatment methods. The NATA strongly recommends assessing core body temperature via rectal thermometry and rapid cooling by cold water immersion (CWI) for the assessment and treatment of EHS. Additionally, the NATA along with the American Medical Association (AMA) has published an official statement encouraging the employment of a Certified Athletic Trainer (ATC) at all secondary schools.³ When these recommendations and guidelines are followed, death from EHS is almost entirely preventable.

According to a study, Ransone et al.⁴ assessed the first aid knowledge and decision making of high school athletic coaches. Results showed that 36% of the coaches passed the first aid assessment given to coaches. In addition, coaches that had passed the first aid assessment were more prone to returning an injured starter to the game. In June of 1998 the AMA House of Delegates adopted a policy saying that each state's Department of Health should encourage the placement of an Athletic Medical Unit in each school.⁴ The AMA reported that coaches were not trained to handle emergency situations in sports and that an ATC is fully qualified to handle these situations.² Table 1 demonstrates the top causes of sudden death in sport along with common scenarios for pathology, treatment, and common mistakes that are often made with treatment. Current research does not provide information regarding coach's knowledge regarding sudden death in sport.

Top Causes of Sudden Death in Sport

Pathology	Common Scenario	Treatment	Common Mistakes
Cardiac	Basketball player suddenly collapses with no apparent contact	Activate EMS; Check ABCs; Begin CPR; use AED as soon as it becomes available	No AED; Unprompt EMS activation; No initiation of immediate CPR
Exertional Heat Stroke	Football player practicing in full pads on a hot humid summer afternoon in August	Assess core body temperature (rectal temperature); Immediate rapid cooling (cold water immersion); Monitor vitals; Cool first transport second	Not assessing core temperature; not using cold water immersion; Not initiating treatment quickly; not continuously circulating water
Asthma	Soccer player having difficulty breathing during a match	Administer rescue inhaler; Monitor vitals	No rescue inhaler; not knowing athlete has asthma
Anaphylaxis	Athlete is stung by a bee	Aid patient in administration of epi-pen; activate EMS; maintain airway	No epi-pen; No EMS activation
Head Injury	Baseball pitcher hit in head by a ball	Remove from activity; Cognitive and physical assessment; Monitor vitals; Monitor symptoms; Gradual return to player when asymptomatic	Return to play too soon; Not recognizing symptoms; Treating symptoms too lightly
Sickling	African-American player collapses while running conditioning sprints	Remove from activity; administer oxygen; hydrate; cool if necessary	Misdiagnosed with heat or cardiovascular collapse; No intervention
Diabetes	Diabetic athlete shows signs of cognitive distress, and decreased responsiveness	Assess vitals; determine hyper/hypoglycemia (blood glucose level); Monitor vitals; administer glucose; Assess vitals; Check Na levels; Check core temperature; restrict fluids; administer hypertonic saline if hyponatremia is severe (Na levels must be measured)	No diabetes kit; Unaware athlete has diabetes; Confusing hyper and hypoglycemia
Hyponatremia	Marathon runner collapses 25 yd. from finish line		Administer fluids;

Lightning	Lacrosse player struck by lightning	Activate EMS; Move victim to safe place; Monitor vitals; Initiate CPR; treat in a "reverse triage" strategy Stabilize and maintain neck in neutral position; Activate EMS; Monitor vitals (Remove facemask in sports requiring the use of helmet);	Continue to play; Not utilizing flash-to-bang; Not using 30/30 rule
C-Spine	Football player tackling with head down	Secure to spine board (if appropriate personal available) Thorough abdominal evaluation (location of pain, referred pain, local or diffuse pain); EMS activation; keep player in recumbent position until EMS arrives	Improper stabilization; excessive motion; not monitoring vitals; removal of helmet
Traumatic Injury	Soccer player getting kicked in the abdomen		Not suspecting abdominal trauma (internal bleeding)

Created by McGrath, Adams, Yabor, Salvatore

Table 1. Top causes of sudden death in sport

Sudden Cardiac Arrest

Sudden cardiac arrest is the leading cause of sudden death in athletes under the age of 35.¹⁰ According to the NCAA, in 80 medical causes of sudden death, 45 were caused by cardiovascular related issues.¹¹ Although sudden cardiac arrest can happen to either gender, males seem to be at far greater risk than females with a male-to-female ratio of 10:1.^{10,11} The sport that sees the highest incidence of death is basketball, with 14 fatalities, followed by football with 8.¹⁰ Of the many conditions that can cause an athlete to go into sudden cardiac arrest, hypertrophic obstructive cardiomyopathy (HCM) is the most common cause.^{18,19} In this disorder, the myocytes of the left ventricle appears to

hypertrophy, causing thickening and stiffening of the ventricular wall.²⁰ This can lead to diastolic dysfunction from poor ventricle filling and subsequent cardiac arrest.²⁰ Other causes include coronary artery anomalies, commotio cordis, myocarditis, marfan syndrome, valvular heart disease, and arteriosclerotic coronary artery disease.¹⁸ Early recognition of an athlete that is suffering from sudden cardiac arrest is key to preventing death. Figure 1 displays the causes of sudden death in 387 young athletes, with a large majority occurring from sudden cardiac arrest.¹⁹

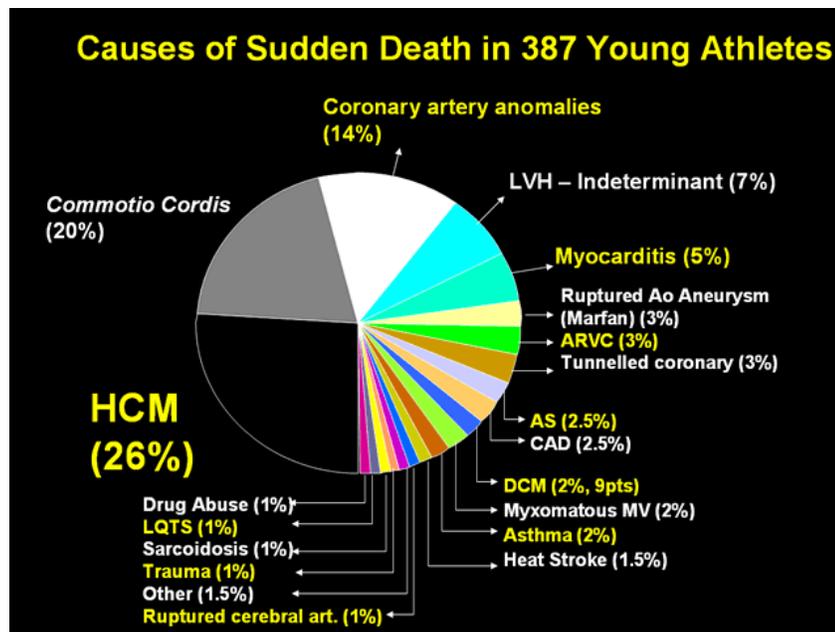


Figure 1. Causes of sudden death in young athletes¹⁹

I. Signs/symptoms

Since early detection and treatment of sudden cardiac arrest is essential to survival, it is important to know the signs and symptoms of an athlete that is suffering from this disorder. It can be difficult to identify the signs and symptoms because sudden collapse occurs very often.¹⁸⁻²⁰ Common symptoms include chest pain, difficulty breathing, dizziness, and getting tired more quickly than usual.¹⁸⁻²⁰ Signs that the athletic trainer

should watch out for are wheezing from the athlete, disorientation and confusion, and passing out. An athlete suffering from any of these signs and symptoms should immediately be removed from play and given a thorough evaluation.

Early recognition and treatment of an athlete that is suffering from sudden cardiac arrest is extremely important. The American Heart Association describes 4 links in a “chain of survival” to emphasize the time-sensitive interventions for victims of SCA:²⁰

- Early recognition of the emergency and activation of the EMS or local emergency response system: “phone 911”
- Early CPR: immediate CPR can double or triple the victim’s chance of survival from ventricular fibrillation sudden cardiac arrest
- Early delivery of a shock with a defibrillator: CPR plus defibrillation within 3 to 5 minutes of collapse can produce survival rates as high as 49% to 75%
- Early advanced life support followed by postresuscitation care delivered by health care providers

II. Treatment

By immediately phoning 911, emergency responders can arrive at the scene and transfer the athlete to the hospital as quickly as possible for more advanced care. Once EMS is notified, CPR should be administered until an AED is available or advanced medical personnel arrive. According to the American Heart Association, CPR consists of cycles of 30 chest compressions followed by 2 rescue breaths. Chest compressions should be at a rate of 100 compressions per minute, allowing for the chest to completely recoil in between compressions. Once an AED is available, the pads should be placed on the

athlete's chest as indicated on each pad. If a shock is advised, administer a shock and then immediately continue CPR for five more cycles and re-check pulse or if advanced medical personnel has arrived.

There is no general consensus when trying to determine if an athlete with any form of cardiac disorder should be disqualified from competitive athletics permanently. The American College of Cardiology (ACC) has been establishing consensus guidelines for eligibility/disqualification decisions in competitive athletes with cardiovascular abnormalities.⁴³ With regards to HCM, the ACC does not say that individuals identified with the disorder need to be precluded from participation in competitive athletics because there is no evidence of adverse cardiac events occurring from this strenuous activity.⁴³ Table 2 shows the disorders that the ACC recommends are too dangerous for high-intensity competition.

