

The Inter-Association Task Force for Preventing Sudden Death in Secondary School Athletics Programs: Best-Practices Recommendations

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The secondary school athletic population leads the nation in athletic-related deaths.^{1–6} Given that many such deaths are avoidable through proper prevention, recognition, and treatment protocols, those involved with secondary school athletics can benefit from policy considerations regarding health and safety for participation in sport. The health and safety of secondary school athletes is paramount, but barriers that jeopardize the delivery of optimal safety and preventive measures remain prevalent across the secondary school athletic landscape. To date, these “best-practices” recommendations have been endorsed by the American College of Sports Medicine, American Medical Society for Sports Medicine, American Orthopaedic Society for Sports Medicine, American Osteopathic Academy of Sports Medicine, Canadian Athletic Therapists Association, Gatorade Sports Science Institute, Korey Stringer Institute, Matthew A. Gfeller Sport-Related Traumatic Brain Injury Research Center, National Athletic Trainers' Association, National Center for Catastrophic Sport Injury Research, National Council

on Strength and Fitness, National Federation of State High School Associations, National Interscholastic Athletic Administrators Association, and National Strength and Conditioning Association.

This document provides a roadmap for policy considerations regarding health and safety concerns for secondary school athletes. Although these guidelines are not exhaustive for all conditions, these best practices address the leading causes of sudden death in this population (head and neck injuries, exertional heat stroke [EHS], sudden cardiac arrest [SCA], and exertional sickling). Further, we present information to address the infrastructure conditions and barriers that can introduce the most risk to athletes (lack of emergency action plans [EAPs], lack of medical staff, lack of emergency equipment [eg, defibrillators], poor heat acclimatization policies, and improper conditioning sessions).

The advent of increasing policy mandates and legislative efforts has resulted in a greater need to have a medical gatekeeper who can properly supervise the sports health of

the secondary school athletes. This includes the policies, mandates, and laws that have been created to enhance the health and safety of these athletes. In addition, most of the deaths in secondary school sports can be avoided by providing appropriate prevention, recognition, and treatment strategies. Accordingly, supervisors of secondary school athletics programs would benefit greatly from having an athletic trainer (AT) who can guide these efforts. As James Roscoe Day said when chancellor of Syracuse University and after President Theodore Roosevelt mandated changes in collegiate football to decrease the number of deaths: "One human life is too big a price for all the games of the season." Day helped to overhaul the rules of collegiate football and form the National Collegiate Athletic Association because President Roosevelt provided this mandate, showing that smart implementation of policy changes and oversight can dramatically enhance the safety of sport participation. Therefore, the purpose of this consensus statement is to provide a similar benefit through recommendations and guidelines for best practices. Most deaths in sports are preventable; our charge is to meet this expectation.

EMERGENCY ACTION PLANS⁷⁻¹⁶

1. Each school should have an EAP, including specific details for each athletic facility where practice and competition occur, to ensure that appropriate strategies and site-specific procedures are invoked during a time of crisis. The EAP ideally is developed by school administrators in collaboration with coaches, school medical personnel (ATs, nurses, team and consulting physicians), and campus public safety officials and coordinated with the local emergency medical services (EMS) system.
2. The following components covering emergency communication and equipment should be included:
 - A. Establish an efficient communication system to activate EMS at each athletic venue.
 - B. Establish a communication system to alert on-site (school) responders to the emergency and its location.
 - C. Post the EAP at each venue, including a list of emergency numbers, facility map with street address, and directions to guide EMS.
 - D. Post the specific location of all emergency equipment.
 - E. Strategically locate automated external defibrillators (AEDs) to allow immediate retrieval and use within 3 minutes (with 1 minute being ideal) of recognizing an emergency.
 - F. Provide a readiness check of emergency equipment before each scheduled athletic activity.
 - G. Maintain emergency equipment, including battery and lead replacement for AEDs, according to the manufacturers' guidelines and document the maintenance.
 - H. Register each AED with the local EMS system and integrate it with the specific EAP.
3. All athletics staff who have contact with student-athletes and are associated with practices, competition, and strength-and-conditioning sessions, including coaches, strength-and-conditioning coaches (S&CCs), and administrators, should have the following:

