CHAPTER

1

Developing Safety Policies for Organized Sports

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Introduction

The goal of every high school administrator, coach, and sports medicine team is to facilitate their athletes' safe and injury-free participation in sports. Sports provide an opportunity to experience competition, teamwork, success and adversity, and most importantly, athletes develop a framework for future successes as they move into adulthood. Many of the life lessons learned in sports are building blocks for successful careers and the development of lifetime sports achievements.

It has been reported that approximately 42%[1] of interscholastic programs have access to an athletic trainer. More recent data suggest that this number has risen in the last 10 years to closer to 70%. Athletic trainers are essential healthcare professionals who provide a safe playing environment, evaluate injuries, implement rehabilitation programs for the return to activity following injury, and lastly, provide expertise in developing policies and procedures for safe sports participation.

Trends in Policy Development

There are several medical conditions that lead to death, disability, or permanent injury. It is important to be aware of them in today's environment and litigious society. Many of these conditions are preventable with proper rules and regulations that are designed to prevent injury or at least mitigate the risk of these injuries. Among others, these medical conditions include:

- Heat stroke
- Brain trauma and concussion
- Sickle cell trait
- Heart abnormalities

This text will describe each of these conditions in much greater detail with criteria for the cause, treatment, return to play, and prevention considerations. The purpose of this chapter is to describe how various interest groups can work together to develop policies to reduce the risk of injury and allow for safe athletic participation.

Using a Data-Based Approach

catastrophic injury A sudden death or disability in which there is life-altering physical or mental impairment, or both.

With sports participation, there is an inherent risk of injury. Over the past several years, there has been an increased emphasis on collecting data to mitigate risk, to reduce severe or **catastrophic injuries**, and to develop injury/illness prevention programs based on empirical data. This is clearly evidenced by some of the recent rule changes regarding concussion and preseason acclimatization that used data as part of the policymaking process. When making policy decisions or changing rules, it is extremely important for decision makers to rely on data rather than casual observation or intuition about what they think is happening. VanMechelen[2] et al. suggested an excellent model for thinking about policy or rules changes for sports:

1. Describe the injury or condition related to the policy or condition.
2. Establish the etiology and injury mechanism based on the available data.
3. Identify preventive measures based on the injury data analysis.
4. Assess the effectiveness of the new policy and intervention program and make any revisions to the policy based on the data.

How to Develop a Policy

Once an injury has been identified or a question developed to prevent an injury, a comprehensive team approach to finding a solution that decreases the incidence of the injury should be implemented. First, all parties and stakeholders who have an interest in the process and could provide input must be identified from the outset. This will allow all parties to have a voice in the development of the policy rather than coming in at a later point in the process. This will prevent rehashing and delays caused by bringing other parties up to speed while the larger group has been moving together in developing the solution.

All concerned groups should be involved in data analysis and identifying potential solutions to an injury. This should be done in a way that is not laden with statistical jargon but rather identifies trends and patterns for the injury while honoring those findings that are statistically and practically significant. For example, the Georgia High School Heat Illness project discovered there was an increased trend in the first week for exertional heat stroke (EHS) cases when practices lasted longer than 2 hours. For those practices that went beyond 2 hours, the injury rate increased 4.8 times. However, in the second week, participants demonstrated a 30-minute **acclimation** time and the injury rate did not increase until 2.5 hours of practice. Using these data, a policy was implemented to limit practice to 2 hours for the first week, then increasing the practice time for the second week onward during the preseason period, up to a maximum of 3 hours.

acclimation Adaptive changes that occur in response to experimentally induced changes in particular climatic factors. Used most often in research studies to refer to the artificial process of acclimatization that is induced via climate-controlled chambers.

Once trends and patterns are identified in the data, all parties must be involved in developing a subsequent rule change or modification. The change should take a commonsense approach that does not drastically alter the sport, but rather provides the safest playing environment possible with rules in place to mitigate risk. All aspects of the existing and proposed rules should be discussed in detail to identify the intended and unintended consequences. Many times when new rules are implemented, there are unanticipated effects that were not considered when they were being developed. New rules should be vetted by as many people and professionals as possible, discussing the implications of the rule change and how it may be interpreted and implemented by those who were not involved in deciding on the change but who now have to apply it.

Lastly, the governing structure of an organization should be adhered to during policy change. All members of the governing body should have a voice in policy development and implementation. This will facilitate "buy-in" to the policy and allow affected parties to voice concern or identify potential areas of concern. Further, a rule change should be made publically available for comment within the important committees, such as the state athletic association or state medical advisory committee, for review and comment.

