



Cardiac Emergency Response Planning for Schools

Policy Statement 2023

Introduction:

Schools are entrusted by communities to provide a safe learning environment for students, staff, and visitors. To meet this objective, schools develop emergency operations plans for unexpected events such as natural disasters and should also prepare to respond to medical emergencies, including sudden cardiac arrest (SCA) ⁽¹⁾. Preparation is key to the survival from a SCA due to the time-sensitive nature of treatment. With each minute delay in treatment the chance of survival decreases by 10% ^(2, 3). However, we can increase survival by more than two-fold through the rapid initiation of CPR and use of an automated external defibrillator (AED) ⁽⁴⁾. Damar Hamlin's cardiac arrest during a January 2023 Buffalo Bills game provides a positive striking example of what is possible when a team is prepared to respond.

A Cardiac Emergency Response Plan (CERP) is necessary to ensure that schools are prepared to respond to this time-sensitive emergency. Survival from an SCA is higher at schools that have developed CERPs compared to schools who have not ⁽⁵⁾. CERPs may also address disparities related to bystander involvement in SCA events and survival based on race or socioeconomic status. People suffering a SCA are less likely to receive lay-rescuer CPR if they are Black or Hispanic, or in low-income Black neighborhoods or predominately Hispanic neighborhoods, compared with high-income White neighborhoods ⁽⁶⁻⁸⁾.

In this statement, we provide key recommendations for the development, implementation, and use of a CERP. The CERP is a stand-alone document that may be used by school personnel, health care providers, and school-based legislative and advocacy groups for SCA preparedness. Documents needed to prepare, implement, practice, and evaluate the CERP can be found at www.heart.org/cerp. Additionally, a CERP can be integrated into a school's existing medical emergency response plan to make sure that there is a plan that meets the core elements of a CERP.

History and Description of the Issue

On any given day in the United States, 49.4 million students and nearly 300,000 staff are in school settings ^(9, 10). More than 350,000 cardiac arrests occur outside of the hospital each year ⁽¹¹⁾ with approximately 7,000-23,000 of these events occurring in children (≤ 18 years of age) ⁽¹²⁾. It is estimated that nearly 39% of these events in youth are sports related ⁽¹³⁾. According to the Cardiac Arrest Registry to Enhance Survival (CARES) 2020 data, 6.5% of children younger than 1 year, 14.4% of children 1-12 years, and 21.2% of those 13-18 years of age who experience cardiac arrest survived to hospital discharge ⁽¹⁴⁾. This

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number is lower when adults are included and therefore the overall survival from SCA in the United States is estimated to be 10% ⁽¹¹⁾.

Survival from SCA increases significantly with early CPR and defibrillation with an automated external defibrillator (AED) ⁽¹⁵⁾. Unfortunately, CPR is initiated, and AEDs used in only about 41% and 6%, respectively, in out-of-hospital cardiac arrest ⁽¹⁴⁾. State laws that have enacted CPR training in high schools have shown higher rates of bystander CPR and AED use, but not all states have such laws ⁽¹⁶⁾. In March 2023, the National Football League (NFL) launched The Smart Heart Sports Coalition ⁽¹⁷⁾, a nationwide campaign in partnership with other major pro sports leagues and leading public health, nonprofit and patient advocacy organizations to encourage every state to adopt policies to prevent fatal outcomes from sudden cardiac arrest among high school students.

Policies that provide evidence-based guidelines and standards to schools to implement plans in response to cardiac emergencies have the potential to benefit any student, staff, or visitor to a school. The training of school staff and students allows that knowledge to be applied anywhere the need arises. A carefully orchestrated response to cardiac emergencies will reduce deaths in school settings and ensure that chaos does not lead to an improper or no response. Preparation is the essential key to saving lives.

Sudden Cardiac Arrest Overview

Specific Causes of SCA

Sudden cardiac arrest (SCA) in youth is most often the result of an abnormal heart rhythm, called an *arrhythmia*. Arrhythmia can occur from abnormalities of the heart structure, changes to the muscle of the heart, or a disruption of the heart's electrical conduction system. When the heart is in an arrhythmia, the heart muscle does not get good blood flow and the individual may go into cardiac arrest.

In youth, the most common causes of sudden cardiac arrest are inherited abnormalities of the heart muscle (e.g. hypertrophic cardiomyopathy, or HCM; arrhythmogenic cardiomyopathy), anomalies of the coronary arteries, and primary electrical conduction system abnormalities (e.g. Long QT syndrome, Catecholaminergic Polymorphic Ventricular Tachycardia, or CPVT). These conditions are congenital, meaning that the individual was born either with the abnormality or they have the ability to develop the abnormality. Acquired conditions that can cause SCA in an otherwise normal heart myocarditis and commotion cordis (a blow to the chest that causes abnormal heart rhythm) ⁽¹⁸⁾.