- A. Current certification in first aid and cardiopulmonary resuscitation (CPR), including the use of an AED.
- B. Coaches also should be educated about factors contributing to sudden death and recognizing life-threatening situations.
- C. Coaches should be responsible for documenting competencies and continuing education specific to preventing sudden death in sport.
4. The EAP should be site specific and reviewed each sport season by all coaches, assistant coaches, and athletics and medical personnel in coordination with local EMS. The school-wide EAP should be rehearsed and reviewed at least once annually by all personnel involved with student-athletes and athletics programs. In addition, it should be reviewed any time the EAP is modified.
5. No scheduled athletic activity, including conditioning sessions, should occur until the school's athletic director or principal has confirmed that coaches and support staff are fully familiar with the EAP.
6. The EAP should be updated as needed if the athletic field or facility is altered (eg, by renovations) or its location changes permanently or temporarily.

ATHLETIC TRAINER SERVICES

1. Athletic trainers are health care professionals who collaborate with physicians. The services ATs provide comprise prevention, emergency care, clinical diagnosis, therapeutic intervention, and rehabilitation of injuries and medical conditions.¹⁷ The domains of athletic training include injury prevention, evaluation, immediate care, rehabilitation, and administration related to athletic injuries.
A state-regulated or certified AT should be defined as one who
 - has earned and currently holds national certification by the Board of Certification,
 - currently holds state licensure in the state where employed, and
 - is employed with the responsibility of coordinating or assisting with the implementation of the school's sports medicine program.
2. Related to emergency issues, the AT must be able to
 - determine an athlete's readiness to participate via an appropriate preparticipation physical evaluation and, if necessary, consult with the supervising team physician or treating physician, or both;
 - identify unsafe facilities or playing environments;
 - properly select, fit, determine the function of, and maintain the athletic equipment;
 - develop and implement an EAP;
 - implement protocols for environmental conditions based on current recommendations;
 - prevent, recognize, and treat emergency medical conditions; and
 - develop and implement a comprehensive athletic health care administrative system.
3. The AT should be physically at the school and accessible for practices and competitive events as defined in the school's policies and procedures, with coverage decisions and priorities based on scientific data indicating the highest risk of catastrophic events, in

consultation with the medical team and school administration.

4. Each AT employed by a secondary school in the United States should collaborate with a physician (medical doctor or doctor of osteopathic medicine only) who is licensed in the state and has an interest and expertise in sports medicine.
5. Ideally, the AT is employed directly by the school district. This increases the likelihood that emergency planning recommendations are developed as school-wide policies and ensures that relevant health and safety state laws and state athletic association policies are managed and enforced consistently.
6. The AT should conduct an annual safety education program for athletes, coaches, administrators, and parents focusing on athletic head and neck injury, cardiac, heat-related, respiratory, exertional sickling, and other emergencies and EAPs.

CONDITIONING SESSIONS AND THE S&CC

1. Athletes should acclimatize progressively to training demands and environmental conditions for optimal safety.
 - A. These conditioning programs ideally are developed by an S&CC credentialed by an organization accredited by a recognized independent accreditation agency, but if the school does not have an S&CC, the basic principles of strength and conditioning need to be understood by all involved with conditioning programs. The S&CC should work cooperatively with medical staff (AT, supervising physician, or both) when developing transitional workout plans, particularly if the patient is recovering from an injury, if any uncertainty exists regarding the pace of exercise progression, or if the patient's medical history warrants it.
 - B. Conditioning periods should be phased in gradually and progressively to encourage proper exercise acclimatization and to minimize the risk of adverse events.
 - C. The first 7 to 10 days (at minimum, the first 4 separate-day workouts) of any new conditioning cycle (including but not limited to return to school after summer, winter, and spring breaks and return after an injury) are referred to as *transitional periods*.
 - D. A progressive program of increasing volume, intensity, mode, and duration should be instituted for all transitional periods.
 - E. Transitional periods should consist of an appropriate work-to-rest ratio for the sport. This is especially important during serial, intense activity. It is imperative to allow sufficient recovery during training sessions.
 - F. A qualified coach or credentialed S&CC should be knowledgeable about and use acclimatization principles.
 - G. Participation in summer workouts on school grounds under the supervision of a coach or an S&CC is preferable to unsupervised workouts elsewhere or workouts conducted by unqualified individuals.
 - H. Training programs should be individualized. Some athletes will require a longer acclimatization process.