Examples of Rule Changes

As mentioned previously, providing a safe sports environment is a common goal as demonstrated by recent publications on heat[3]. However, many of today's injury prevention policies are not based on data, but rather on observation, educated guesses, and common sense. For example, face shields were introduced to girls lacrosse to reduce eye injuries. Although there were limited data to support that the number of eye injuries were increasing because of lack of protective equipment or that such injuries were resulting in permanent injury, a decision was made to require the equipment. This was a commonsense approach to prevent injury; the simple piece of equipment did not have an effect on how the sport was played or any of the historical contexts of that sport. This has not been the case with soccer. Some have suggested that a headband be worn to prevent concussion and head injuries. Again, there were no data to support or refute the claim. However, in this case it was clear from the pathomechanics of concussion that a headband would not prevent a concussion, and thus wearing this piece of equipment during participation did not become a requirement.

The sport of football has been proactive in trying to reduce injuries for years by changing rules and modifying techniques at all levels (National Football League [NFL], National Collegiate Athletic Association [NCAA], and National Federation of State High School Associations [NFHS]). However, the NCAA data suggest that while there has been improvement in sports techniques and coaching and training of athletes, the injury rate for games has remained relatively flat for the past 20 years. Unless the fundamentals of the sport are changed (e.g., blocking, tackling, etc.), the injury rates will not change significantly.[4]

Nonetheless, there have been several rule changes that have had a positive impact on reducing the number of injuries. Recently, the NFL moved the kickoff 5 yards closer to the 35 yard line and only allowed a 5-yard run up, which has reduced the number of collisions and thus reduced the number of concussions. The NCAA enacted modifications for the preseason football **acclimatization** period in 2003 by setting regulations for the duration and frequency of practice. This has reduced the number of heat-related illnesses. These are just two examples of recent changes that have been utilized to reduce injury.

acclimatization A complex of adaptive responses that demonstrate improved homeostatic balance in multiple organs; usually requires 10 to 14 days for responses to develop adequately. The body can acclimatize (to varying degrees) to hot, cold, high altitude, and underwater environments.

Education About Rule Changes

Once a rule change or modification has been made, a comprehensive approach to educating coaches must be developed and implemented. The education should use as many forms of media as possible to educate those involved about the change. Some obvious educational formats include use of the Internet for webinar and educational materials. There are numerous successful examples, such as the Centers for Disease Control and Prevention's (CDC) approach to education on concussion. The CDC has developed numerous materials geared to different audiences such as coaches, parents, student-athletes, and medical personnel. Similarly, the NFHS developed a webinar for the prevention, recognition, and treatment of heat illnesses.

For rule changes or modifications that are technique based, a video can be used to demonstrate proper and improved techniques. This was particularly important for the spearing mechanism in tackling. When the head is bent (flexion) about 15–20 degrees, the spine is placed in a segmented column or an axial loaded position. The National Athletic Trainers' Association (NATA) created a video that showed a reenactment of the spine and the forces that crush the spinal column when it is in an axial loaded position. This demonstration showed in a clear and concise format the position of the forces and how the cervical spine (C-spine) buckles under those forces. NATA also used a drinking straw to illustrate the effect of force on the C-spine. When force is applied to both ends of the straw, the straw breaks or bends at the midpoint of the forces, which is the same as the C-spine.

Protecting the health and safety of athletes has become a major focus at all levels of sports. While professional associations such as the NFL and the NCAA have made great strides in implementing policy changes to protect the health and safety of their athletes, policies protecting high school student-athletes are still in their infancy. In regard to concussion management, states have done a good job passing legislation to protect young student-athletes, but for injuries such as heat illness, state high school associations are just now beginning to make policies to help prevent these injuries from occurring. Implementing

health and safety policies at the high school level requires each state's high school athletic association to adopt health and safety policies because the NFHS has no power to mandate policy changes nationwide. The following section of this chapter outlines 10 policy initiatives that high schools and state high school athletic associations should adopt to further protect their student-athletes. Many of these ideas or initiatives are discussed in greater detail or reinforced in later chapters.

Ten policy Initiatives to Be Considered in Organized Sport

First Initiative

High schools and state high school athletics associations should adopt the 2009 *NATA Heat Acclimatization Guidelines for Preseason Practices.*

Components

One of the most effective ways to prevent EHS is to implement appropriate heat acclimatization guidelines for preseason practices, particularly in August. Heat acclimatization is the physiologic adaptation to exercise in the heat that occurs over a period of 10 to 14 days, which ultimately results in adaptations that improve an athlete's ability to cope with heat stress. During exercise in the heat, internal body temperature rises and is affected by the following six factors:

- Intensity/duration of exercise
- Hydration level of athletes
- Protective equipment worn
- Fitness level of the athlete
- Environmental conditions
- Individual differences (weight/body fat, medications, illness)

Heat acclimatization guidelines gradually phase in an increase in exercise intensity/duration and the use of protective equipment in sports such as football over a period of about 14 days. **Table 1.1** depicts