<p style="text-align: center;">Recommended for Low-Intensity Sport</p> <p style="text-align: center;">Long-QT Syndrome Marfan Syndrome Implanted Cardioverter-Defibrillator Premature Ventricular Complexes</p>
--

Table 2. Recommendations for low-intensity sport

III. Prevention

Although there is no full proof method to preventing sudden death from cardiac complications, there are steps that can be taken to minimize the risk. First, a full medical history should be taken with a pre-participation physical to target any predisposing

conditions.¹⁹ According to deWeber and Beutler, there are nine questions that need to be asked and they are represented in table 3.³⁵

Pre-Participation Screening Questions	
a.	Have you ever passed out during exercise?
b.	Have you ever passed out after exercise?
c.	Have you ever had chest pain during exercise?
d.	Does your heart race or skip a beat during exercise?
e.	Has a doctor ever told you that you have a heart murmur?
f.	Has a doctor ever ordered a test for your heart?
g.	Has anyone in your family died for no apparent reason?
h.	Does anyone in your family have a heart problem?
i.	Has anyone in your family died suddenly before age 50?

Table 3. Pre-Participation Screening Questions

A physical examination is then used to ensure the general health of the athlete and detect any defects such as a heart murmur. If a predisposing condition is suspected, more advanced testing, such as an electrocardiogram or echocardiogram,¹⁹ is ordered.

Comprehensive emergency planning is needed in order to ensure an efficient and structured response to sudden cardiac arrest.⁴⁵ According to the NATA, essential elements of an emergency action plan include establishment of an effective communication system, training of anticipated responders in cardiopulmonary resuscitation and AED use, access to an AED for early defibrillation, acquisition of

necessary emergency equipment, coordination and integration of on-site responder and AED programs with the local emergency medical services system, and practice and review of the response plan.⁴⁵

Cervical Spine Trauma

Athletic injuries to the cervical spine are most commonly occurring as a result of axial loading.^{23,24} It can be caused by a football player striking an opponent with the crown of his helmet or a swimmer poorly diving into a shallow pool. This mechanism causes compression of the cervical vertebrae by way of the rapidly decelerating head and the continued acceleration of the body.²³ The purpose of the cervical spine is to contain and protect the spinal cord, support the skull, and enable diverse head movement. The cervical spine consists of seven vertebrae that begin at the base of the skull and eight cervical nerves. A system of ligaments and muscles are in place to assist in movement of the head and neck and also to prevent excessive movement from occurring. Cervical spine injuries receive a lot of attention because of the ramifications that can occur, such as long term paralysis and even death.^{23,46} The mean incidence of catastrophic c-spine injury over the past 30 years has been approximately 0.5 per 100,000 participants at high school level and 1.5 per 100,000 at the collegiate level.⁴⁶ Immediate recognition and proper stabilization is key to minimizing any complications that might occur.

I. Signs/symptoms

A cervical spine injury is a very serious situation and needs to be handled with immediate care. The main signs/symptoms are unconsciousness or altered level of consciousness, bilateral neurologic findings or complaints, significant cervical spine pain

with or without palpation, and obvious spinal column deformity.²¹ In the presence of any of these findings, the use of spinal injury precautions is highly recommended.

II. Treatment

Once a cervical spine injury is suspected, immediate manual stabilization should be implemented. There are two main types of manual stabilization, the head squeeze and the trap squeeze.⁴⁷ When performing the head squeeze, the head should be manually stabilized by grasping the mastoid processes bilaterally and cupping the occiput in the hands.^{21,22} The rescuer should position his or her hands so the thumbs are pointed toward the face of the injured athlete. This technique ensures that hand placement does not have to be changed with repositioning of the athlete, unless rolling the athlete from a prone to a supine position is required, in which case the rescuer's arms should be crossed before rolling.^{21,22} The rescuer grabs the patient's trapezius muscles on either side of the head with his/her hands (thumbs anterior to the trapezius muscle) and firmly squeezes the head between the forearms with the forearms placed approximately at the level of the ears.^{47,48} While stabilization is taking place, another rescuer should be activating the emergency action plan (EAP) and alerting EMS. Once the EAP has been activated, it is important to assess the airway, breathing, and circulation of the injured athlete. If CPR is not indicated, then an additional neurological exam should be carried out testing sensory and motor nerves.

The next step is to transfer the athlete from manual stabilization to mechanical stabilization.²¹ A cervical collar is recommended to ensure cervical spine immobilization. According to Del Rossi et al., there are three maneuvers that can be used to transfer an athlete to a spine board:⁴⁹

- Logroll Maneuver- One rescuer maintains stabilization while three others assist in rolling the body on it's side in unison. Fifth rescuer wedges the spine board beneath the athlete and then the athlete is lowered to a supine position.
- Lift-and-Slide Technique- Head is stabilized while three other rescuers straddle the athlete and lift upper torso, hips, and lower extremities. Fifth rescuer places the spine board under the athlete then the athlete is lowered to a center position on the board.
- 6-Plus Person Lift- Head is stabilized and six individuals (1 positioned on each side of the chest, pelvis, and legs) assist with the lift. A spine board is placed under the athlete while he is elevated off of the ground.

The results of the study by Del Rossi et al.⁵⁰ showed that the lift-and-slide method and the 6-plus person lift limit the amount of axial rotation, lateral flexion, and medial-lateral translation. Because of this research, the logroll method should no longer be considered a preferred method for transferring a c-spine injured athlete from the ground to a spine board.^{21,49} Rescuers still need to be familiar with the logroll technique in the event that the athlete is found in the prone position.²¹

III. Prevention

Although some cervical spine injuries are unavoidable, many can be prevented by proper coaching and technique modification. One of the most frequent and dangerous mechanisms of injury is spearing in football. This places an excessive axial load on the cervical vertebrae which can result in a fracture or dislocation.^{23,24} Athlete education and coaching the proper technique for a safe and effective tackle at young ages is very

beneficial to preventing a catastrophic spinal injury. Initiating contact with the shoulder/chest while keeping the head up is the safest way to play football. The game can be played aggressively with this technique with much less risk of serious injury. Also according to the NATA, year-round supervised neck strengthening programs should be implemented in order to help with maintaining the neck in extension.

In the event that a cervical spine injury is suspected, it is crucial that the proper medical equipment is available for use. This equipment should include an AED, spine board, cervical collar, vacuum splints and supplemental oxygen where available. This equipment should be easily accessible on site in case an emergency situation presents itself.

Head Trauma

Management of head injuries has been a highly discussed and debated topic lately as recent research has shown how detrimental head trauma can be to the athlete in the short term and long term. A concussion, defined as “any transient neurological dysfunction resulting from a biomechanical force that may or may not result in a loss of consciousness,”⁵⁶ is the most common head injury that is seen in the athletic setting. Nationally, it is estimated that 62,816 concussions occur each year among high school athletes, with football accounting for 63.4% of the cases.⁵⁵ Other pathologies that can occur as a result of head trauma include subdural hematomas, epidural hematomas, and intracerebral hemorrhage or hematomas. The main mechanisms of injury are a blow to the head or sudden acceleration or deceleration that causes the brain to shift position suddenly in the cerebrospinal fluid which causes tissue damage. The main elements that

affect the severity of the injury include velocity of the head before impact, time over which the force is applied, and the magnitude of the force.

The issue with head trauma, mainly concussions, has become so controversial that the NATA issued a position statement detailing its recommendations for recognizing and treating athletes suspected of sustaining a traumatic brain injury.¹¹ This statement contains evaluation techniques, cognitive assessment tools, return to play guidelines, and special considerations for different populations of athletes.¹¹ The NFL has also taken measures to ensure the safety of its athletes suffering from a concussion.⁵⁷ It expanded its list of symptoms that would prevent an athlete from returning to a game that same day to include gap in memory, inability to remember assignments, abnormal neurological exam, new and persistent headache, and loss of consciousness⁵⁷.

I. **Signs/Symptoms**

Since you normally can not see a concussion or other head injuries involving the brain, it is important to recognize the signs and symptoms quickly. Some symptoms might be present immediately while others can show up hours or days after the injury. Common signs and symptoms of a concussion are shown in table 4.

<u>Concussion Signs and Symptoms</u>	
Amnesia	Confusion
Headache	Loss of consciousness
Balance problems	Dizziness
Blurry vision	Sensitivity to light or noise
Nausea	Feeling sluggish or groggy
Irritability	Memory problems
Difficulty concentrating	Slowed reaction time

Table 4. Concussion signs and symptoms

There are a variety of assessment tools that are being used to diagnose concussions and to determine when an athlete is adequately prepared to return to play. Symptom checklists are used to gauge how many different signs or symptoms the athlete is suffering from and graded symptom checklists are used to assess the severity of each symptom. Standardized tests, such as the SAC and SCAT-2, are used to assess the cognitive functioning of the athlete.^{11,26} Table 5 lists a variety of factors that could affect performance on these standardized tests. These tests consist of a variety of different questions that assess orientation, immediate memory, concentration, and delayed recall. Functional tests are also used to assess coordination and balance.

Factors Influencing Neuropsychological Test Performance
Previous concussions
Educational background
Preinjury level of cognitive functioning
Cultural background
Age
Test anxiety
Distractions
Sleep deprivation
Medications, alcohol, or drugs
Psychiatric disorders
Learning disability
Attention deficit/hyperactivity
Certain medical conditions
Primary language other than English
Previous neuropsychological testing

Table 5. Predisposing factors that may influence performance on neuropsychological testing¹¹

II. Treatment

It is important that anyone that is suspected of sustaining a concussion immediately be removed from play and be evaluated by an ATC. The athlete should continue to be monitored by the ATC at 5 minute intervals until the athletes symptoms have subsided or the athlete is referred for further care.^{11,25} Athletes who continue to be symptomatic for 20 minutes at rest or exertion immediately following the injury should be disqualified from returning to participation. Athletes whose symptoms subside in less than 20 minutes following the injury can return to play but must continue to be monitored for the next 24 to 48 hours.^{11,25}

According to the International Conference on Concussion in Sport Held in Zurich, a six step protocol should be followed for anyone that has suffered a concussion and was removed from play. This protocol was developed that the brain has fully healed and the athlete is able to tolerate full physical activity following a concussion. The six steps are shown in figure 2.^{25,56}



Figure 2. Concussion return to play protocol

Each step typically represents a 24 hour period so that the athlete will take approximately one week to complete to full progression. If any post-concussion symptoms occur while in the stepwise program, then the patient should drop back to the previous asymptomatic

level and try to progress again after a further 24-hour period of rest has passed.²⁵ A factor that typically increases the return to play time and time to complete each step in the protocol is previous history of head injury. It is important to be especially careful with athletes that have had some sort of past head trauma because the symptoms can be more intense and take longer to subside. An athlete that has suffered from a concussion is also more susceptible to sustaining another.