An athlete at a different level of preparedness than his or her teammates (due to injury or time away from training) should use a training program tailored to his or her level of fitness or other medical needs.

2. New conditioning activities should be introduced gradually. Any new exercise or training drill introduced into a strength-and-conditioning program should be added in a deliberate, gradual fashion. This is particularly important during the early stages of a conditioning program.
3. Exercise and conditioning activities must not be used as punishment.
 - A. Physical activity should not be used as retribution, for coercion, or as discipline for unsatisfactory athletic or academic performance or unacceptable behavior.
 - B. No additional physical burden that may increase the risk of injury or sudden death should be placed on the athlete under punitive circumstances.
4. Proper education, experience, and credentialing of S&CCs should be ensured.
 - A. Some coursework should be dedicated to the health and safety concerns of athletes, with a focus on preventing sudden death. This includes the prevention, recognition, and management of on-field emergencies.
 - B. Continuing education requirements should ensure certified S&CCs engage in educational opportunities that provide applicable, up-to-date information regarding important health and safety topics, emergency procedures, and prevention of sudden death.
 - C. All S&CCs should be required to pass a certification examination credentialed by an independent accreditation agency. Competency standards, ongoing assessment, and continuing education requirements should be documented clearly.
 - D. All S&CCs should maintain certification in first aid and CPR, including the use of an AED.

CATASTROPHIC BRAIN AND NECK INJURIES^{12,14,18–20}

1. Any secondary school sponsoring contact or collision sports, including but not limited to baseball, basketball, diving, field hockey, football, gymnastics, ice hockey, lacrosse, pole vaulting, rugby, soccer, softball, water polo, and wrestling, should employ an AT.
2. When one is assessing suspected concussions, the following tests should be used as informational tools to aid in the clinical decision-making process of the health care professional:
 - A. The third edition of the Sport Concussion Assessment Tool (SCAT3), which in part includes a Graded Symptom Checklist (GSC), the Standardized Assessment of Concussion (SAC), and the firm-surface conditions of the Balance Error Scoring System (BESS). If appropriate, the full BESS (including foam stances) should be completed; and
 - B. If applicable, computerized neurocognitive testing.
3. The team physician and AT should consult, when necessary, neuropsychologists to help interpret the neurocognitive test findings when indicated.