TABLE 1.1 National Athletic Trainers' Association's Preseason Heat Acclimatization Guidelines for Secondary School Athletics[3]

Area of Practice Modification	Practice Days 1–5		Practice Days 6–14
	Days 1–2	Days 3–5	
Number of practices permitted per day	1		2, only every other day (1 all other days)
Equipment (if applicable)	Helmets only	Helmets and shoulder pads	Full equipment
Maximum duration of single practice session	3 hours*		3 hours (a total maximum of 5 hours on double session days)
Permitted walkthrough time	1 hour (but must be separated from practice for 3 continuous hours)		
Contact	No contact	Contact only with blocking sleds/dummies	Full, 100% live contact drills

*Based on data gathered by Ferrara and Casa, the risk of heat illness increased after the 2-hour mark during the first five days of practice, so limiting practice to 2 hours during the first five days may increase player safety (Personal Communication: Douglas J. Casa, PhD, ATC, August 2013).

the components of an appropriate heat acclimatization protocol recommended for secondary school student athletes.[3]

Successes

In 2003, the NCAA mandated that every school follow specific heat acclimatization guidelines for preseason practice in response to a series of EHS deaths that occurred in the years prior. Since 2003, there has been only one EHS-related death during an August practice at the NCAA level. In 2009, NATA published a similar document, closely following the NCAA guidelines but specific to secondary school student-athletes. These guidelines, although recommended by NFHS, are not mandatory at the secondary school level nationwide. In order for secondary schools to mandate the use of appropriate heat acclimatization guidelines, each state's high school athletic association must adopt these guidelines and mandate their use. Since 2011, 11 states (see **Figure 1.1**) have adopted heat acclimatization guidelines that meet the recommendations made by both the NATA and NFHS. The state of Georgia for example, mandated heat acclimatization guidelines that are taken word-for-word from the NATA recommendations. Georgia also added requirements in coaching education for first aid and CPR, as well as training on specific emergency conditions likely in sport.

In addition, the states of Illinois, Pennsylvania, and South Carolina have passed heat acclimatization guidelines at the secondary school setting. Although these four states have made improvements and have passed heat acclimatization guidelines, they do not fully meet the recommendations previously published.[3] In order to protect the health and safety of secondary school athletes as they relate to the prevention of EHS, all states must mandate the use of appropriate heat acclimatization guidelines.

wet bulb globe temperature (WBGT) The most widely used heat stress index in industry and sports; may be used to assess the severity of hot environments. It is derived from a formula that incorporates the dry bulb, wet bulb, and black globe temperature.

Second Initiative

Adopt policies that promote the creation and use of environmental monitoring measures (such as wet-bulb globe temperature) for practice and game modifications or cancellations.

Components

Wet bulb globe temperature (WBGT) is an environmental measure that is used to calculate the heat stress index. WBGT is used in athletic, military, and industrial settings to control the

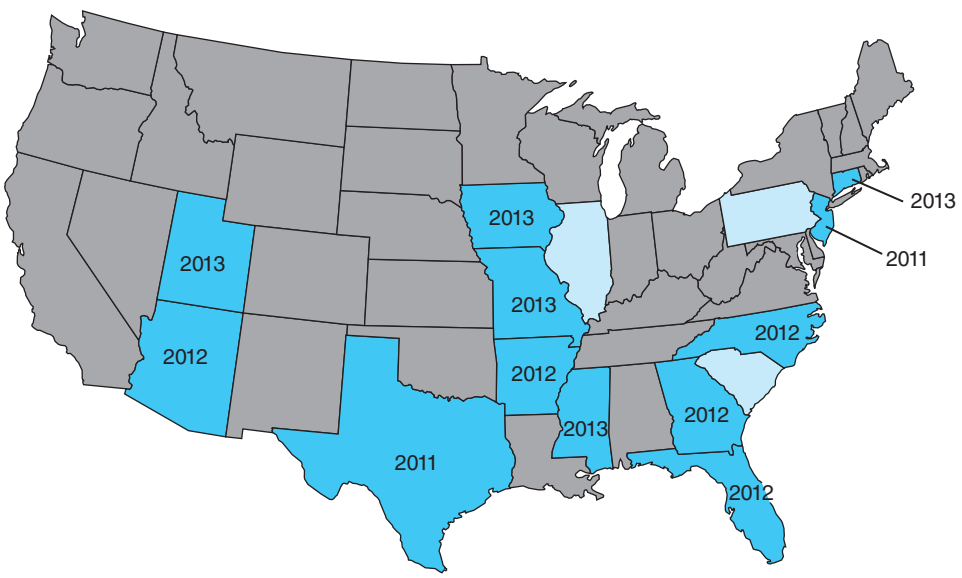

Figure 1.1 The states in dark green depict states that have passed heat acclimatization guidelines to meet the minimum standard set in place by the National Athletic Trainers' Association. The states in light green show the states that have passed improved heat acclimatization guidelines, although insufficient from the 2009 guidelines. The states colored in gray have insufficient heat acclimatization guidelines.