Sudden cardiac arrest due to these causes, and others, can occur at any time or location. However, vigorous exercise, including during sports participation, appears to act as a trigger for such arrhythmia events ⁽¹⁹⁾. Sports-related SCA accounted for nearly 39% of SCA events in those younger than 18 years of age ⁽¹²⁾ and the likelihood of SCA in competitive athletes is estimated to be 2.5-3.6 times higher than the general population ⁽²⁰⁾. An emphasis remains on identifying those at risk for SCA before athletic participation, but also for those who may be at risk and who are non-athletes ⁽²¹⁾.

Factors Affecting Survival

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Survival to hospital discharge after EMS-treated SCA in children is estimated to be 15% ⁽¹¹⁾. The factors that have been shown to be associated with survival are prompt recognition of cardiac arrest, high quality CPR, and early defibrillation. Together, this initial response is crucial to survival of a victim of SCA and constitutes the first few steps performed by a bystander in the Chain of Survival (22) (see Figure 1).

Recognizing sudden cardiac arrest requires having a high index of suspicion and an awareness of the common features present in most SCA events. It should be assumed that children and adolescents, like adults, who are unresponsive and have abnormal breathing are in cardiac arrest. When witnessed, the individual often collapses without warning. Seizure-like activity (convulsive movements) and abnormal gasping or irregular breathing occur in 30-40% of SCA victims ^(23,24).

Together, high quality CPR and use of an AED when a shock is advised significantly improve chances of survival. Since the implementation of "hands-only" CPR in 2008, bystander CPR and survival rates have increased ⁽²⁵⁾. Nearly 47% of sports related SCA is caused by pulseless ventricular tachycardia or ventricular fibrillation ⁽²⁶⁾ and an AED 'shock' can restore normal heart rhythm in these situations. When CPR and defibrillation are performed within 3 minutes of SCA compared with beyond 3 minutes, survival increased to 74%. ⁽²⁷⁾.

Barriers to Implementing CERPs in Schools

Implementing effective CERPs in schools is vital to reducing the mortality associated with SCA events. However, numerous barriers hinder the successful implementation of such plans. These issues include general barriers to bystander CPR, lack of funding and resultant limited access to AEDs, a lack of staff knowledge in developing and implementing CERPs, competing interests, as well as concerns about liability.

General barriers initiating CPR and AED use at out-of-hospital SCA events include concern for injuring the victim, the fear of performing CPR incorrectly, the fear of infection, and legal liability concerns ⁽²⁸⁾. Though this manuscript focuses on implementing CERPs in schools, broader societal level initiatives should be performed to help remove these barriers common to all out-of-hospital SCA events.

In terms of schools, financial resources are a critical determinant of whether schools can effectively develop and implement a CERP as well as procure AEDs. The acquisition and maintenance of AEDs and their regular maintenance is the primary hurdle and can require substantial funding, especially for large schools ⁽²⁹⁾. And when some funds are available, access to AEDs may be limited within school premises. The school may lack enough AEDs to ensure one is available within 3 minutes from any point on campus ^(30,31). In addition to the AEDs, there is a cost to educating staff, creating a cardiac emergency response team, and the time required to develop the CERP as well as drills. These costs can create a major barrier to schools with limited budgets.

As health care and resource disparities can be a challenge in communities, schools may also face the same challenges when working to fully implement a CERP, such as the cost of equipment and its maintenance, staff training and support, and the need for medical oversight. Poverty as a primary social

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determinant of health often means that children and their families do not have access to health care resources, nor do the schools they attend ⁽³⁸⁾.

It is recommended that efforts be made to address public funding opportunities, considerations for gifts, grants, and donations, including in-kind donations designated for the purchase of an automatic external defibrillator that meets the standards established by the United States Food and Drug Administration and for the costs incurred to inspect and maintain AEDs.

Adequate training of school staff is crucial for an effective response to cardiac emergencies. The time, with associated costs, required for training can be prohibitive, particularly for schools with limited resources ^(32,33). Ensuring that staff members are confident and competent in using AEDs and administering cardiopulmonary resuscitation (CPR) can be challenging.

It is also recommended that funding opportunities must address training for faculty and staff in CPR and AED use, and basic first aid training and educational materials that follow guidelines set by emergency cardiovascular care.