4. Schools without ATs should not be performing points 2 and 3 without guidance or direct supervision from trained and experienced medical professionals.
5. An annual brain and spine safety education program should be conducted for all student-athletes and coaches and should include a discussion of the proper rules and safety measures to prevent dangerous and potentially catastrophic use of the head or helmet as a weapon.
6. Providing student-athletes with in-season behavior modification “check-ups” may prevent unnecessary head and neck injuries. This includes regular instruction and feedback regarding heads-up tackling technique and ensuring that athletes do not lead with the head during contact.
7. Physicians and ATs working in the secondary school setting should complete an education module focusing on updates in appropriate medical management and return to activity after brain (concussion) and neck injuries. An example includes the Centers for Disease Control and Prevention’s “Proper Management of Cervical Spine Injuries” in *Heads Up to Clinicians: Addressing Concussion in Sports Among Kids and Teens*.¹⁹
8. The AT and school athletics officials should enforce the standard use of certified helmets and should educate athletes, coaches, and parents that helmets do not prevent concussions.
 - A. The AT, in conjunction with the school’s equipment manager or coaches, or both, should ensure helmets have appropriate manufacturer-specific corrosion-resistant hardware, are maintained regularly throughout the season and the helmets’ lives, are reconditioned and recertified based on manufacturers’ guidelines, and meet national certification standards.
 - B. The AT, in conjunction with the school’s equipment manager or coaches, or both, should ensure proper fitting of all helmets for all athletes.
9. A comprehensive medical-management plan for acute care of a potential cervical spine or brain injury (eg, an intracranial hemorrhage or diffuse cerebral edema) should be implemented. The plan should be initiated in the presence of unconsciousness or altered level of consciousness, bilateral neurologic findings or other substantial neurologic concerns, substantial midline spine pain with or without palpation, or obvious spinal column deformity. Cervical spine injury should be ruled out for all injured but conscious patients before moving them.
If the AT suspects a head or neck injury, he or she should be prepared to do the following.
 - A. Provide on-field and sideline medical management of head injury to address more serious, quickly deteriorating, and potentially life-threatening conditions;
 - B. Stabilize the patient and activate the local EMS system in the event of a serious head or neck trauma;
 - C. Provide rescue ventilations (eg, bag-valve-mouth resuscitation);
 - D. Provide CPR and use an AED in case of cardiopulmonary collapse;
- E. Properly spine board an injured patient without compromising the cervical spine; on-field rescue training and spine-boarding practice should be conducted at least annually by the AT and other identified school staff who may assist in an emergency situation; and
- F. Immediately transfer the patient with assistance from local EMS to a medical facility equipped to manage traumatic head and neck injuries. Local EMS should be responsible for transporting the patient, and the AT and school officials should facilitate this process with a well-rehearsed EAP. Elevating the spine board to a 30° head-up position during transport may reduce intracranial pressure.
10. No athlete with a suspected concussion should be permitted to return to a practice, game, or activity on the same day.
 - A. The school’s AT or physician should evaluate a patient with a suspected concussion. When a trained medical professional is not present, the patient should be withheld from activity, and the coach, parent, or responsible adult—whoever is present at the time of the injury—should initiate a referral to the patient’s primary care provider or emergency department for timely medical evaluation.
 - B. Oral and written instructions for home care should be given to the patient and a responsible adult (eg, parent, legal guardian, or other responsible party).
 - C. Before returning to participation, the patient must receive written release from a licensed medical professional trained and experienced in the evaluation and management of concussion, in accordance with the state’s concussion law.
11. To prevent a premature return to participation and to avoid placing the patient at risk for a catastrophic brain injury, the AT and team or treating physician should work together to implement a supervised, graduated return-to-participation progression after a concussion. If the patient becomes symptomatic at any stage of the graduated return-to-participation progression, exercise should be ceased, and the patient should regress 1 step and immediately consult with the physician or AT in charge. The patient should progress no more than 1 step in a 24-hour period. A 6-step graduated return-to-participation progression follows:
 - Exertion step 1: no activity until complete symptom resolution.
 - Exertion step 2: light aerobic exercise for 20 minutes.
 - Exertion step 3: sport-specific exercise, which may include interval aerobic exercise and body weight circuit.
 - Exertion step 4: noncontact training drills, which may include repeated shuttle runs, plyometric workout, and noncontact sport-specific drills.
 - Exertion step 5: limited, controlled, and gradual return to full-contact practice.
 - Exertion step 6: full return to participation.

EXERTIONAL HEAT STROKE^{7,8,12,14,21,22}

1. Before the season begins, all teams should follow a heat acclimatization program that focuses on phasing in

equipment use, intensity of exercise, duration of exercise, and total practice time. Specific guidelines should follow the 2009 preseason heat acclimatization guidelines for secondary school athletics²² that adhere to the key points of a heat acclimatization program as defined by the National Federation of State High School Associations.⁸