Data from Korey Stringer Institute. Heat Acclimatization Guidelines by State. 2013. Available at: http://ksi.uconn.edu/prevention-strategies/high-school-state-policies/heat-acclimatization-state-policies/. Accessed September 28, 2013.

number of heat casualties and to set limits for physical exertion in the heat. Temperature, humidity, wind, and solar radiation are taken into account when calculating the particular WBGT value.[3]

The risk of EHS increases when factors such as temperature, humidity, or heavy protective equipment are present during exercise.[5] The incidence of EHS can be reduced by establishing activity modification and rest break guidelines for exercise in the heat according to environmental measures, such as WBGT. The essential components of implementing effective environmental monitoring policies include:

- State athletic associations should require all schools to have a heat modification policy that is based on WBGT measures.
- The WBGT temperature guidelines should be based on epidemiologic data specific to the state/region (e.g., the temperature guidelines for New England may be different than those needed in the Southeast).
- The heat policy should have at least a four-step progression of modifications dependent on environmental conditions (ranging from no modifications to cancellation of practice/games).
- The heat policy should include modifications of equipment (if applicable to the sport), work-to-rest ratios, total practice time, number of water breaks, and mention the use of shaded areas for rest breaks.

These guidelines should be detailed in each state's athletics handbook so they are strictly enforced. **Table 1.2** outlines the WBGT guidelines established by the Georgia High School Association that every secondary school in the state of Georgia must follow for practices and games at the secondary school setting.

Successes

As mentioned, the state of Georgia has been successful in incorporating WBGT guidelines into its policies for secondary school. All secondary schools are required to monitor environmental conditions during practices and make any necessary activity modifications to protect the health and safety of the student-athletes. WBGT guidelines have also been used successfully to monitor environmental conditions in the military and industrial settings. The military has been using WBGT for a number of years to protect soldiers against the risk of EHS. Industrial settings such as steel mills also use environmental monitoring measures such as WBGT to protect workers against the extreme conditions in which they are required to work.

TABLE 1.2 WBGT Guidelines Established by the Georgia State High School Association

WBGT Reading(°F)	Activity Guidelines and Rest Break Guidelines
Under 82.0	Normal activities: provide at least three separate rest breaks each hour lasting a minimum of 3 minutes each during a workout
82.0–86.9	Use discretion for intense or prolonged exercise; watch at-risk players carefully; provide at least three separate rest breaks each hour lasting a minimum of 4 minutes each
87.0–89.9	Maximum practice time is 2 hours. For football: players restricted to helmet, shoulder pads, and shorts during practice. All protective equipment must be removed for conditioning activities. For all sports: provide at least four separate rest breaks each hour lasting a minimum of 4 minutes each
90.0–92.0	Maximum length of practice is 1 hour, no protective equipment may be worn during practice, and there may be no conditioning activities. There must be 20 minutes of rest breaks provided during the hour of practice
Over 92.1	No outdoor workouts; cancel exercise; delay practices until a cooler WBGT reading occurs

Source: Data from Georgia High School Association. GHSA Constitution and By-Laws for 2013-2014. 2013. Available at: http://www.ghsa.net/sites/default/files/documents/Constitution/Constitution2013-14Complete.pdf. Accessed September 28, 2013.

Third Initiative

Adopt policies that promote the creation and maintenance of optimal emergency action plans that cover all potential emergency scenarios.

Components

emergency action plan (EAP) A written document that defines the standard of care for the management of emergencies in athletics.

In order to appropriately and adequately respond to emergency situations such as natural disasters or serious illnesses and injuries, it is essential that an **emergency action plan (EAP)** be in place. The purpose of an EAP is to reduce the incidence of catastrophic injuries and sudden death during sports. An EAP should be a written, site-specific document that ensures that medical personnel have access to a venue in the event of a catastrophic injury occurring.[6] The components of what should be included in an EAP to allow for a prompt response to an emergency situation are shown in **Table 1.3**. The people involved in the development of these policies should include the on-site medical staff (e.g., the athletic trainer), local emergency medical services (EMS), school safety officials, coaches, on-site first responders, and school administrators.

Successes

Some states have taken action to require EAPs for all secondary school athletic departments. Twelve of the 50 states require secondary schools to have an EAP for their athletics programs (see **Table 1.4**). Arkansas, for example, passed legislation in 2011 requiring that every public secondary school develop and implement an EAP relevant for its athletics program.[7] This is the first state in the United States to pass legislation requiring the use of a written EAP to help protect the health and safety of its student-athletes. It is imperative that every state's athletics association mandates its member schools develop and implement a school-specific EAP in the event of a catastrophic sports-related injury.