III. Prevention

Although there are many cases that concussions and other head trauma can be avoided, sometimes an athlete is completely unable to prevent it from happening. Even though this is the case, there are things that can be done to minimize the chances of sustaining such an injury. It is important for athletes, especially those involved in contact sports, to never initiate contact with their head or helmet.²⁷ It is still possible to sustain a head injury while wearing a helmet. They should also avoid striking an opponent in the head, whether it is by elbowing, kicking, tackling, or checking.²⁷ Rules are being implemented to prevent these actions from taking place, but often times they are not enforced.

Immediate removal and evaluation is also a preventative measure to ensure that the injury is not worsened by the additional stress placed on the brain or another blow to the head. Second-impact syndrome is a serious condition that involves rapid swelling of the brain after a person suffers from a second concussion before the previous has completely healed.²⁸ This can often times be fatal and further supports the position to be more conservative than not when dealing with any sort of head trauma. This is especially true

when dealing with adolescent athletes since it is believed that the younger brain is more vulnerable because it has not fully developed.⁵⁶

Exertional Heat Stroke

With the increasing demands placed on athletes to perform at optimal levels by practicing and exercising long and strenuous hours comes the increased risk of an athlete to suffer from EHS. This is especially true with athletes that begin their competitive seasons in the late summer because of the increased temperatures and the limited amount of time to prepare for the upcoming season. According to the NATA position statement on EHI, EHS is defined as an elevated core body temperature above 104°F associated with signs of organ system failure due to hyperthermia.^{5,15} The temperature regulation system becomes overwhelmed due to the excess heat that is created and inhibited heat loss which can progress to complete thermoregulatory system failure.^{5,29,30} Immediate reduction of core body temperature greatly reduces the risk of subsequent illness and death. Athletes that suffer from EHS become susceptible to other medical conditions including severe lactic acidosis, hyperkalemia, acute renal failure, rhabdomyolysis, and disseminated intravascular coagulation which can often times cause death.⁵

I. Signs/symptoms

Since many of the signs and symptoms of EHS are similar to other heat related illnesses, it is important to have a detailed understanding of the differences between each illness. The most significant symptom that separates EHS from all other heat illnesses is the elevated core body temperature above 104°F with altered mental state.^{5,34} Current

research has overwhelmingly shown that the most accurate and effective method for assessing core body temperature is rectal thermometry.^{5,7,31} Altered mental status can include any of the following signs or symptoms located in table 6:^{5,29,34}

<u>Types of Altered Mental Status</u>	
Dizziness	Drowsiness
Irrational behavior	Confusion
Irritability	Emotional instability
Hysteria	Aggressiveness
Delirium	Disorientation
Seizures	Loss of consciousness

Table 6. Types of altered mental status.

Other signs and symptoms include dehydration, weakness, hot and wet or dry skin, tachycardia, hypotension, hyperventilation, vomiting, and diarrhea.^{5,29,34}

II. Treatment

Chance of survival and return to normal functioning is greatly increased when immediate proper medical treatment is given to anyone that is suffering from EHS.³² Lowering the core body temperature to less than 104°F within 30 min should be the primary goal of EHS treatment.⁶ If it is determined that an athlete has a core body temperature above 104°F and has an altered mental status, then immediate whole body cooling should be initiated. Figure 3 shows the cooling rate of various cooling methods, with ice water immersion easily being the most effective way of lowering core body temperature.⁵ In an article published recently by Casa et al.,⁶ the criticisms of cold water immersion(CWI) are refuted by scientific evidence and compared to various other cooling methods used in the field. It has been established that the benefits of CWI greatly outweigh the limited number of risks.⁶

When performing CWI, the athlete should be placed into a bath or tub filled with cold water (between 35°F and 59°F).^{5,6,32} As much of the body should be immersed in the cold water as possible to ensure the most effective treatment and rapid cooling, excluding the head. A health care provider can prevent the head from sinking into the water by placing a towel under the athlete's axillaries and holding both ends. Circulation of the cold water, either mechanically or manually, should be performed to increase the effect of the cooling. The athlete's core body temperature should be assessed rectally while the treatment is being administered in order to monitor the change in temperature and to ensure that overcooling does not take place.^{5,7,32} Once the core body temperature has fallen to 104°F or below, the athlete should be removed from the tub and taken to a hospital for further medical evaluation. Monitoring of the athlete should continue for 24-hours to ensure that organ-system complications do not occur.⁵ CWI is also defended in a systematic review by Smith,⁵⁸ in which he describes CWI as the most effective cooling method when available. He describes other techniques, such as spraying water over patient, removal of clothing, and use of a fan as acceptable when the methods are used in combination with one another.⁵⁸

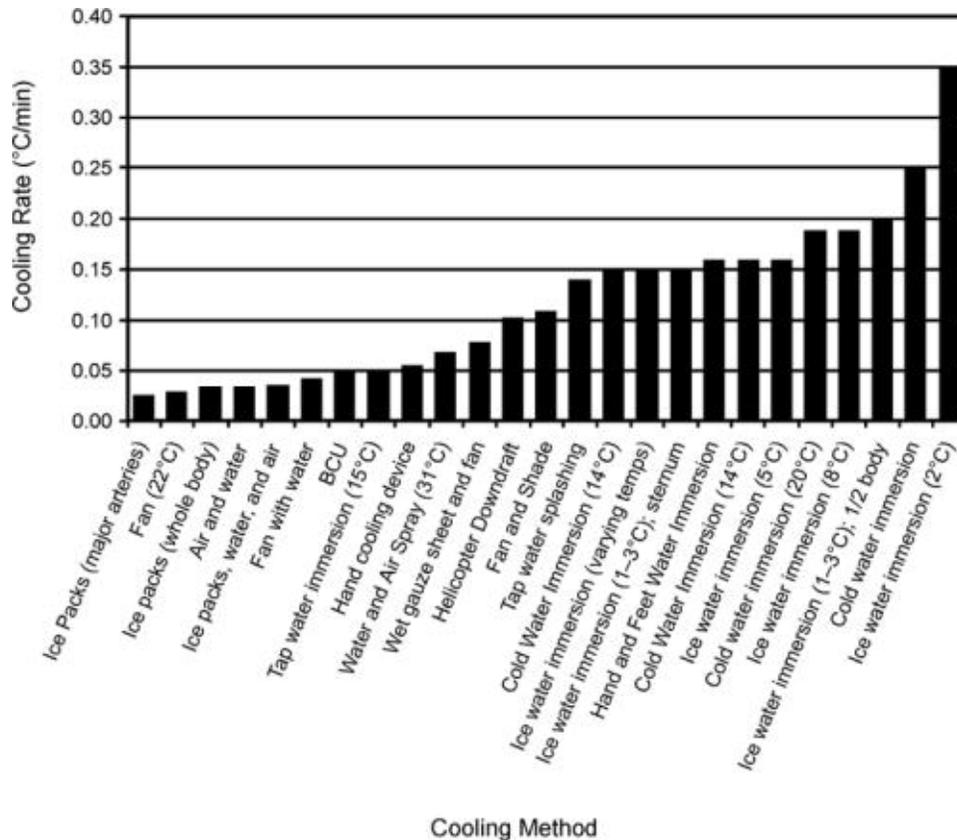


Figure 3. Cooling rate of various cooling methods^{5,6}

If immediate cold water immersion is not possible to perform, other alternatives are possible for cooling until core body temperature is lowered to 104°F or cold water immersion can be performed. These methods include:^{5,6,29,30,32}

- Removal of clothing
- Sponging athlete with cold water and applying cold towels
- Applying ice bags to as much of the body as possible, especially major vessels in the armpit, groin, and neck
- Providing shade
- Fanning the body with air

III. Prevention

In most cases, death from EHS can be entirely preventable. Being prepared with the proper equipment to assess core body temperature and to implement immediate whole body cooling greatly reduces the risk of fatality. Rectal thermometry has been shown to be the most accurate and efficient way to assess core body temperature in the field.⁵⁻⁷ Research also shows that cold water immersion is the most efficient way to rapidly lower the core body temperature.^{5,6,32}

The American College of Sports Medicine (ACSM) recently held a roundtable consisting of numerous experts from the civilian sports medicine community and the Department of Defense to discuss relevant EHI issues.⁵⁹ It was determined that there are various individual risk factors that need to be recognized in order to prevent EHI. These factors include age over 40, medications, skin disease, acute illness, chronic disease that cause autonomic dysfunction, dehydration, poor acclimatization, high body mass index, use of dietary supplements, and poor conditioning.⁵⁹

The NATA has published its own set of guidelines to assist ATCs and other health care providers in preventing EHS from occurring. These guidelines include:⁵

- ATCs present at all practices and events
- Physician-supervised preparticipation medical screening
- Acclimatization of athletes to heat over a period of 10-14 days
- Educate athletes and coaches about heat related illness and hydration
- Develop practice and event guidelines during hot and humid weather
- Schedule training to avoid hottest parts of the day
- Plan rest breaks to match environmental conditions and practice intensity
- Provide adequate supply of fluids to maintain hydration

- Minimize clothing worn in hot and humid conditions

Exertional Hyponatremia

Exertional hyponatremia (EH) involves a decline of serum or plasma sodium levels to less than or equal to 130 mEq/L during exercise that lasts longer than 4 hours.³⁷

Examples of this type of exercise include marathon running, triathlons, and extensive hiking. Low sodium levels in the extracellular fluid causes water to flow into the cells, causing intracellular swelling that can cause neurologic and physiologic dysfunction.^{5,37,38}

According to the NATA, two mechanisms of EH are proposed: an athlete ingests water or low-solute beverages well beyond sweat losses, or an athlete's sweat sodium losses are not adequately replaced.⁵ Regardless of the mechanism, EH can become fatal if not treated properly.