2. Administrators, coaches, athletes, and parents must be educated about the common causes of EHS, wet bulb globe temperature (WBGT) and heat index guidelines, and predisposing factors.
 - A. Intrinsic contributing risk factors include a history of exertional heat illnesses; insufficient heat acclimatization; low fitness; high percentage of body fat; substantial dehydration; current or recent fever or gastrointestinal illness; skin condition (eg, sunburn, skin rash); ingestion of certain medications (eg, antihistamines, diuretics, dopamine-reuptake inhibitors) or dietary supplements (eg, ephedra); motivation to push oneself/warrior mentality; and reluctance to report problems, issues, illness, etc.^a
 - B. Extrinsic contributing risk factors include intense or prolonged exercise with minimal breaks; high temperature, humidity, or sun exposure and exposure to heat and humidity in the preceding days; inappropriate work-to-rest ratios based on intensity, WBGT, clothing, equipment, fitness, and the athlete's medical condition; lack of education and awareness of exertional heat illnesses among coaches, athletes, and medical staff; no or inadequate emergency plan to identify and treat EHS; no access to shade during exercise or during rest breaks; limited duration and number of rest breaks; insufficient access to fluids before and during practice and rest breaks; and delay in recognition of early warning signs.^a
3. Activities should be modified when environmental conditions are extreme. The WBGT should be used to determine these modifications, but specific WBGT thresholds for activity alterations may vary based on geographic location. Guidelines must dictate appropriate rest breaks, including duration and total number, for practice sessions and should depend on session length and intensity of activity. Whereas WBGT is optimal for assessing the environmental stress, the heat index can provide an adequate reading if WBGT is not available.
4. Enough water or sports drinks must be available and placed at various stations around the practice field or sufficient breaks and a large central rehydration station should be provided to allow each player to drink quickly and freely throughout each practice and conditioning session.
5. The athlete's percentage of body mass loss must be limited to less than 2% in any session; weigh-ins are useful before and after each session and should be conducted under conditions of high heat and humidity. (Weigh-ins before and after practice sessions only account for water loss during the session and not the state in which the athlete arrived to the session. Athletes often arrive to practice 2% or more dehydrated.)
6. Exertional heat stroke should be suspected in any athlete who exhibits central nervous system dysfunction during intense exercise in the heat. The classic clinical diagnostic criterion is central nervous system dysfunction (eg, loss of consciousness, altered consciousness, personality change, staggering gait) combined with hyperthermia ($>104^{\circ}\text{F}$ – 105°F [$>40.0^{\circ}\text{C}$ – 40.6°C]) at the time of collapse.
7. When assessing body temperature in a patient suspected of having EHS, rectal temperature should be obtained by a medical professional. Other devices (eg, oral, axillary, temporal, tympanic) have been shown to be inaccurate for assessing body temperature when athletes have been participating in intense exercise in the heat.
8. When EHS is suspected, cold-water immersion or another cooling modality until cold-water immersion is ready should be implemented **before** transport by EMS.
 - A. Active cooling should continue uninterrupted until the patient's core body temperature is less than 102°F (38.92°C).
 - B. If a rectal temperature device is not available, cooling via cold-water immersion should be implemented for 15 minutes.
 - C. Cold-water immersion should be implemented in a tub of cold water that is 45°F to 60°F (7.23°C to 15.57°C) with continuous stirring of the water.
 - D. Examples of alternative cooling modalities to cold-water immersion (only if cold-water immersion is not available) include dousing with cold water, rotating wet ice towels over the entire body, and placing the patient under a cold shower.
9. All schools should have a cold-water immersion tub if a risk of EHS exists.
 - A. All medical personnel and team coaches should have access to the tub for prompt treatment of patients with EHS.
 - B. The tub should be set up on site for all high-risk activities, especially those performed during summer conditioning sessions and August and early September practices.
 - C. The doctrine of "cool first and transport second" should be followed if appropriate medical professionals (medical doctor, doctor of osteopathic medicine, AT, or EMS) are on site when treating EHS.
10. All patients with EHS must be monitored thoroughly for appropriate return-to-participation considerations.
 - A. A physician must clear the patient based on progress made during recovery, blood tests, and ability to tolerate gradual return to activity in the heat.
 - B. The appropriate timeline for return to activity should be based on the specific case and advanced based on intermittent progress and re-evaluation.

SUDDEN CARDIAC ARREST^{2,12–16,18,20,23–25}

1. Athletes should undergo cardiovascular screening before participation in competitive athletics.

^a Portions of this document are adapted from Inter-Association Task Force on Exertional Heat Illnesses. Consensus statement. <http://www.nata.org/sites/default/files/inter-association-task-force-exertional-heat-illness.pdf>. Published 2003. Accessed April 10, 2013.