Fourth Initiative

Adopt policies that promote hiring on-site medical care, such as athletic trainers, who are trained in the prevention, diagnosis, and treatment of emergency medical conditions.

Components

Athletic trainers are licensed medical professionals who specialize in the recognition, assessment, prevention, and treatment of sports-related injuries. They also have the knowledge to prevent, recognize,

TABLE 1.3 Components of an EAP

- Every school or organization that sponsors an athletic program should develop an EAP for managing serious and/or life-threatening injuries.
- Schools should have a written EAP document that is distributed to all staff members.
- The EAP should be specific to each venue and include maps and/or directions for access to the venue.
- On-site equipment that may be needed in an emergency situation should be listed in the written EAP.
- The EAP should identify personnel and their responsibilities for carrying out the plan of action with a designated chain of command.
- Facility address, location, contact information (for both the school and EMS), etc. should be identified in the EAP.
- The EAP should specify actions that need to be taken after an emergency.
- The EAP should be reviewed and rehearsed annually by all parties involved.
- Healthcare professionals who will provide medical coverage during games, practices, or other events should be included in the EAP.

TABLE 1.4 States Requiring Secondary Schools to Have an EAP for Their Athletics Program

- Arkansas
- California
- Colorado
- Georgia
- Kentucky
- Maryland
- Massachusetts
- New Hampshire
- New Jersey
- North Carolina
- Ohio
- Virginia

diagnose, and treat life-threatening emergency situations in sports to reduce the incidence of sudden death. It is essential to have appropriate medical staff at all school-sanctioned athletics events to ensure the safety of young athletes. Policies to promote the hiring of on-site medical care workers who are trained in the diagnosis and treatment of emergency medical conditions should contain the following components:

- All schools that sponsor a sanctioned athletics program should hire appropriate on-site medical care for its student athletes. Hiring an athletic trainer is recommended, because they are trained in the prevention, recognition, assessment, and treatment of sports-related injuries (including life-threatening injuries).
- The hired on-site medical care should be in charge of the development and implementation of the school's EAP and the policies and procedures to follow in the event of an emergency situation occurring during participation in sports.
- On-site medical care should be available for all sanctioned practices and games, and coverage decisions should be based on scientific evidence related to sports with the highest incidence of catastrophic events.
- The on-site medical care should collaborate with a state licensed sports medicine trained physician (medical doctor or osteopath).

Successes

Access to on-site medical care, especially at the secondary school setting, has increased over the past decade. Previous research has shown that approximately 42% of secondary schools employ an athletic trainer for their athletics program.[1] More recent data, by a study to be published by Korey Stringer Institute in 2014, puts the number of all secondary schools that have access to an athletic trainer for their athletics program closer to 70%. This represents a huge improvement. As secondary schools continue to recognize the value of and need for appropriate medical staff on site for school-sponsored athletics programs, the number of athletes that have access to medical care will continue to increase.

Recently, numerous medical organizations endorsed a report titled "The Inter-Association Task Force for Preventing Sudden Death in Secondary School Athletics Programs: Best-Practices Recommendations." This document covers how to prevent sudden death in sports, including having appropriate medical staff

and an athletic trainer employed at secondary schools. This document clearly identifies the roles and responsibilities that the athletic trainer should have in the secondary school setting in regard to handling emergency situations.[8]

Fifth Initiative

Adopt policies that implement standards for coaching education, continuing education, and certification in first aid, cardiopulmonary resuscitation (CPR), and recognition of emergency conditions.

Components

Roughly 70% of high school student-athletes have access to appropriate medical care during participation in high school sports. Because this leaves ~30% of high school student-athletes without access to appropriate medical care, it is imperative that coaches are required to undergo regular continuing education focused on the health and safety of athletes. Educating coaches on signs and symptoms of emergency situations, such as EHS or traumatic brain injury, is pertinent to the athlete's survival in life-and-death situations. Policies that require coaches to obtain continuing education for emergency and medical conditions should encompass the following components:

- Should require all coaches on staff to be CPR/AED and first aid certified
- Should require all coaches to attend annual continuing education courses focused on emergency and medical conditions in sports
- Continuing education courses should focus on the prevention, identification, and treatment of causes of sudden death in sports

Successes

Currently, 37 of the states in the United States require coaches to obtain at least first aid certification. Of those 37 states, 18 require coaches to obtain both first aid and CPR/ **automated external defibrillator (AED)** certification in order to coach at the high school level.[9] In light of recent changes in legislation related to concussions, some states require coaches to undergo regular education on concussion.[10] The state of Connecticut, for example, requires all coaches to undergo an initial training session prior to receiving coaching certification on signs and symptoms of concussion and protocols they must follow if they suspect one of their athletes has sustained a concussion. Once they have their coaching certification, coaches must undergo a yearly refresher course on concussion management in order to maintain their coaching credential.[11] State high school athletics associations need to continue to implement coaching education standards as they relate to emergency and medical conditions to ensure proper safety of student-athletes.

automated external defibrillator (AED) A computerized device that analyzes the heart rhythm, determines whether a shock is needed to restart a normal rhythm, charges to an appropriate shock dose, shocks a patient's heart, and uses audio and visual instructions to guide the rescuer.