I. Signs/symptoms

Since proper treatment of EH can prevent death, it is important to quickly recognize and differentiate this condition from other heat related illnesses. Athletes suffering from EH will typically be seen at the end of a long endurance bout of exercise. They can present with a variety of complications including disorientation, altered mental status, headache, vomiting, lethargy, seizures, and swelling of the extremities.⁵ In general, the lower the sodium level the more severe the neurological signs and symptoms.⁶⁰ The degree of hyperthermia is typically less than that of other heat related illnesses. Table 7 displays the differences in signs and symptoms between EHS and EH.

Differences in signs/symptoms of EHS and Hyponatremia

EHS	Hyponatremia
- Core Temp >104°F	- Core Temp <104°F
- Central nervous system changes	- Extremity swelling
- Dehydrated	- Low-blood sodium level
- Hyperventilation	- Lethargic/apathetic
- Tachycardia	- Pulmonary/cerebral edema

Table 7. Differences in signs/symptoms of exertional heat stroke and exertional hyponatremia

II. Treatment

All medical facilities at endurance events should include onsite analysis of sodium.⁶⁰

This is the most effective way of determining if EH is present.

If EH is suspected, immediate transfer to an emergency medical center is needed.⁵

Medical facilities at endurance events can be considered a temporary emergency medical center if they have the capability to administer intravenous fluids.⁶⁰ An intravenous line should be placed to administer medication as needed to increase sodium levels, induce diuresis, and control seizures.⁵ Ultimately the athlete needs to be transferred to a definitive medical facility and the diagnosis of EH needs to be communicated to the emergency room physician upon transfer of care.⁶⁰ The athlete should be monitored until sodium levels have returned to normal and all signs and symptoms have subsided.

III. Prevention

It is important that athletes replenish their fluids based on individual need rather than by universal recommendations.³⁹ Individual need can vary depending on factors such as exercise intensity, duration, environmental conditions, pre-race hydration status, and sweat rate.³⁷ Athletes competing in extensive endurance competitions should be cautious

not to ingest excessive amounts of water immediately prior to and during activity.³⁸ A general goal should be to expect to lose up to two percent of body weight during exercise and never to gain weight.⁶⁰ When fluid is ingested, they should contain some sort of sodium. This helps to maintain plasma sodium levels better than just pure water.³⁷ Foods that contain sodium are also beneficial to offset sodium losses in sweat and urine.³⁷

The Second International Exercise-Associated Hyponatremia Consensus Development Conference⁶⁰ has recognized certain risk factors that might predispose athlete to EH. These factors include excessive drinking behavior, weight gain during exercise, low body weight, female sex, slow running, event inexperience, and NSAID agents.⁶⁰

Coach education and relationship with AT

In order to become a head football coach in the United States at the high school level, you must obtain a bachelor's degree.⁴¹ Popular majors include physical education, exercise science, or any other subject that enables teaching. Many coaches decide to pursue a Master's degree in order to enhance the amount of compensation that they receive. Each state also has its own set of guidelines and requirements that are needed in order to become certified to coach in that state. Coaches must also be first aid and CPR certified.

Although there is no requirement for the amount of experience that is needed in or to obtain a head coaching position, it is very difficult to acquire a position without previous experience at the high school level. Previous experience can come from a variety of different positions that include defensive coordinator, offensive coordinator, specials teams coach, etc.⁴¹ Additional experience also typically leads to an increase in salary.

The National High School Coaches Association (NHSCA) has created a professional development program for coaching excellence in order to provide coaches with feedback about their performance.⁶² The program consists of a self-evaluation, colleague evaluation, coaching evaluation by team members, and feedback regarding the overall team culture.⁶²

Even though it is a requirement for all head football coaches at the high school level to be certified in first aid and CPR, not all are adequately prepared to handle an emergency situation. Ransone et al.⁴ determined that coaches that have the proper education and knowledge of first aid and CPR do not act in the proper manner when handling an injury as opposed to those that are not knowledgeable.⁴ This means that even though the coaches know that an athlete is injured and should be removed from play, they tend to leave them in and risk greater consequences. Coaches tend to show bias towards certain players and will risk overall health in order to succeed. These athletes also typically receive less medical attention when the competition is over and the injuries can persist for an extended amount of time. According to a study by Rowe & Miller,⁵³ only 26% of athletes that suffered an injury in Georgia high schools were referred to a physician. Even more alarming is the fact that only 7% of the injured athletes received any kind of rehabilitation following the injury.⁵³ This same study showed that the reinjury rate in high schools that employ an ATC is only 3% when compared to 71% in schools that do not employ an ATC.⁵³ This supports the need for an unbiased medical professional, ideally an ATC, to be present during competition in order to protect the best interests of the athletes.⁴

According to an article by Obert,⁵⁴ coaches not only do not want to handle the medical side of athletics, but they also feel that they are not educated enough to handle the injuries as best as possible. He also states that situations in which an ATC can report to a school a few times a week from a clinic is still better than not having any ATC employed at all.⁵⁴ Employing an ATC at the secondary school, even part-time, is difficult because many of the schools have a severe lack of funding^{52,53}.

The levels of competence of coaches at the youth levels are even worse than those that we see in high school and collegiate athletics. First aid and CPR certification is not required of youth coaches, and their backgrounds in Sports Medicine are typically very limited.^{50,51} According to Barron et al.,⁵¹ only 15 out of 290 coaches that completed a first aid assessment survey earned a passing score Valvovich-McLeod et al.⁵² also showed very low passing rates on their first aid assessment, but coaches with current first aid and CPR certification scored significantly higher on the test.

Another aspect of sports medicine that coaches need to have considerable knowledge about is preventing, recognizing, and treating concussions. O'Donoghue et al.⁵⁵ determined that coaches have a moderate level of knowledge regarding concussion, with the most knowledge in the area of recognition and the least in the area of management. Having the ability to recognize that an athlete has a concussion does not benefit anyone if you are unable to know how to get the athlete back to full health. In the last five years, a handful of states have stepped forward to make sure schools take notice.⁵⁶ Connecticut, Idaho, Oregon, Texas and Washington have passed legislation to establish minimum concussion education and management guidelines for their high school coaches.⁵⁶

In Connecticut, a concussion bill was recently passed that will require interscholastic and intramural coaches to receive regular training in recognizing signs and symptoms of concussion, remove athletes who exhibit signs or symptoms of a possible concussion from activity, and refer them for medical assessment.⁶¹ Athletes will not be permitted to return to activity until they have been evaluated and received written clearance from a qualified medical professional.⁶¹

Coaches can also assist with concussion management by being in contact with school officials and teachers and encouraging them to make academic accommodations for athletes recovering from concussion.⁵⁶ Recommendations for modifications of academics include extra time to complete tasks, breaks while studying, and avoiding significant testing until the athlete has fully recovered.⁵⁶

It has been shown that schools that implement adequate health care and training programs see far better results in regards to injured athletes. Rice et al.⁶³ instituted an athletic health care and training program to help Seattle Public Schools meet the educational, organizational, and record-keeping needs of the athletic programs. The program consisted of education coaches and nurses, development of a central training room, and implementation of written procedures and record-keeping.⁶³ The schools that had the program implemented were shown to have managed injuries 95% of the time, as opposed to those with out the program at only 14%.⁶³

Although overwhelming evidence is available in favor of an ATC at all secondary schools, many decide not to employ one. These schools are placing the health and well-being of their athletes in the hands of those that are not fully educated and capable of

handling emergency situations in the athletic setting. More research is needed in order to describe the reasoning behind the lack of ATCs that are employed at the secondary level.

Conclusion

Athletes today are under greater amounts of pressure to succeed than in previous years. This forces them to push their bodies to levels that they are sometimes not capable of tolerating. Having an athletic trainer that is fully educated and certified enables these athletes to work at high levels and know that they will be taken care of should any type of incident occur. Athletic trainers are medical professionals that are experts in dealing with prevention of sudden death in sport as well as any other injury that one might sustain during competition. ATCs know how to recognize, treat, and work towards preventing any type of sudden death from occurring. With increased employment of ATCs at the secondary level, it is possible to lower the numbers of sudden death in sport from the increasing frequency that we see today.

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Introduction

Sudden death in sport, often viewed as an uncommon occurrence, has become an increasing concern for the sports medicine professional, coach, and athlete. Evidence to this centers on the reported number of deaths annually, particularly in cases where death could have been prevented. In August of 2011 alone there were 5 deaths reported in one seven-day period, one of the deadliest ever recorded. The preseason months of July and August are often associated with the highest number of sudden deaths in high school and college aged athletes. Sudden cardiac death is the leading cause of death for young athletes who are exercising,^{1,2} followed by head injuries, and heat stroke and/or sickling.^{2,3} The unfortunate reality regarding sudden death in sport is that it is preventable or at most treatable through proper medical screening, providing proper on-site medical care, and education.