- A. The task force supports recommendations from the American Academy of Family Physicians et al¹⁸ as the minimum standard for screening using a comprehensive personal history, family history, and physical examination.
 - B. A resting 12-lead electrocardiogram (ECG) may be used in many preparticipation screening programs. An ECG may increase identification of athletes with cardiac conditions associated with sudden death. Questions and limitations regarding sensitivity and specificity, physician infrastructure, and cost, however, preclude universal ECG screening for all athletes at this time. Proper physician education in ECG interpretation in athletes and appropriate cardiology resources for secondary evaluations when indicated are important.
2. An AED should be on site and readily available within 3 minutes (with 1 minute being ideal) for all organized athletic activities.
 3. School staff, medical professionals, coaches, and athletes should be educated at least annually about the location, function, and use of AEDs.
 4. Any athlete who has collapsed and is unresponsive should be assumed to be in SCA until proven otherwise or another cause of the collapse clearly is identified. Proper management of SCA includes the following.
 - A. Prompt recognition of SCA
 - (1) Brief seizure-like activity is common in athletes with SCA. Therefore, assume “seizure equals SCA” until proven otherwise.
 - (2) Agonal respirations or intermittent gasps do not represent normal breathing.
 - B. Early activation of the EMS system (ie, call 911). Call for additional rescuer assistance, as well.
 - C. Early CPR beginning with chest compressions for a witnessed collapse. Chest compressions are provided at 100 per minute.
 - D. Early defibrillation
 - (1) Immediate retrieval of the AED.
 - (2) Application as soon as possible for rhythm analysis and shock delivery if indicated.
 - (3) If no shock is recommended, a nonshockable SCA (ie, asystole or pulseless electrical activity) is still possible, and CPR and life-support measures should be continued until the patient becomes responsive or a noncardiac cause can be established clearly.
 - (4) If an athlete collapses with multiple bystanders present, EMS activation, initiation of chest compressions, and AED retrieval should happen concurrently.
 - (5) If only 1 rescuer is present, the rescuer should activate EMS and then retrieve and use an AED if known to be in close proximity. If no AED is known to be close, the rescuer should begin CPR and continue until additional help arrives.
 - E. Transport of the patient with SCA to a hospital capable of advanced cardiac life support, as well as therapeutic cooling if possible, should be prioritized. Induced hypothermia (rapid cooling) in select cases (when cognitive function does not return on site or en route) for patients with SCA, including ventricular fibrillation arrest, has been shown to improve survival and decrease neurologic complications.
 5. Athletes who have cardiovascular symptoms, such as exertional chest pain, exertional syncope or presyncope, palpitations, new or excessive shortness of breath, or exertional fatigue, should be evaluated by a physician and require medical clearance before returning to sport participation. Patients with an identified cardiac disorder, unexplained symptoms, or previous sudden death events should be cleared by a cardiologist before return to sport participation is considered.
 6. The supervising physician for a school should discuss clearance decisions with appropriate consultants and parents to help make prudent clearance decisions.
 7. Clearance for patients with cardiac disorders should be based on expert cardiology evaluation and should take into consideration the recommendations from the American College of Cardiology Foundation.²⁴
 8. The task force actively supports funding research and other initiatives that improve our collective knowledge about factors that contribute to sudden death in young athletes and that mitigate risk.

EXERTIONAL SICKLING^{9,12,14,26,27}

1. Efforts to obtain newborn screening results of sickle cell trait (SCT) status during the preparticipation physical evaluation are recommended.
2. In the absence of newborn screening results, SCT screening during the preparticipation physical evaluation should be considered for all athletes, especially if they are performing intense physical activity.
3. No patient who has SCT should be denied participation in sport.
4. All personnel overseeing athletic activity should be educated about the signs and symptoms of and the preventive and immediate treatment measures for an exertional sickling crisis, which some have termed *exertional collapse associated with SCT*.⁹
 - A. All athletics personnel should be aware of which athletes have SCT in case an emergency arises.
 - B. Signs and symptoms of exertional sickling include lower extremity or low back pain, “cramp” or “spasm,” muscle weakness, fatigue, difficulty recovering from exercise, shortness of breath, or “slow” collapse (unlike cardiac collapse, which is instantaneous).
 - C. Supplemental oxygen should be available for training and competitions at high altitude.
5. Simple precautions and modifications during exercise, such as modifying training intensity, monitoring environmental conditions, evaluating for acute illness, maintaining hydration, acclimatizing to heat, and adapting to recent or new exercise, can prevent complications from SCT.
 - A. Patients with SCT should be allowed longer periods of rest and recovery between conditioning repetitions and possible exclusion from participation in performance tests that occur in early training (ie, transitional periods), such as mile runs and serial sprints.