Sixth Initiative

Adopt policies for the creation and implementation of supervision policies and exercise acclimatization policies, specifically for strength and conditioning sessions.

Components

Strength and conditioning sessions, especially at the collegiate level, have become a cause for concern in relation to the health and safety of the participating student-athletes. Since 2000, at the NCAA level, 21 collegiate football players have died during strength and conditioning sessions. The top three causes of death of these athletes were sickle cell trait, EHS, and cardiac arrest. The issues surrounding these deaths were implementing exercise programs that were novel or too intense too soon, using exercise as punishment, and not having appropriate medical coverage during these sessions. Implementing policies that focus on supervision and exercise acclimatization during strength and conditioning sessions will assist in reducing the risk of sudden death during these activities. **Table 1.5** outlines the key points for promoting the health and safety of athletes during strength and conditioning sessions.

TABLE 1.5 Components for Best Practices During Strength and Conditioning Sessions

- Acclimatize progressively by phasing in exercise gradually (in terms of volume and intensity)
- Introduce new conditioning activities gradually
- Do not use exercise and conditioning activities as punishment
- Ensure proper education, experience, and credentialing of strength and conditioning coaches
- Provide appropriate medical coverage
- Develop and practice EAPs
- Be cognizant of medical conditions
- Administer strength and conditioning programs
- Partner with recognized professional organizations
- Provide adequate continuing education for the entire coaching and medical team

Successes

In 2012, "The Inter-Association Task Force for Preventing Sudden Death in Collegiate Conditioning Sessions: Best Practices Recommendations," which is endorsed by numerous medical organizations, was published by the NATA. It outlines specific ways to reduce the incidence of sudden death during strength and conditioning sessions at the collegiate level.[12] In addition to this document, the NATA document regarding preventing sudden death in the secondary school setting also outlines how sudden death can be prevented during strength and conditioning sessions using recommended best practices.[8] These documents are instrumental in providing athletics programs, in both collegiate and secondary school settings, the information needed to implement changes to strength and conditioning sessions to make them safer for athletes and reduce the risk of sudden death.

Seventh Initiative

Adopt policies promoting the installation of AEDs that can be accessed within 1 minute of any athletic venue.

Components

Sudden cardiac death is the leading cause of death in sports, especially in young athletes. In 78% of cases involving sudden cardiac death, the first symptom is death. An AED is a device that is used to deliver an electric shock in the event of a person collapsing from cardiac arrest. Research has shown that for every minute after collapse as a result of cardiac arrest without the application of an AED, the chance of survival decreases about 10%. Utilizing the following guidelines helps to ensure that proper care is used in the event of a cardiac arrest in terms of accessing an AED.

- AEDs are to be used under the advice and consent of a physician by individuals with proper training and certification.
- The AED should be kept in a safe place and should be easily accessible; all athletic trainers, coaches, administrators, school nurses, and physical education teachers should have access to an AED on school property and at all school-sanctioned athletic events/activities.
- Institutions sponsoring athletic events should have an AED on site or access to one at each athletic venue for practices, games, or other athletic events. Ideally, an AED should be accessible within 1 minute at every athletic venue.
- Individuals should be provided annual training and certification in CPR and AED use.

- The location of the AED should be well marked, publicized, and known among trained staff.
- The AED should be used only after activating the EMS system.
- AEDs should be inspected frequently to ensure proper working order (batteries charged, electrodes and wires are in good condition).

Successes

Implementing AEDs in public venues has become commonplace in today's society. Most public venues (e.g., airports, shopping malls, schools) have an AED on site for use in the event of an emergency. When looking specifically at secondary schools, almost all have an AED within their walls. In Arkansas, legislation was passed in 2009 to create AED and CPR programs in secondary schools. This requires schools to have an AED on site in the event of an emergency situation involving cardiac arrest.[13] In 2013, Arkansas passed Act 1016, which, starting in the 2014–2015 school year, will require all public school students to become trained in both CPR and AED use.[14]

It is important for schools that have an AED (or more than one) to make them accessible in the event of an emergency and to store them in a location that is central to athletics venues. For schools in which the athletics venues are not adjacent to one another or some venues are off campus, it is important to have an AED at each venue or close to multiple venues so that they can be accessed from any location within 1 minute. Having quick access to an AED increases the chance of survival in the event of a cardiac arrest.