Concerns related to legal liability can deter schools from implementing comprehensive cardiac emergency response plans ^(34,35). School administrators may worry about potential legal repercussions if something goes wrong during an emergency response. This apprehension can impede the willingness and efforts to develop a comprehensive SCA response plan. It is recommended that these concerns be addressed by looking into the state's specific Good Samaritan laws, which limit liability for those who voluntarily perform care and rescue in emergency situations ⁽⁴⁰⁾. Finally, school staff deal with multiple competing interests. A recent survey noted many of these issues, including a desire to address mental health issues, mandatory state academic testing, and active-shooter drills among others ^(36,37). The recent and ongoing COVID-19 pandemic also created massive disruption to schools in terms of time, resource allocation, and staff wellbeing/burnout. These issues, coupled with a lack of clarity on the need for such programs further hinders wide implementation of CERPs.

Developing a Cardiac Emergency Response Plan

A Cardiac Emergency Response Plan (CERP) is a comprehensive, written document that establishes the specific steps to improve survival from SCA. With nearly 20% of the adult and child population located in schools throughout the United States on any given day, the presence of a CERP in schools is particularly important. Similarly, efforts to implement a CERP on youth recreation fields and community sites are ongoing.

Cardiac Emergency Response Team (CERT)

SCA events at school can occur anywhere and at all times of the day. To ensure an effective SCA response, a Cardiac Emergency Response Team (CERT) must be identified. It is recommended that this team be comprised of at least 5 individuals or 10% of staff to help increase the likelihood of a team member being

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present if, and when, an event occurs. These individuals should have current CPR/AED training and agree to provide basic life support during a cardiac emergency.

The CERT should be established prior to the start of each school year to plan, implement, and evaluate the school's CERP. It is important to establish an individual who will act as the Site Coordinator and who will be responsible for leading the school through the necessary steps of developing the CERP. This role involves overseeing CPR training for staff and AED procurement and maintenance. The Site Coordinator may communicate with local medical experts and EMS to ensure effectiveness of the CERP.

Other team members play a pivotal role in the CERT and are necessary for an effective SCA response. These individual team members are often staff with current CPR/AED training, athletic directors or trainers, coaches, and especially school nurses. The expectation is that team members are present for any on-site activity and that they have a strong understanding of the CERP and have practiced drills.

An efficient communication network linking all parts of the school campus, including playgrounds and athletic fields, is needed to prevent critical delays. This network should activate the school's cardiac emergency response team and connect directly to EMS.

Training in CPR and AED use

Currently, annual rates of CPR training in the United States remain low (2.9-4%) and the prevalence of reported CPR training was 18%⁽¹⁴⁾. CPR training for members of the Cardiac Emergency Response Team is critical for successful SCA response. It is recommended that members of the Cardiac Emergency Response Team undergo CPR-AED re-training at least every 2 years.

Ideally, a school should strive to achieve CPR training for all its staff. The goal of CPR training for all is to increase the likelihood that a sudden cardiac arrest event is recognized, activate Cardiac Emergency Response system, or call 9-1-1, be familiar with chest compressions, and know the purpose and function of an AED.

Maintenance and Placement of AEDs and other Emergency Equipment

The likelihood that a victim will survive sudden cardiac arrest is often related to the availability and use of an AED⁽¹¹⁾. A CERP prioritizes having sufficient numbers of AEDs with proper placement, installation, and maintenance.

It is recommended that there be enough AEDs such that the device can be retrieved and delivered to any location on the school campus within 3 minutes. These devices should be accessible for responding to a cardiac emergency at any time of the day or night and should never be locked in an office or stored away. There should be clear signage for all AEDs.

Currently, procurement of AEDs remains a barrier to successful development and implementation of CERP⁽²⁴⁾. State laws requiring AEDs in schools vary and funding is often insufficient to ensure that each school has access to the number of AEDs needed in case of a SCA emergency on school grounds. Schools often

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turn to independent fundraising and philanthropy to ensure that they have enough AEDs to meet their needs.

Communication of CERP

Awareness and access to the CERP is imperative to the successful response to a SCA event and is a focus of the updated AHA CERP document. Specifically, a concerted effort should be made to distribute and post the CERP broadly.

According to the updated AHA CERP document, the CERP should be posted in each classroom, cafeteria, restroom, health room, break room, and in all offices of the school. Given the increased risk of SCA with athletic participation, the CERP should be clearly posted in the gym, swimming pool, and all other indoor or outdoor locations where athletics or physical activity take place. Finally, the CERP should exist adjacent to the AED and to public telephones.

In addition to posting the CERP broadly, it is recommended that this document be distributed to all staff and administrators at the start of each school year. All staff should be educated on the CERP yearly and new staff members should receive the CERP in their orientation material.