Perhaps the cause of death that has gained the most attention from the media over the last few years is exertional heat stroke (EHS). Of the fourteen reported incidences involving sudden death during the months of July and August 2011, ten were likely due to EHS as determined by a review of the final cause of death. Furthermore, between 1995-2009 it is estimated that 42 deaths have occurred as a result of EHS.³ In comparison, it is believed that 44 deaths have occurred as result of cardiac implications from 2004-2008 alone and 44 deaths relating to head injuries from 1995-2004.³ It has been shown that majority of these EHS deaths occur during the preseason training months of July and August, mainly in high school football athletes.³ Factors contributing to EHS for the high school and college-aged athlete include dehydration, sleep loss, exercise intensity, heat acclimation, and personal drive and motivation among others.³

The high school-aged athlete, particularly that of the football player, appears to be associated with the highest incidence of fatal injuries, including EHS. Illustrating this is the recent case of Max Gilpin, a 15-year-old football player from Kentucky that died from EHS during a practice session. Many factors contributed to Max's death, including environmental conditions, intensity, dehydration, and lack of medical care on-site. Exercise induced heat stroke is entirely preventable, as well as treatable once recognized. However, without recognition and proper care by a trained health care professional it is deadly as indicated by the data previously mentioned.

A key factor in reducing the number of sudden deaths in sport centers on having appropriate medical care on site during practice and competition. Although most universities and colleges employ the services of an athletic trainer (AT), the secondary school level does not guarantee medical coverage at athletic events/practices by an AT. The National Athletic Trainers' Association (NATA) along with the American Medical Association (AMA) recommends that all secondary schools employ the services of an AT.⁴ Despite this recommendation by the NATA many schools do not employ the full-time or even part-time services of an AT. This places the immediate care of the athletes in the hands of the coaches for that particular sport. This can produce a potentially dangerous situation considering that not all states require all of their secondary school coaches to be certified in first aid/CPR. In fact, according to a study by DeRene *et al.*,⁵ only 51.3% of secondary schools required certification in first aid and only 45.6% required their coaches to be certified in CPR. Many coaches that have become first aid/CPR certified might not feel confident enough in their abilities to deal with a sudden death case, mainly EHS, since it is not covered in depth in the curriculum. The NATA⁶

and American College of Sports Medicine (ACSM)⁷ counsel that any athlete suffering from EHS must be cooled immediately before transportation to ensure an optimal outcome; recommendations beyond the coaches training and duties particularly in the area of proper recognition.

Coaches play an extremely integral part in the prevention of sudden death in sport. By following detailed guidelines that have been set forth by the NATA^{8,9} coaches can plan their practices in ways that protect the athletes from increased amounts of harm. This can be done by planning more breaks during practice, allowing athletes to become acclimatized to weather conditions, and not pushing them beyond the limits of which they can tolerate. Current research is very limited regarding the knowledge of coaches on sudden death in sport and whether or not they attempt to alter the training habits and practice conditions to avoid such situations. The purpose of this investigation was to gain a better understanding of the coaches' knowledge regarding sudden death in sport as well as their level of preparedness to manage a potential case of sudden death. Collecting this information can help all members involved in the care of the secondary school-aged athlete to protect them from a potential case of sudden death.

Methods

In this exploratory study, we used mixed-methods approach to gain a better understanding of the perceptions of secondary school football coaches regarding sudden death in sport. This approach enabled us to use multiple types of questioning in order to gain the most information possible from the participants and to help strengthen the findings generated by the study. A mixed-method approach was selected because there is limited information about coach's knowledge of sudden death and measures used to help

prevent its occurrence during practice and competition, and use will help increase the generalizations made from the study's findings.¹⁰

Participants and Recruitment

We purposefully recruited participants with coaching experience at the secondary school setting by both criterion and snowball sampling procedures.¹⁰ The primary criteria for inclusion included the position of head football coach at the secondary school level. In addition, we attempted to recruit participants based on their geographical location and years of experience as a football coach, with relative equal distribution between region and years of experience. This was done in order to gain a heterogeneous sample.¹¹

Potential participants were initially recruited at the 2011 American Football Coaches Association Annual meeting held in Dallas, TX by distributing an informational sheet regarding the study's purpose and data collection procedures. Also at that time the researchers received the contact information for all coaches with membership to the American Football Coaches Association (AFCA). In addition to those who initially indicated interest from the AFCA meeting, potential participants were recruited by email. Contained in the email was an invitation letter, the same used to recruit at the conference and a link to the website that contained the interview questions and background information. Recruitment was done until both data saturation¹¹ and relative distribution amongst age and region were met.

A total of 38 coaches participated in this study, of which 37 were male and 1 was female. All participants in this study were head high school football coaches, had obtained some sort of college degree, and were employed in 18 different states throughout the country. The mean age of the participants was 47±10 years with an

average coaching experience of 22±10 years. A summary of participant demographic data is highlighted in Table 1.

Table 1. Participant Demographics

Age	47 years ± 10
Coaching Experience	22 years ± 10
Head Coaching Experience	12 years ± 9
Years at Current School	13 years ± 10
Gender	37 M, 1 F
State	7- WI
	5- TX
	3- CT, MN, NH, NC
	2- OH, KY
	1- TN, MI, IL, AL, MO, GA, SC, LA, FL, DE
Education	Associates Degree- 1
	Bachelor's Degree- 8
	Master's Degree- 28
	Other- 1 (Specialist in Education)

Data Collection

Participants completed a two-part online questionnaire via the secure website Zoomerang. There were three types of questions that were used in the two-part questionnaire: 11 multiple choice, 14 open-ended, and 7 Likert scale. The first section of the questionnaire was designed to gain background information on the participants, such as general demographic data and basic knowledge regarding sudden death in sport. The second section was used to gain information about experiences and prevention strategies used by coaches to prevent sudden death in sport, as well as their relationship with the AT. The interview questions were developed by a research team, which included 5 members. Those members included two athletic training educators and researchers, two graduate assistant ATs, and one qualitative researcher. Prior to data collection the questions were reviewed by an expert qualitative researcher not involved with the data

collection procedures, and was piloted with a small cohort of coaches (n=2). Updates and changes were made accordingly after each subsequent step in the content validation process and prior to data collection. Data gained from the small pilot was not used for data collection procedures, but rather to ensure quality and consistency with data collection. Data collection took place during the months of May and June, 2011.

Credibility

Credibility was established using three strategies: 1) peer review,¹¹ 2) multiple analyst-triangulation,¹⁰ and 3) data-source triangulation;¹¹ three very common methods employed in qualitative research.¹¹ An independent researcher served as the peer; they reviewed the data collection procedures as well as evaluated the final emergent themes as determined by the research team. Two researchers independently coded and analyzed the data using the methods described next, prior to discussing the findings. The two researchers were in agreement with the findings prior to sharing the data with the peer. The presentation of findings was agreed upon by the researcher team and peer as reflected in the upcoming section. As mentioned, data collection incorporated both qualitative and quantitative measures, to evaluate the secondary coaches knowledge and perspectives on sudden death in sport.

Data Analysis

The qualitative data was analyzed using a general inductive approach to data analysis as described by Thomas.¹² The structured analysis procedure involved a holistic evaluation of the data, initially, to gain an appreciation for the data. Once this step was done, the second and third evaluations involved categorizing specific incidents and statements by assigning labels to represent their meaning, similar to an open coding

process.¹² The qualitative data was evaluated once the coding procedure was completed to group categories with shared or similar underpinnings. Likert scale questions were evaluated by computing the mean for each question. Frequency of response to multiple choice questions was also calculated in order to gain a better understanding of background knowledge or responses to questions.

Results

There were four themes that emerged from the data: *level of preparedness*, *misconceptions about sudden death in sport*, *activity modification strategies*, and *positive coach/athletic trainer relationships*. Each theme is discussed below along with supporting quotes from the participants.

Level of Preparedness

The data indicates that a majority of the secondary coaches had a high self-efficacy regarding managing an emergency situation, despite limited involvement with an emergency situation. Of the 38 participants, 24 (63%) said that they felt qualified and prepared to handle an emergency situation. One participant stated: “I feel qualified and prepared to handle an emergency situation. We have several assistant coaches who are certified in CPR. I am on our school's emergency response team.” Another participant shared, “I do believe I stand a good chance of handling the situation.” One coach discussed his confidence in his ability to provide a secure practice venue to prevent issues. He shared, “I feel very confident in my abilities to provide a safe environment, monitor my athletes’ performance, and properly react to any medical situations that may arise.” Other participants linked annual re-training and support from their AT, as reasons to feel prepared to handle an emergency care situation. For example one coach stated, “I

feel qualified. I receive training each year and my first aid and CPR training must renew every 2 years.” A different coach shared, “I feel qualified as we are CPR trained, however, when we have our [athletic] trainer or team doctor around, I am getting out of the way.”

Of the remaining participants, none indicated a concern with management of an emergency situation but rather indicated the potential for additional training to aid in their level of preparedness. One coach said, “I do believe I stand a good chance of handling the situation but I feel I should have more training.” Another coach shared, “I feel that I would be able to deal with the situation, but I think one needs to be continually trained to be prepared as possible.” In an honest response, one coach shared, “I have the basic knowledge [regarding preventing sudden death in sport] but do not feel fully prepared. Additional training would be beneficial [to increase my confidence level].”

Misconceptions about sudden death in sport

Judging by their responses to the questions regarding signs and symptoms as well as their discussion of the most common emergency care situations, it became apparent that the secondary coach had misconceptions regarding sudden death in sport. Many were unable to correctly identify the correct signs and symptoms that may present with some of the conditions, most specifically EHS. This was determined by having the participants evaluate a list of potential signs and symptoms related to sudden death in sport, mainly EHS. Table 2 provides a breakdown of the signs and symptoms presented and a summary of the participant’s responses. A majority of the coaches described dizziness as a definite symptom for EHS (92%) and 61% stated that the athlete would not be sweating, whereas only 13% felt sweating would be present in a case of EHS. The

coaches' perceptions of signs and symptoms related to EHS were based upon prior educational training rather than experience, as only 7 (18%) had indicated having an athlete suffer from an EHS. Additionally, when asked about symptoms presented with a case of EHS, they frequently mentioned fatigue, dizziness, and vomiting as key to diagnosis of a case of EHS. One coach described his reasoning for selecting not sweating with the following statement, "We practice in heat, if they aren't sweating that can't be normal." This coach agreed and said, "The [exertional] heat stroke signs are lack of sweat and hot skin." Another coach even felt that "cold and clammy [skin]" would be a sign that would warrant a diagnosis of EHS. Central nervous system dysfunction was only described by 12 of the 38 coaches (32%). Whereas only one coach described central nervous system dysfunction in his explanation for choosing those signs and symptoms when he stated, "I know nervous system dysfunction is a key sign." Sweating was the least chosen sign, with only 5 coaches selecting that choice.