Eighth Initiative

Adopt policies that promote the creation and use of preparticipation exams that utilize specific screening questions to target the top reasons why athletes die in sports.

Components

Preparticipation exams (PPEs) are an important screening tool to be administered prior to participation in sports. PPEs are used to identify underlying medical conditions that can be detrimental to the health of a participating athlete or put him or her at greater risk for an emergency medical event. It is imperative that PPEs contain specific screening questions that target the top reasons why athletes die in sports. These screening questions should be system specific (e.g., cardiovascular, central nervous system, pulmonary, general medical) and ask about previous history, existing medical conditions, family history, and signs/symptoms during exercise. In addition to screening questions, the PPE should also include a thorough physical examination in order to identify any present pathology that would warrant exclusion from participation. A team physician or a physician familiar with the demands and risks associated with sport should always perform PPEs.

preparticipation exams (PPEs) A formal requirement prior to participation in sports. PPEs must be conducted by a qualified health professional. They are usually performed once a year with the goal of identifying medical problems that may place an athlete at risk for injury or illness.

Successes

The NATA document addressing the prevention of sudden death in secondary school athletics programs recommends using best practices as they relate to the leading causes of death during sports. Along with recommending that all secondary schools have appropriate medical staff on site, NATA also recommends using minimum standards set forth by the American Academy of Family Pediatrics for cardiac screening (comprehensive personal history, family history, and physical examination) during the athlete's PPE. It is also recommended that the PPE includes obtaining the athlete's sickle cell trait status before allowing participation in sports.[8] Following recommendations such as these during an athlete's PPE is critical in reducing the risk of sudden death during sport.

Ninth Initiative

Adopt concussion and head injury policies that are in line with leading sports health organization recommendations.

Components

The CDC estimates that sports-related concussions affect 1.6 to 3.8 million athletes annually.[15] A concussion is a traumatic brain injury that, if not treated appropriately, can have long-lasting effects. Recent media attention about the severity of concussions and their relationship to chronic traumatic encephalopathy has raised awareness of this injury, especially in young athletes who may not have access to appropriate medical care at the time of injury. An appropriate concussion and head injury policy includes the following components:

- Preseason education should be provided for personnel, coaches, athletes, and parents on the basics of concussion (signs/symptoms, treatment, return to play, that helmets do not prevent concussions).
- High school athletes suspected of sustaining a concussion should not be permitted to return to a practice, game, or activity involving exertional activity on the same day.
- Athletes suspected of a concussion should not be permitted to return to participation until written release from a licensed physician or athletic trainer is received.
- No child/adolescent should return to sports/activity unless he or she has managed to return to school.
- There should be implementation of a graduated return to participation protocol (see **Table 1.6**), with at least five steps and no more than two in one day.[16]
- There should be a comprehensive medical management plan for acute care of a potential head or cervical spine injury.

Successes

Between 2009 and 2013, 47 of the 50 states, including the District of Columbia, enacted legislation that requires each state to mandate policies regarding concussions, specifically sports-related concussions

TABLE 1.6 Graduated Return to Play Protocol[15]

Rehabilitation Stage	Functional Exercise at Each Stage of Rehabilitation	Objective of Each Stage
1. No activity	Symptom-limited physical and cognitive rest.	Recovery
2. Light aerobic exercise	Walking, swimming, or stationary cycling, keeping intensity < 70% maximum permitted heart rate. No resistance training.	Increase heart rate
3. Sport-specific exercise	Skating drills in ice hockey, running drills in soccer. No head impact activities.	Add movement
4. Noncontact training drills	Progression to more complex training drills (e.g., passing drills in football and ice hockey). May start progressive resistance training.	Exercise, coordination, and cognitive load
5. Full-contact practice	Following medical clearance, participate in normal training activities.	Restore confidence and assess functional skills by coaching staff
6. Return to play	Normal game play	

Source: From: McCrory P, Meeuwisse WH, Aubry M, et al. Consensus statement on concussion in sport: the 4th International Conference on Concussion in Sport held in Zurich, November 2012. *J Am Coll Surg*. 2013;216(5):e55–71. doi:10.1016/j.jamcollsurg.2013.02.020.