Local Emergency Medical Services (EMS) Integration with the CERP

While the CERP is a document that is specific to each school, it is important that local EMS and dispatch agencies be included and incorporated in the planning and execution of a CERP. EMS may help provide valuable training and supplies to prepare the CERT and often are available to help with response drills. Most importantly, the hand-off from the bystander to EMS is a vital component of the chain of survival and therefore EMS should be included in the CERP.

Drills

Cardiac Emergency Response practice drills are the best way to test the Cardiac Emergency Response Plan and ensure proficiency in staff awareness and response. Drills can provide confidence to team members and staff and help streamline communication and the coordinated response that is necessary in the event of a SCA. On the other hand, drills help expose deficiencies in CERP and result in modifications and improvements. Drills should be performed at least once per school year to assure optimal performance during an actual emergency.

Practice drills should involve the school site coordinator, members of the Cardiac Emergency Response Team, school staff, and a recorder (to record times on the Drill Summary checklist).

Ongoing and Annual Review and Evaluation of the Plan Annual Review

An annual review needs to take place, in addition to post incident and post drill reviews. Included in the annual review are post incident reviews, drill summary checklists, an inventory of emergency supplies, and a record of routine AED maintenance per the manufacturer's guidelines. Post event Incident Guidelines. After an incident, the CERT meets to review the CERP components and the team's implementation. The

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goal is to identify those actions consistent with a well-run and well-equipped team and those actions needing improvement or clarification. After an emergency occurs, there should be a review of plan and the school's management of the cardiac event, its response and adherence to the CERP, the adequacy of services provided, and the accuracy and completeness of data recorded to evaluate access to and quality of emergency services and materials and make necessary recommendations for changes in the school's protocols and supplies. ⁽³⁹⁾

Recommendations

Simply having an AED onsite is not adequate should a SCA occur. Not all AED placement mandates take into consideration the complexity of what is needed for each location. Effort needs to be made to address AED availability, reliability, and usability. The development of a CERP requires input from the school nurse and other key school and community personnel, in addition to EMS. The school cardiac emergency response policy must be guided by resuscitation science; although affected, it should not be undermined by available resources and local political and budgetary realities.

The American Heart Association makes the following recommendations to support the adoption and practice of CERPs in schools:

1. The AHA recommends that all schools have a CERP in place that follow evidence-based core elements:

- Establishing a cardiac emergency response team
- Activating the team in response to a SCA
- Implementing AED placement and routine maintenance within the school that follow guidelines set by the American Heart Association
- Disseminating and communicating the plan throughout the school campus
- Maintaining ongoing staff training in CPR/AED use
- Practicing using drills
- Integrating local EMS with the plan
- Ongoing and annual review and evaluation of the plan, including post event evaluation and review

2. The AHA recommends that state laws, regulations, and related educational standards require schools to develop and maintain a CERP and that appropriations are made available to support the development, implementation, and evaluation of CERPs in schools. Where related appropriations are lacking, CERPs should still be in effect, using indirect sources of community or EMS-related support.

Conclusion

Sudden cardiac arrest occurs in both children and adults in the school setting. Survival rates from such events are low. The adoption, practice, and use of a Cardiac Emergency Response Plan by schools can increase survival by increasing recognition of cardiac arrest, CPR and AED use, and communication with local EMS.

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Documents needed to implement the CERP can be found at www.heart.org/cerp

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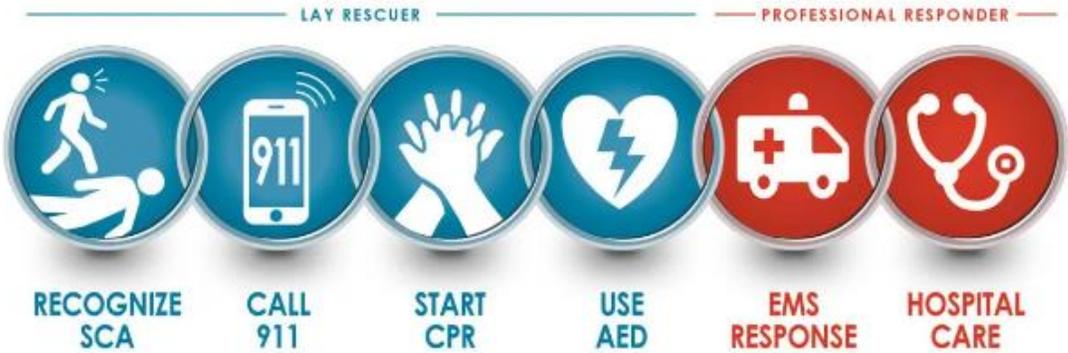
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Figure 1: Chain of Survival



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