- B. Work-rest cycles should be adjusted for environmental heat stress, and athlete hydration should be emphasized.
6. Athletes with signs or symptoms of exertional sickling should be removed immediately from participation and managed with rest, oxygen, hydration, and cooling.
7. A patient with exertional sickling collapse should be treated as having a medical emergency.
 - A. Check vital signs and activate the EAP.
 - B. Provide high-flow oxygen (15 L/min) with a non-rebreather face mask.
 - C. Cool the patient if necessary.
 - D. Activate EMS, attach an AED, start an intravenous line if feasible, and transport the patient to the hospital as soon as possible if the patient is obtunded or if his or her vital signs decline.
 - E. Monitor the patient for metabolic complications, explosive rhabdomyolysis, and cardiac arrhythmias.

NEXT STEPS

The health and safety of secondary school athletes are of paramount concern for health care professionals, organizations, administrators, coaches, parents, athletes, and other stakeholders. Issues and barriers that jeopardize the delivery of optimal safety and preventive measures at the secondary school level need to be addressed. One of the current challenges is that each state athletic association or legal system (or both) is tasked with developing and implementing its own safety standards. Therefore, guidelines, policies, and laws must be developed and implemented on a state-by-state basis. This is an arduous process requiring extensive resources, time, and effort that in many cases does not involve medical or health professionals who are best equipped to develop the policies. We hope these guidelines can provide a roadmap to safer sport participation for the secondary school athlete.

DISCLAIMER

The National Athletic Trainers' Association (NATA) and the Inter-Association Task Force for Preventing Sudden Death in Secondary School Athletics Programs advise individuals, schools, athletic training facilities, and institutions to carefully and independently consider each of the recommendations. The information contained in the statement is neither exhaustive nor exclusive to all circumstances or individuals. Variables such as institutional human resource guidelines, state or federal statutes, rules, or regulations, as well as regional environmental conditions, may impact the relevance and implementation of these recommendations. The NATA and the Inter-Association Task Force advise their members and others to carefully and independently consider each of the recommendations (including the applicability of same to any particular circumstance or individual). The foregoing statement should not be relied upon as an independent basis for care but rather as a resource available to NATA members or others. Moreover, no opinion is expressed herein regarding the quality of care that adheres to or differs from any of NATA's other statements. The NATA and the Inter-Association

Task Force reserve the right to rescind or modify their statements at any time.

REFERENCES

1. National Center for Catastrophic Sport Injury Research. <http://www.unc.edu/depts/nccsi/>. Accessed April 30, 2013.
2. Maron BJ, Doerer JJ, Haas TS, Tierney DM, Mueller FO. Sudden deaths in young competitive athletes: analysis of 1866 deaths in the United States, 1980–2006. *Circulation*. 2009;119(8):1085–1092.
3. Kerr ZY, Casa DJ, Marshall SW, Comstock RD. Epidemiology of exertional heat illness among U.S. high school athletes. *Am J Prev Med*. 2013;44(1):8–14.
4. Boden BP, Breit I, Beachler JA, Williams A, Mueller FO. Fatalities in high school and college football players. *Am J Sports Med*. 2013; 41(5):1108–1116.
5. Grundstein AJ, Ramseyer C, Zhao F, et al. A retrospective analysis of American football hyperthermia deaths in the United States. *Int J Biometeorol*. 2012;56(1):11–20.
6. Meehan WP 3rd, Mannix R. A substantial proportion of life-threatening injuries are sport-related. *Pediatr Emerg Care*. 2013; 29(5):624–627.
7. Council on Sports Medicine and Fitness, Council on School Health. Policy statement: climatic heat stress and exercising children and adolescents. *Pediatrics*. 2011;128(3):e741–e747.
8. National Federation of State High School Associations Sports Medicine Advisory Committee. Heat acclimatization and heat illness prevention position statement. Published 2012. <http://www.nfhs.org/content.aspx?id=5786>. Accessed April 3, 2013.
9. O'Connor FG, Bergeron MF, Cantrell J, et al. ACSM and CHAMP Summit on Sickle Cell Trait: mitigating risks for warfighters and athletes. *Med Sci Sports Exerc*. 2012;44(11):2045–2056.
10. 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. *Br J Sports Med*. 2013; 47(5):250–258.
11. Andersen JC, Courson RW, Kleiner DM, McLoda TA. National Athletic Trainers' Association position statement: emergency planning in athletics. *J Athl Train*. 2002;37(1):99–104. <http://www.nata.org/sites/default/files/EmergencyPlanninginAthletics.pdf>. Accessed February 15, 2012.
12. Casa DJ. *Preventing Sudden Death in Sport and Physical Activity*. Burlington, MA: Jones & Bartlett Learning; 2012.
13. Drezner JA, Courson RW, Roberts WO, Mosesso VN, Link MS, Maron BJ. Inter-Association Task Force recommendations on emergency preparedness and management of sudden cardiac arrest in high school and college athletic programs: a consensus statement. *J Athl Train*. 2007;42(1):143–158.
14. Casa DJ, Guskiewicz KM, Anderson SA, et al. National Athletic Trainers' Association position statement: preventing sudden death in sport. *J Athl Train*. 2012;47(1):96–118.
15. Drezner JA, Rao AL, Heistand J, Bloomingdale MK, Harmon KG. Effectiveness of emergency response planning for sudden cardiac arrest in United States high schools with automated external defibrillators. *Circulation*. 2009;120(6):518–525.
16. Toresdahl BG, Harmon KG, Drezner JA. High school automated external defibrillator programs as markers of emergency preparedness for sudden cardiac arrest. *J Athl Train*. 2013;48(2):242–247.
17. Terminology: definition of athletic training. National Athletic Trainers' Association Web site. <http://www.nata.org/athletic-training/terminology>. Accessed May 22, 2013.
18. American Academy of Family Physicians, Academy of Pediatrics, American College of Sports Medicine, American Society for Sports Medicine, American Orthopaedic Society for Sports Medicine, and American Osteopathic Academy of Sports Medi-