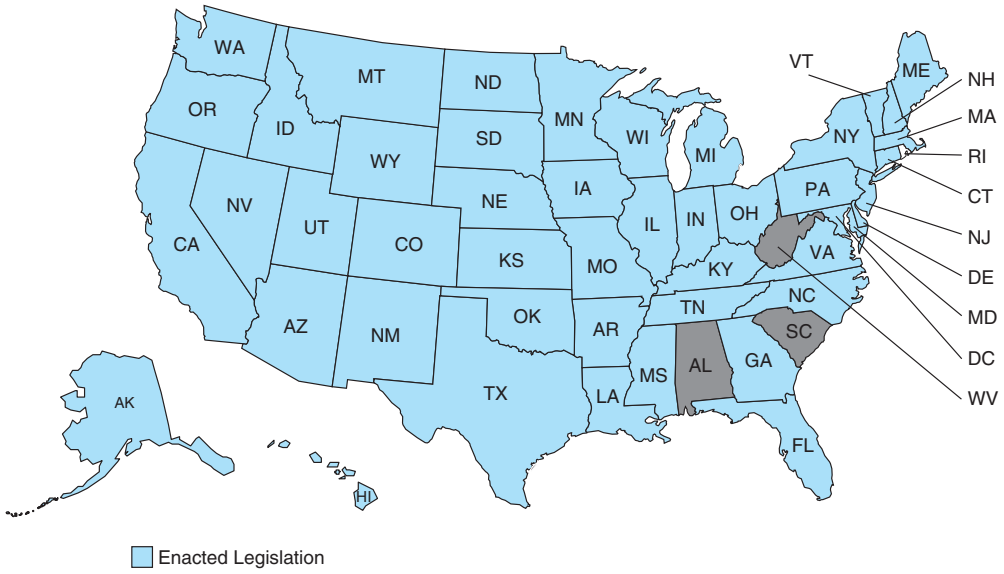

Figure 1.2 Map of the United States indicating states that have enacted legislation regarding sport concussion.

Source: Traumatic Brain Injury Legislation. National Conference of State Legislatures; 2013. Available at: http://www.ncsl.org/issues-research/health/traumatic-brain-injury-legislation.aspx. Accessed July 1, 2013.

(see **Figure 1.2**). The concussion legislation is specific to the appropriate management of a concussion (evaluation by a licensed medical professional; clearance to return to play by a licensed medical professional, athlete, parent, and coaching education on the signs and symptoms of concussion; etc.).

Tenth Initiative

Adopt policies for the creation and implementation of policies for the appropriate management of exertional heat stroke.

Components

EHS is 100% survivable if it is promptly recognized and treated using cold water immersion. The goal of treatment is to aggressively cool an athlete so that his or her core temperature reaches 102°F (38.9°C) as quickly as possible to reduce the risk of morbidity and mortality.[6] Using the concept of "cool first, transport second" maximizes the chance of survival because it limits the amount of time that the person is above the critical threshold temperature of 104.5°F (40.3°C). Implementing policies for the appropriate management of EHS is essential for the health and safety of athletes, and such policies should contain the following recommendations:

- Any athlete suspected of suffering from EHS should have an accurate temperature taken (rectal temperature) by a licensed healthcare professional.
- Athletes suffering from EHS should be cooled first via cold water immersion prior to being transported to the hospital. In cases where an athletic trainer is present, the athletic trainer is responsible for managing the situation (take the rectal temp, instruct coaches to activate EMS, and direct the cooling of the athlete).
- In situations in which an athletic trainer is not present, coaches should immediately activate EMS and attempt to cool the athlete until licensed medical professionals arrive to take over.
- Once the body temperature reaches 102°F, cooling should be ceased and the athlete should be transported to a hospital.

Successes

In 2012, the Arkansas Department of Health developed protocols for the state's EMS section. Within the protocols is a section dedicated to EHS and exertional heat illnesses where responding emergency personnel must take a rectal temperature and, if indicated, aggressively cool the patient prior to transport to the receiving medical facility. Implementing protocols such as these ensures that athletes suffering from EHS will be appropriately managed to protect their health and safety and maximize their chance of survival.

Summary

In summary, coaches, administrators, and the sports medicine team play an integral role in protecting the health and safety of athletes. Coaches can play a proactive role in ensuring the health and safety of athletes through education, following best practice recommendations and policy changes at the local, regional, and state levels.[7] Specifically, coaches can increase the safety of athletes by:

- Advocating for policy changes at the local, regional, and state levels, such as implementing heat acclimatization policies, WBGT policies, and EAP policies at all secondary schools.
- Advocating for policy changes at the state level that require coaches to undergo annual continuing education as it relates to emergency conditions and preventing sudden death during sports.
- Coaches should follow the best practices for preventing sudden death in sports, as outlined in the report, "Inter-Association Task Force for Preventing Sudden Death in Secondary School Athletics Programs: Best-Practice Recommendations."

Key Terms

Acclimation

Acclimatization

Automated external defibrillator (AED)

Catastrophic injury

Emergency action plan (EAP)

Preparticipation exams (PPEs)

Wet bulb globe temperature (WBGT)

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