Table 2. Signs/symptoms of EHS

Signs/Symptoms	Frequency	Percentage
Sweating	5	13%
Redness	13	34%
Cramping	15	39%
Dizziness	34	92%
Nausea	16	42%
Vomiting	19	50%
Weakness	17	45%
CNS dysfunction	12	32%
Fever	9	24%
Not sweating	23	61%
Hot skin	15	39%

Coaches were also asked to describe any emergency situation in which they were involved with a sudden death or any emergency situation. Consistently, the participants

wrote about their experiences with spineboarding and concussions, but rarely mentioned any other potential condition leading to sudden death in sport. Furthermore, in the written responses the coaches often recited the examples provided of causes of sudden death, which identifies a deficiency in knowledge regarding other conditions classified as a cause of sudden death.

Activity Modification Strategies

The theme *activity modification strategies* reflect the coaches' tunnel vision regarding specific prevention tactics to help prevent a case of sudden death in sport. In fact, although coaches had limited training regarding EHS and other heat related illnesses, many modifications were addressing EHS. Coaches discussed the main environmental conditions that would lead them to alter activities as well as the strategies that they use to make the activity safer, which included lightning, cold, and heat.

Heat was the predominant environmental factor that leads to activity modification, as only 3 coaches did not make direct mention of heat as an environmental condition that would require them to change their activity schedule. This coach stated, "We have a head index chart that we follow and it is progressive. At one point we take off pants, then shoulder pads, then helmets and finally cancel all activity." Another said, "In Alabama, when the heat index reaches a critical level- NO Practice!" Modifying practice because of lightning was also mentioned in an overwhelming majority of the responses. One coach wrote, "The only environmental condition we alter practice for is lightning." Another coach said, "Obviously we are not going to practice outside if lightning is occurring." Another coach gave an educated and informed response, "The bigger concern here is usually storms with lightning, then as rule we must exit the field

and may not resume until 1/2 hour after the last strike.” Other conditions listed as possibilities were extreme cold, rain, and poor air quality.

Activity modification when extreme weather conditions are present is an important strategy for decreasing the likelihood of sudden death in sport and this sample of coaches agrees. Moving practice to cooler parts of the day, such as early in the morning or later in the afternoon is the most prominent strategy for protecting the athletes. One coach said, “We try to have our practice earlier in the morning or late at night to avoid the hottest part of the day. Heat is always a concern here.” A coach implemented cancelling practice altogether into his strategies, “We have a policy in place for bad weather. Either alternative practice schedules that are indoors, or cancellation of practice.” Moving practices indoors has also been mentioned as a strategy when the facilities are available for the teams to use. One coach has developed a schedule with his school that allows “in-season” sports to take priority of the indoor facilities for that day.

Modifying the intensity of practice is another way of protecting the athletes. This can be done in a variety of ways. One way is going “lighter” with each drill and giving more breaks in between participation. A coach stated, “We have mandatory water breaks where helmets have to be taken off and we will shorten practice and lessen conditioning.” Decreasing the amount of running during a practice can also be instituted, as explained by this coach, “we will cut practice short or eliminate additional conditioning.” Increasing the amount water breaks was also discussed as a strategy, but the misconception that a player must be dehydrated to suffer from EHS needs to be addressed.

One way of reducing the physical demand on players is to limit amount of equipment that is worn on that particular day. Only 21% of the subjects mentioned in some way that they would reduce the amount of equipment that was to be worn for that day or eliminate pads altogether when conditions are extreme. This coach said, “For extreme heat we will never wear full pads.” Another said, “If the heat and humidity is close to a certain level we can practice but without equipment on.” Only 2 coaches mentioned that they implement acclimatization plans in order to help their players adjust to the heat and increasing demands of competition.

Positive Coach/Athletic Trainer Relationships

The theme *positive coach/athletic trainer relationships* demonstrated the strong professional relationships that were developed between the AT and the secondary school coach. All but four coaches in this study currently worked directly with an AT. The coaches were asked to describe their previous experiences with having an AT on-site. Of the 38 coaches that were surveyed, only one reported that they had never had an AT on staff. All of the coaches that had worked with an AT described their relationship as positive and stated that ATs are a valuable asset to have and important for all contact sports. This coach went as far to say, “Every high school program should be required to have one on staff.” Another coach shared his view on the important role of the AT, “The [athletic] trainer plays a crucial role in educating coaches and players and implementing guidelines and protocols.” A different coach elaborated on this in even more detail:

Having an [athletic] trainer on staff has always been positive. From taping, to general first aid, to especially major injuries, concussions, they are in charge. She is a trained professional in these areas. We, the coaches, have only touched on these areas.

Another benefit that was stated was the ability of AT to help bring players back from injuries. This is referenced with different techniques such as rehabilitation, taping and bracing, and assistance with the mental aspects of an injury. A coach shared, “Helping to diagnose injuries is valuable, more important possible is the valuable input and therapy in bringing that athlete back from an injury.” This coach best sums up the way that the relationship between a coach and AT should be with the following, “I have had an [athletic] trainer on the premises for every sport and every year I have coached. [Athletic] Trainers and coaches must work together to help ensure the well being, preventative care and rehabilitation care for our athletes.”

Discussion

The secondary school coach has become a critical player in sudden death in sport, particularly at the secondary school setting. Over the last few years, several of the cases involving sudden death in sport have attributed the athlete’s death in part to the coach; particularly due to the role they play in designing the training regimens and practice schedules. Implications have also been made regarding their knowledge of emergency care procedures, including the ability to recognize potential symptoms of conditions that can lead to sudden death. The recent civil case involving Jefferson County, KY and football coach Jason Stinson illustrates the seriousness of sudden death and the role the coach can play in prevention. Moreover, the response to the prosecution of Jason Stinson, promoted the state of Kentucky to mandate more training for the coach regarding emergency care procedures and sudden death in lieu of hiring appropriate medical care in the hopes to prevent future tragedies like Max Gilipin.¹³ Recognizing that limited medical care may be available during practice and conditioning sessions, the secondary school

coach must be ready to act accordingly to avoid a catastrophe. Despite the push to provide more education for the coach, there is limited information regarding the current knowledge base regarding sudden death in sport of the secondary school coach. Our results highlight that the coach has a basic understanding regarding causes of sudden death, particularly the top causes of death, signs and symptoms, and strategies to reduce or treat the condition. Optimistically, we found that having an AT present has a positive influence on the coach and their confidence regarding preventing sudden death in sport. The coaches in the present study were fortunate to have an AT present to help manage the healthcare of the student-athlete, but data suggests that this is not the luxury for all secondary coaches, as many secondary schools do not employ the services of an AT.¹⁴

Level of preparedness

The majority of coaches who participated in our study (68%) felt that they were confident and qualified to handle an emergency situation. Our findings are quite contradictory compared to the existing literature examining coaches' knowledge and comfort related to first aid, as often they report very low comfort levels.^{15,16,17} Often a lack of training is cited as a reason for incapability to manage an emergency situation, so therefore our findings illustrate a potential need to increase training in CPR and first aid for the coach. The National Association for Sport and Physical Education (NASPE) does outline fundamental competencies for the coach, which includes sport safety and injury prevention; however these standards are not enforced at the state level, leaving many states to arbitrarily select their coaching certification mandates. Coaches have been encouraged to receive and maintain current first aid and CPR training from the American

Red Cross, but again, some states do not require this training as part of their certification process.^{18,19}

Many states do necessitate all coaches to complete two courses offered by the National Federation of State High School Association (NFHS). These two “core” courses are titled “Fundamentals of Coaching” and “First Aid for Coaches” and are valid for 3 years. These two courses are important to help the coach be aware of basic first aid information and details on prevention of sport-related injuries, comparable to the competencies outlined by the NAPSE, but are still limited in the information provided. The content presented in the courses is designed to cover some emergency situations such as cardiac care, shock, and musculoskeletal injuries and are limited in some areas including concussion awareness, heat illness recognition, and cervical spine injury management. While learning the absolute basics about emergency situations can help with awareness and appreciation for the existence of the conditions, it makes it very difficult to become fully comfortable and confident in ones abilities to manage an emergency situation. Many of the coaches agreed and stated that additional training would always be helpful, especially regarding emergency situations. Some states, such as Connecticut²⁰ and New Jersey,²¹ have begun mandating additional courses that focus on concussion awareness and recognition of heat related illness. Even though this is a huge step in the right direction, taking a simple 3 hour course is simply not enough time to grasp an adequate knowledge base on these complex conditions. Some of these conditions, such as EHS and exertional sickling, present with very similar signs and symptoms but require completely different treatment techniques. For example, although both conditions are medical emergencies and EMS should be called immediately, athletes

suffering from EHS should be immersed in cold water while those suffering from exertional sickling should be given supplemental oxygen, skills and care beyond the training of the coach, regardless of certification mandates. Athletic Trainers receive training in these situations for at least 4 years and asking a coach to be the sole medical provider with limited training might be too tall of a task. It is also worthy to note that in the case where an AT is not present and the coach is left to initiate care including activating EMS, recent data illustrates that the EMS professional is not adequately trained regarding treatment of EHS.²² Current protocol, with the exception of the state of Arkansas, is to transport the EHS patient immediately before cooling can take place; something that has been demonstrated as detrimental to the care of the condition. Again, having an AT present is necessary to ensure accurate diagnosis and proper care is implemented in the case of EHS, as well as any other sudden death condition.