- cine. *Preparticipation Physical Evaluation*. 4th ed. Elk Grove Village, IL: The American Academy of Pediatrics. Published 2010. <http://www.aap.org/en-us/professional-resources/practice-support/pages/Preparticipation-Physical-Evaluation-Forms.aspx>. Accessed March 21, 2013.
19. Centers for Disease Control and Prevention. Proper management of cervical spine injuries. In: *Heads Up to Clinicians: Addressing Concussion in Sports Among Kids and Teens*. <http://preventingconcussions.org/>. Accessed March 18, 2013.
 20. Hazinski MF, Markenson D, Neish S, et al. Response to cardiac arrest and selected life-threatening medical emergencies: the medical emergency response plan for schools. A statement for healthcare providers, policymakers, school administrators, and community leaders. *Circulation*. 2004;109(2):278–291.
 21. Armstrong LE, Casa DJ, et al. American College of Sports Medicine position stand: exertional heat illness during training and competition. *Med Sci Sports Exerc*. 2007;39(3):556–572.
 22. Casa DJ, Csillan D; Inter-Association Task Force for Preseason Secondary School Athletics Participants. Preseason heat-acclimatization guidelines for secondary school athletes. *J Athl Train*. 2009;44(3):332–333.
 23. Harmon KG, Asif IM, Klossner D, Drezner JA. Incidence of sudden cardiac death in National Collegiate Athletic Association athletes. *Circulation*. 2011;123(15):1594–1600.
 24. American College of Cardiology Foundation. 36th Bethesda Conference: eligibility recommendations for competitive athletes with cardiovascular abnormalities. *J Am College Cardiol*. 2005;45(8):1313–1375.
 25. Rittenberger J, Abella BS, Guyette FX. Postarrest cardiocerebral resuscitation: an evidence-based review. *EM Crit Care*. 2012;2(5):1–12. http://www.ebmedicine.net/topics.php?paction=showTopic&topic_id=341. Published October 2012. Accessed April 11, 2013.
 26. Harmon KG, Drezner JA, Klossner D, Asif IM. Sickle cell trait associated with a RR of death of 37 times in National Collegiate Athletic Association football athletes: a database with 2 million athlete-years as the denominator. *Br J Sports Med*. 2012;46(5):325–330.
 27. Christopher SA, Collins JL, Farrell MH. Effort required to contact primary care providers after newborn screening identifies sickle cell trait. *J Natl Med Assoc*. 2012;104(11–12):528–534.

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