Judging by their responses, coaches are definitely aware of the need for more training personally regarding emergency care as well as the importance of having an AT on-site. The coaches stated that retraining and the presence of an AT gives them more confidence in their abilities, an interesting finding that challenges the findings of Kujawa.¹⁵ Kujawa¹⁵ found that coaches who do not have the medical services of an AT appear to be more knowledgeable regarding emergency procedures than those with ATs on-site. Previous assumptions were that those coaches who were without an AT were forced to maintain their skills because they were the sole first responders. Our results, however, indicate that the AT can be a positive influence on the level of preparedness of the coach and the importance of the teamwork established between the two members of

the sports medicine team. The ATs presence appears to serve as a facilitator of knowledge and retention of basic emergency care procedures.

Individual states are encouraged to mandate CPR/AED and first aid training for all coaches and the individual coaches are encouraged to gain and maintain the training offered by the American Red Cross on their own personal accord to ensure the well-fare and well-being of their student-athletes. Currently the American Red Cross offers this training nationwide and retraining takes places every 2 years, which provides coaches with updates on current policies and techniques that might have changed over the 2 year span as well as refresh their skills, which they might not have used during that timeframe. Having an AT onsite to either provide immediate care or take over for a coach would be ideal in any athletic setting, however this is not always the case for the secondary level. The NATA and AMA support this recommendation but evidence highlights a lack of coverage, particularly in many of the sudden death cases.²³ This again supports the findings of our study and other research that the coach is ill-prepared to manage an emergency situation due to limited training and knowledge. Athletic trainers are trained healthcare providers with the necessary training to handle emergency situations and preventing sudden death in sport and can help the coach feel more at ease with sudden death in sport. Having an AT onsite means that the coaches can focus on getting their players to perform to their optimal levels and leaving the medical aspects to the AT. Knowing that coaches are aware that more training is needed and ATs are more qualified to handle emergency situations should make any future policy changes easier to accept.

Misconceptions about sudden death in sport

The ability to quickly recognize the signs and symptoms of an athlete that is suffering from a potentially life threatening situation is key to preventing sudden death in sport. Our results demonstrate that a coach's knowledge regarding the signs and symptoms of many conditions related to sudden death is inadequate, especially concerning EHS. Exertional heat stroke is a topic that is often understated in the basic emergency course and in some cases overlooked, despite its prevalence in the secondary school setting and ranking as a cause of sudden death. In addition to an elevated core body temperature [$>40^{\circ}\text{C}$ (105°F)], the condition is hallmarked by central nervous system (CNS) changes and often the first marker for someone that is suffering from EHS.⁶ Despite this fact, only 32% of coaches in our study mentioned CNS changes as a symptom of the condition. The coaches also felt that cessation of sweating was another indicator that EHS was present; this has been a long-standing misconception regarding EHS. An athlete suffering from an EHS, although may appear to have dry skin, will almost always be sweating.⁶ Making a diagnosis of EHS is challenging even for the trained medical care provider, as they will present with a host of symptoms including fatigue, dizziness, nausea, and vomiting, which is comparable to other conditions such as a concussion, exertional sickling, and heat exhaustion. A timely and accurate diagnosis is critical when an athlete, who has been intensely exercising, especially in the heat, is suffering from EHS. This athlete needs to be cooled as quickly as possible in order to decrease the core body temperature and minimize the risk of permanent damage or death.²⁴ An athlete who is immediately cooled prior to transportation to the hospital will

be saved as evident by the many successful cases presented in the literature²⁵ as well as the many research studies proving its efficacy.^{6,7}

Although a large portion of the findings spoke directly to EHS, this was purposeful, as many cases of sudden death at the secondary level have involved EHS. Overall, the cohort of coaches in our study demonstrated an inability to fully appreciate all the causes of death or the prevalence of their occurrence. Again, many coaches may only possess basic emergency care training, including CPR/AED and first aid, which explains their limited knowledge regarding sudden death, as the curriculum presented is very limited. When asked to describe an experience involving sudden death or an emergency situation, the coach only seemed to mention EHS, spineboarding, and concussions. These conditions are considered hot topics within the media, as they receive the most attention regarding sudden death and sport. For example, the NFL is currently restructuring their policies on concussion management and many states are beginning to mandate educational training for the secondary coach. Moreover, we have presented several high profile cases regarding EHS, including the Max Gilpin case and most recently the Ereck Plancher case at the University of Central Florida. Other conditions, however, are classified as potentially life-threatening, and current data tells us that the following, in order, are the most common causes of death in sport:³ cardiac, head injuries, heat stroke, exertional sickling, asthma, trauma (not to head or neck), neck injuries, and other (lightning, diabetes, etc.). The expectation of differentiating these conditions should not fall on the secondary coach, but rather a trained medical care provider such as an AT. Although the coaches in this study benefited from the services of an AT, this is not always the case at the secondary level. Therefore, our recommendation is not to have

the coach provide care, but they should be armed with the appropriate knowledge in order to help act accordingly to prevent sudden death or at minimum implement an emergency care plan.

Activity modification strategies

The NASPE national standards for sport coaches consist of 8 specific domains: philosophy and ethics, safety and injury prevention, physical conditioning, growth and development, teaching and communication, sport skills and tactics, organization and administration, and evaluation.²⁶ Safety and injury prevention is a domain that needs to be emphasized but may often be overshadowed by the other standards. Expectations within this domain include having knowledge about predisposing conditions that increase the risk of injury as well as practice and activity modification and recognition of potentially limiting conditions or factors that can predispose an athlete to injury.²⁶ Environmental conditions definitely play a major role in sudden death in sport and can fall within this coaching benchmark. Heat, humidity, and lightning are the major extreme conditions that can increase the risk of sudden death and that is evident by the rules and regulations in place regarding those conditions. Our participants did appear knowledgeable regarding these factors, but lightning was the only condition that appeared to dictate cancellation of a practice or game. Game and practice modifications, conversely were made by coaches when extreme heat was involved, but rarely did they mention not practicing in those same conditions as with lightning.

Modifying activities when extreme environmental conditions are present is necessary for preventing sudden death in sport and an important responsibility of the coach in protecting the well being of their student-athletes. Our coaches were very

knowledgeable about several activity modifications related to the prevention of EHS, which included equipment removal, intensity of conditioning sessions, and timing of practices.

Helmets, protective pads, gloves, and clothing trap heat and reduce heat dissipation. Exercise produces heat metabolically which raises the core body temperature. Practicing in full pads in extreme temperatures greatly increases the risk of EHS because of the body's inability to disperse the excess heat that is being made.⁷ The American College of Sports Medicine⁷ has divided the types of equipment to be worn during different conditions into 3 categories: S (shirts, shorts, socks, and sneakers), P (helmet, undershirt, shoulder pads, jersey, shorts) and F (full game uniform). The effect of football uniforms on heat tolerance and time to exhaustion was documented in a study by Armstrong.²⁷ This study showed that more equipment worn resulted in increased physiologic strain on the body, resulting in shorter time to exhaustion.²⁷ Decreasing equipment worn in hot-humid environments not only protects the players, but also increases performance.

High-intensity exercise in hot-humid conditions poses the greatest risk for EHS.^{6,7} It is the coach's responsibility to know that the hot-humid conditions can pose a greater risk for EHS and it is their job to adjust the practice plan accordingly. Athletes are typically fearful of withdrawing from practice voluntarily so it is the responsibility of the coaches to remove a player if they notice any struggling.²⁷

Moving practice to cooler parts of the day, such as early mornings and later in the evenings, has become a much more common practice lately. These parts of the day tend to have lower temperature and humidity, two key factors of EHS. These times also have a

decreased amount of radiant heat coming from the sun, which lowers the strain on the players.⁶

One important strategy, not completely discussed, but important in the prevention of EHS is heat acclimatization. According to a consensus statement by the NATA,⁸ a 14-day heat acclimatization plan should be implemented in order to increase exercise heat tolerance and enhance the ability to exercise safely in warm and hot conditions.⁸ This plan consists of many different recommendations for preventing exertional heat illness such as: single session practices for the first 5 days of the season, limiting each session to 3 hours, progressing from helmets to shoulder pads to full pads, following a double session day with a single session day, and providing at least 3 hours of rest in between sessions on double session days.⁸ Coaches should be aware of this policy and follow the recommendations outlined as a means to increase a player's safety when practicing in the heat.

However, there are also many nonenvironmental risk factors that need to be accounted for when planning activity. These factors include dehydration, barriers to evaporation (i.e. equipment), current illness, history of previous heat illness, medications, poor physical conditioning and acclimatization, and overzealousness.⁶ Coaches need to be aware of the fact that players might not always be feeling 100% prior to practice, due to poor nutrition or illness, and pay close attention to anyone that might be performing at a lower level than normal or acting out of character.

Education of players, parents, and staff can be very beneficial. Everyone involved should know the signs and symptoms of various sudden death conditions and ways of preventing them. Educational courses about proper nutrition, hydration, nutritional

supplements and rest can not only help protect the athletes but also increase their overall performance. Also, having a qualified medical professional present for practices and competition, such as an AT, assures that appropriate measures are taken for any medical emergency.

Positive coach/athletic trainer relationships

Supporting previous literature regarding the relationship between coaches and athletic trainers, our results demonstrate a positive, professional one.²⁸ These findings help endorse the recommendations made by the NATA and AMA regarding employment of a full-time athletic trainer at the secondary school level.^{14,23} Schools that employ a full-time AT are ensuring optimal care for their student-athletes, and those who do not are leaving the care of the student-athlete to an untrained coach, who lacks the skills necessary to fully care for the injured athlete. Moreover, coaches often return an athlete to play, based upon emotion and desire to win, and potentially overlook the seriousness of the condition.²⁹ It is also presumptuous and potentially negligent to expect a coach to be adequately prepared to manage an emergency situation with only basic first aid and CPR training, when athletic trainers spend at minimum three years in educational preparation to handle life-threatening situations.

The favorable relationship between the coach and athletic trainer was facilitated by a mutual respect and understanding of the roles of each member. It is important for the AT to effectively communicate expectations, emergency planning, and philosophies regarding care, while the coach needs to do the same regarding practice planning and skill performance.¹⁹ By each party respecting decisions made within each professional role, the student-athlete will benefit greatly. Additionally, the coach also appreciates the

AT because it enables them to focus on their job as a coach rather than having to potentially provide medical care to an athlete in distress. Coaches also appreciate the “safety-net” that the AT provides, as it was obvious that having an athletic trainer on-site enhanced the confidence of the coaches in their medical skills; plausible because they did not feel as though they were the lone responder.

Limitations

The coaches that participated in this study were chosen based on availability as well as willingness to participate, therefore the data might not represent the knowledge and practices of all coaches. Our sample population, particularly for a qualitative study, was large and data redundancy was used as a guide for participation recruitment and cessation helping to establish credibility in the findings. Although we attempted to recruit an even number of coaches between the north and south, only 18 different states were represented, which could neglect the attitudes and strategies used by coaches in the states not involved in this study. Also, majority of the coaches studied have an AT employed at their school which makes it difficult to understand the feelings of those coaches that do not have an AT. The role the AT can play on a coach’s knowledge and ease regarding emergency care is mixed, therefore more information is necessary to truly evaluate the relationship between the two. The utilization of online interviewing has its own limitations including some questions being unclear to the coaches and some coaches not being as detailed in answers as they would have been with interviews as follow-up questions would have been plausible. The study was piloted prior to data collection and the interview questions were evaluated for clarity, therefore the researchers are confident in the results yielded.

Future Research

This study has laid the foundation for future studies, especially those on a larger scale that incorporates both survey questionnaires and follow-up interviews either by phone or in-person. Future investigations must also include the views of those coaches who do not have the services of an AT. Although the coach is an important partner in the sports medicine team, the Athletic Director also can help facilitate the inclusion of an AT at the secondary school setting; therefore their thoughts and opinions on sudden death and having AT are warranted. The findings from this study are only from the perspective of the coach, so future studies may interview the AT to determine their perspectives on coaches' preparedness to prevent sudden death in sport.

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Appendix A

Recruitment Email to Head Football Coaches

Hello, you are invited to participate in a research study looking at sudden death in the secondary school setting. This study is being conducted by William Adams and Benjamin McGrath as part of their thesis requirement at the University of Connecticut. Stephanie Mazerolle and Douglas Casa serve as academic and research advisors for this study.

The purpose of this study is threefold: to discover what Secondary School coaches feel is the role of the athletic trainer as it pertains to the prevention of sudden death in sport, to discover the level of understanding of the secondary school coach regarding prevention, recognition and treatment of sudden death in sport, and what influence does region (north vs. south) play in the support of an Athletic Trainer and understanding of their role in preventing sudden death. Understanding current beliefs of secondary school coaches in relation to sudden death in sport and the role of the Athletic Trainer may help advocate for Athletic Trainers in the secondary school setting and help reduce the number of deaths seen in this setting.

This study will involve an online survey using the survey hosting website Zoomerang. You will be provided a direct link to the survey via email if you are interested in completing the survey. The survey will include both open ended questions and demographic questions. The open ended questions will require a typed response and will vary in length depending upon your experience to the question asked. The demographic questions will be focused on your coaching experience and experience with an Athletic Trainer (if applicable).

The online survey can be reached by clicking on the link below:

<http://www.zoomerang.com/Survey/WEB22C3AMHVU5S/>

Participation is confidential and optional. Pseudonyms will be used in place of names, and there will be no link to your current/former institution(s). If you would like to participate, or if you have questions about this study, you may contact me at william.adams@uconn.edu or benjamin.mcgrath@uconn.edu or stephanie.mazerolle@uconn.edu, 860-486-4536. This research study was approved by the UCONN IRB, Protocol #H10-310.

Thank you for your consideration. Please contact me at your earliest convenience if you are interested in participating.

Sincerely,
William Adams, BS, ATC
Benjamin McGrath, BS, ATC
Stephanie Mazerolle, PhD, ATC

Appendix B Interview Guide

1. Do you feel qualified and prepared to handle an emergency situation such as exertional heat stroke or cardiac arrest? a. Do you feel you should gain training in emergency care procedures?
2. What strategies, if any, do you implement into your practices to prevent exertional heat stroke? a. Does your school have an emergency action plan spelling out what to do in the case of an athlete suffering from exertional heat stroke or other emergency situations?
3. There has been a lot of attention placed upon the role of the coach, especially following the case of Max Gilpin (KY), do you believe the coach has a role in preventing sudden death in sport? (what is your opinion of the case, if you are aware of it?) a. How realistic do you feel a case of sudden death is for your team?
4. What environmental conditions would lead you to alter practice and/or games? a. Please explain how you would alter your schedule in accordance with the environmental conditions you just listed b. Are there any environmental conditions that are cause for concern in the state in which you coach? If so, please explain how you prepare for the possible issues that can arise because of the conditions
5. Have you ever had a case of an athlete suffering from exertional heatstroke? If so, please describe the situation. a. What signs did you notice? Did you have an Athletic Trainer Present? b. What was the course of treatment?
6. Have you had any experience with a case of sudden death or an emergency situation (spineboarding, concussion, etc.)? a. Please describe the situation and the course of treatment
7. Please describe your previous experiences with having an Athletic Trainer on staff a. What role do you believe that an Athletic Trainer plays in healthcare and high school athletics?
8. Are you in support of having an Athletic Trainer available during practices and games at your high school? Please explain a. What is your rationale for having or not having an Athletic Trainer onsite? b. What do you believe the Athletic Trainer is qualified to do for athletes?
9. What do you believe is the extent of knowledge that an Athletic Trainer has and the extent to their practical skills in dealing with an emergency situation?
10. What barriers do you perceive as the reason for a lack of Athletic Trainers employed at the secondary school level? What would you think is the biggest reason why

secondary schools do not hire and Athletic Trainer? a. If you have an Athletic Trainer at your school: Why do you think other schools are not following along with hiring Athletic Trainers to provide medical care for the school's athletes? b. If you do NOT have an Athletic Trainer at your school: What reasons exist for not hiring an Athletic Trainer at your school? Who makes the ultimate decision as to whether or not an Athletic Trainer is hired at the school?

11. Gender?

12. Age?

13. How long have you been coaching football?

14. How long have you been a head coach?

15. What state are you currently working in?

16. Indicate your highest level of education.

17. How long have you been employed at your current school?

18. Who provides medical coverage for your practices and games? If you have an Athletic Trainer, please respond to the next two questions.

Full-time Athletic Trainer

Part-time Athletic Trainer

Emergency Personnel Service (EMT/EMS)

Nurse

No medical coverage is provided

Other, please specify

19. Does the Athletic Trainer attend all practices and competitions?

20. Is the Athletic Trainer involved in pre-season practice scheduling?

21. Are you aware of the National Athletic Trainers' Association (NATA) statement on "Preseason Heat Acclimatization Guidelines for Secondary School Athletes?" If yes, please answer the next question

22. Have you read NATA's statement on "Preseason Heat Acclimatization Guidelines for Secondary School Athletes?"

23. Are you aware of the NATA's position on medical coverage and the Secondary School?

24. Have you read the NATA's position statement on medical coverage in the Secondary School?

25. How would you describe your professional relationship with your Athletic Trainer? If you do not have an athletic trainer, please skip to the next question

Not Cooperative
1 2 3 4 5 6 7 8 9 10
Very Cooperative

26. How would you describe your professional relationship with your Athletic Trainer? If you do not have an athletic trainer, please skip to the next question

Not Professional
1 2 3 4 5 6 7 8 9 10
Very Professional

27. How would you describe your professional relationship with your Athletic Trainer? If you do not have an athletic trainer, please skip to the next question

Not Helpful
1 2 3 4 5 6 7 8 9 10
Very Helpful

28. How would you describe your professional relationship with your Athletic Trainer? If you do not have an athletic trainer, please skip to the next question

Not Honest
1 2 3 4 5 6 7 8 9 10
Very Honest

29. How would you describe your professional relationship with your Athletic Trainer? If you do not have an athletic trainer, please skip to the next question

Not Respectful
Respectful
1 2 3 4 5 6 7 8 9 10
Very

30. How would you describe your professional relationship with your Athletic Trainer? If you do not have an athletic trainer, please skip to the next question

Not Informative
Informative
1 2 3 4 5 6 7 8 9 10
Very

31. How would you describe your professional relationship with your Athletic Trainer? If you do not have an athletic trainer, please skip to the next question

No Communication
1 2 3 4 5 6 7 8 9 10
No Problems Communicating

32. What do you feel is the most important aspect of recognizing an exertional heat stroke? Please circle the symptoms listed below that you believe are most important when recognizing exertional heat stroke

Sweating

Redness

Cramping

Dizziness

Nausea

Vomiting

Weakness

Central nervous system dysfunction

Fever

Not sweating

Hot skin

33. Why did you choose those symptoms?

34. Have you ever had an athlete suffer from exertional heat stroke?

35. If yes, how did you recognize it and what did you do for it?

36. Is heat stroke discussed in your school's athletic department policy and procedures manual?

37. If so, what is your school's policy on heat stroke?

38. Have you been given hands-on practice to utilize the skills in treating/assessing an exertional heat stroke victim?

39. Rank the top 5, reasons for sudden death.

Cardiac

Cervical Spine

Exertional Heat Stroke

Exertional Sickling

Hyponatremia

40. Please feel free to add any comments below:

