

Cardiac Emergency Response Planning for Schools

A Policy Statement

Kathleen Rose, RN (Cochair)

Monica Martin Goble, MD (Cochair)

Stuart Berger, MD

Ron Courson, ATC, PT, NRAEMT, CSCS

Gwen Fosse, RN

Randall Gillary, JD

Joe Halowich, MS, MCHES

Julia H. Indik, MD, PhD

Madeleine Konig, MPH

Martha Lopez-Anderson

M. Kathleen Murphy, DNP

Mary M. Newman, MS

Jeff Ranous

Comilla Sasson, MD

Howard Taras, MD

Allison Thompson

A sudden cardiac arrest in school or at a school event is potentially devastating to families and communities. An appropriate response to such an event—as promoted by developing, implementing, and practicing a cardiac emergency response plan (CERP)—can increase survival rates. Understanding that a trained lay-responder team within

the school can make a difference in the crucial minutes between the time when the victim collapses and when emergency medical services arrive empowers school staff and can save lives. In 2015, the American Heart Association convened a group of stakeholders to develop tools to assist schools in developing CERPs. This article reviews the critical components

of a CERP and a CERP team, the factors that should be taken into account when implementing the CERP, and recommendations for policy makers to support CERPs in schools.

Keywords: cardiac emergency response plan; sudden cardiac arrest; school health; advocacy; policy

Medical emergency response plans are designed to enhance safety for students, staff, and visitors at schools. To be effective, these plans need to be coordinated and practiced. Although a school's primary mission is education, mandates typically require drills to prepare for fires, earthquakes, and other potential mass-casualty incidents (U.S. Department of Education, 2013). Beyond preparing for schoolwide emergencies, schools are expected to provide lifesaving responses to individual medical crises, such as a sudden cardiac arrest (SCA). One way to successfully maintain a cardiac emergency response plan (CERP) is to have a clear and concise district policy that is reviewed annually (Doyle, 2013). The CERP should be regularly reviewed for consistency with federal, state, and local laws; nursing practice standards; and established safety practices.

This article presents a national model that encourages schools to develop, implement, practice, and evaluate a CERP. It also addresses legal considerations and special circumstances involving students and school use, and it makes policy recommendations to further the adoption and implementation of CERPs. The goal of the CERP is to increase the chances of survival following a SCA and to decrease the incidence of sudden cardiac death. Designed to be a stand-alone document or a part of the school's existing medical emergency response plan, the CERP can be used by school personnel and health care providers, as well as by those involved in school-based legislative and advocacy efforts related to SCA preparedness. Documents needed to implement the CERP can be found at www.heart.org/cerp.

Focused on SCA, this article seeks to address various groups within a school that may be involved in SCA preparedness planning. School administrators are responsible for managing school facilities and operations in a safe and efficient manner. Their charge should include development and placement of the CERP within a school improvement plan and designation of a responsive and

effective cardiac emergency response team. A registered school nurse often leads the school's health services team. To ensure an optimal response to a SCA, the school nurse assigned to the school or school district should be included in CERP planning and implementation (American Nurses Association & National Association of School Nurses, 2011). In addition, school nurses are often tasked with training, monitoring, and supervising unlicensed assistive personnel within the school (Bobo, 2015), which could include members of the cardiac emergency response team. Administrators may begin by requiring current cardiopulmonary resuscitation (CPR) training for all coaches and/or teachers, enabling them to respond or assist appropriately while awaiting the arrival of medical personnel, whether or not an athletic trainer or school nurse is on-site. Parents and community groups often help to initiate and supplement school-based SCA preparedness efforts.

History and Description of the Issue

On any given day, 63.6 million students and staff are in school settings (U.S. Department of Education, 2015). In 2014 approximately 360,000 people suffered a SCA in community settings (Mozaffarian et al., 2015). This figure includes patients of all ages and refers specifically to nontraumatic SCAs from cardiac causes treated by emergency medical services (EMS); it excludes cardiac arrests of noncardiac origin, such as those secondary to trauma, drowning, and narcotic overdose. Of this yearly total, approximately 7,000 were children (≤ 18 years of age). Overall, approximately 10% of victims survive. Prompt CPR can double or triple the chance of survival (Institute of Medicine, 2015).

SCA most often results from a disruption in the heart's electrical system that causes the heart to beat very rapidly and ineffectively (usually from ventricular fibrillation) accompanied by the loss of a pulse. While SCA and heart attacks are both life-threatening, SCA occurs

abruptly and without warning, while heart attacks usually have a more gradual symptom onset.

SCA requires intervention within minutes to avoid death or permanent neurologic damage. Without immediate CPR to help maintain blood flow to vital organs and the shock of an automated external defibrillator (AED) to reset the heart's natural rhythm, victims usually die. The evidence strongly supports the fact that CPR and early defibrillation save lives (Mozaffarian et al., 2015).

Unfortunately, during routine school physicals or athletic screenings, conditions that can lead to SCA in children and adolescents are difficult to discern and may go undetected. SCA preparedness policies 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.

SCA Overview

Specific Causes of SCA

In younger children, SCA is more often from a secondary (noncardiac) origin, such as respiratory difficulties. SCA in adults, however, is more likely from heart problems acquired over time. In older children and adolescents, SCA is more often from underlying (congenital) conditions, including hypertrophic cardiomyopathy and coronary artery abnormalities (Mozaffarian et al., 2015) present from birth, whether apparent or not. An exception is commotio cordis (Latin for "agitation of the heart"). In this case, an irregular heart rhythm (typically ventricular fibrillation) results from a blow to the chest directly over the heart at a critical time during the cardiac cycle. Not fully developed, the chest of a child is more prone to this as compared with an adult. The blow leads to a SCA (in an otherwise normal heart) for which cardiac defibrillation is urgently needed.

Although SCA can occur at any time or any location, vigorous exercise appears to act as a trigger for lethal arrhythmias, making SCA more common during athletic practices and games (Hazinski et al., 2004).

In an effort to maintain the safety of all their students, schools and coaching staff may be advised by a health care provider to limit the participation in school activities for some students with known heart conditions. Although many may participate in recess, gym, sports, and school activities without restriction, the school nurse may ask the child's parent/guardian to obtain written approval or recommendations from the child's health care provider, with specific activity restrictions noted by the provider where applicable. The parent/guardian must recognize the importance of notifying the school of the child's known heart condition and any changes to the child's symptoms and cardiac status over time.

Factors Affecting Survival

While all staff may not be currently trained in CPR/AED, all can be taught to recognize a possible SCA. Chest pain, nausea, or light-headedness may occur right before a SCA, but most often there are no warning signs. For an individual who collapses, is unresponsive, and is not breathing normally or is not breathing at all, it must be assumed that a SCA has occurred. Seizure-like activity (convulsive movements) and abnormal gasping/irregular breathing occur in 30% to 40% of SCA victims (Cho et al., 2010; Drezner, Rao, Heistand, Bloomingtondale, & Harmon, 2009). Loss of consciousness typically happens within seconds of the onset of the chaotic heart rhythm (most often ventricular fibrillation), and collapse tends to occur suddenly. SCA from ventricular fibrillation can have a survival rate $\geq 50\%$ if the CPR is initiated without delay (Resuscitation Academy Faculty, 2013; see Figure 1). Survival further improves if bystanders not only initiate CPR but include defibrillation with an AED if indicated.

Bystander CPR and survival rates have increased since the implementation of hands-only CPR in 2008 (Hüpfel, Selig, & Nagele, 2010; Søreide et al., 2013). It is

Figure 1. Out of Hospital Cardiac Arrest Chain of Survival.



easier for lay rescuers, avoids mouth-to-mouth contact, and is more readily guided by dispatchers over the telephone. When asphyxia-precipitated SCA occurs, the addition of rescue breathing to compressions is recommended (Atkins et al., 2015; Sayre et al., 2008). Other signs of SCA include not moving and unresponsiveness. CPR should be initiated without delay (see Figure 1).

Barriers to School SCA Preparedness

In developing a CERP, schools may face barriers on many levels, including misperceptions of need, cost of the program, liability concerns, school staff concerns, and widespread disparities in health care access. The potential barriers to implementation vary by school, district, state, school location, and school size. These barriers and others identified by schools must be addressed with practical solutions, including private/public funding or in-kind donations from community organizations.

Specific barriers, with information to assist in their removal include the following:

Perception that SCA is a rare event with little likelihood of survival: Although the survival rate is low, approximately 10%, studies show that prompt bystander CPR and AED use could double or triple those numbers (Wissenberg et al., 2013).

Liability concerns: Federal and state Good Samaritan laws provide immunity to laypersons who voluntarily provide care during an emergency (Health Resources and

Services Administration, 2006; Sutton, 2010). More often, legal cases revolve around the failure to summon medical assistance or not use an AED after SCA (Education Commission of the States, 2015).

Reluctance of school personnel to learn and maintain the necessary skills: School staff may consider formation of a cardiac emergency response team to be another, possibly unwelcome, layer of responsibility. Compounding this, school nurses and athletic trainers are often assigned to more than one school and may need to delegate some of their duties to other staff. Ideally, however, they should be in a position to monitor training, the cardiac emergency response team, and the drills on all the campuses that they cover.

Staff changes within and between school years: These may cause current assignments for CERP responsibilities (including maintenance of AEDs and completion of drill-tracking forms) to be overlooked even when a comprehensive CERP is in place.

Health care and resource disparities: Poverty as a primary social determinant of health often means that children and their families do not have access to health care resources, nor do the schools they attend (White et al., 2016). The same conditions that result in health disparities in these communities may make it difficult for schools to find the necessary resources for full CERP implementation, such as the cost of equipment and its maintenance, staff

Relevant Facts

Fact	Reference
Following a SCA, each minute without treatment decreases the likelihood of survival with a good neurologic outcome.	Link et al. (2010)
In a Midwest survey, 80% of parents assumed that teachers were trained in CPR, but in that survey only 60% of teachers reported any training in CPR.	Gagliardi, Neighbors, Spears, Byrd, and Snarr (1994)
All 50 states have implemented legislation promoting lay rescuer programs and providing Good Samaritan protection for lay rescuers, yet <3% of the U.S. population receives CPR training annually, rendering many bystanders unprepared to respond to SCA.	Sutton (2010), Anderson et al. (2014)
Although few CPR-trained bystanders ever perform CPR, bystander training is one of the strongest predictors of a victim receiving CPR.	Cave et al. (2011)
Defibrillation within 3–5 minutes of collapse can produce survival rates as high as 50%–70%.	Travers et al. (2015)

Note. CPR = cardiopulmonary resuscitation; SCA = sudden cardiac arrest.

training and support, and the need for medical oversight.

Cost of a CPR-AED program: When schools develop their budgets, they must factor in the cost of AED replacement pads and batteries. School staff may not be supportive of training or recertification on their own time and/or with their own funds. Mandatory training and recertification may also be subject to collective bargaining.

Developing a Cardiac Emergency Response Team

Increasing the number of rescuers in society, including schools, saves lives and prevents the emotional toll of a peer death. Delayed action can have profound sequelae for individuals, families, and communities. Increasing the number of people who know how to respond quickly, even by calling 9-1-1 and receiving dispatcher CPR instructions, vastly improves the chances for a timely response and neurologically intact survival (Sasson, Rogers, Dahl, & Kellerman, 2010). Such training may also help remediate disparities in survival rates.

Emergency School Personnel

To ensure an efficient SCA response, a team must be developed with assigned

roles. Implementation of specific roles may vary from district to district, and these assigned roles are likely shared with other types of school emergencies. Some may choose to assign certain roles (e.g., medical director) at the district level, but all schools within a district should have a CERP and a cardiac emergency response team in place, in addition to the school nurse. In a large school, on a widespread campus, or in those schools with before- and after-school programs including athletics, multiple teams may be needed for an efficient response to a SCA.

Specific team roles include the following:

Medical director: involved in the planning process, familiar with available medical resources, and aware of SCA recognition and treatment. The director may write prescriptions for AEDs, if needed, and review the CERP to ensure medical appropriateness.

Coordinator: responsible for helping with budgets, projected timeline, other committee work, and ongoing program oversight.

Team members: those persons that each school identifies in addition to the school nurse to respond when a cardiac or other medical emergency occurs.

Roles within the cardiac emergency team include

- establishing scene safety, recognizing SCA, and immediate care of the victim;
- initiating the chain of survival;
- retrieving emergency equipment; and
- directing EMS to the scene.

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 connect directly to EMS or to a central school office responsible for contacting EMS and activating the school's cardiac emergency response team. School communication networks may connect using telephones, cell phones, walkie-talkies, alarms, and/or an intercom or public address system.

Maintenance and Placement of AEDs and Other Emergency Equipment

One of the first steps in CERP implementation is strategically placing AEDs within the school. In the event of a cardiac emergency, a strategically placed AED is readily accessible so that a rescuer can retrieve it and deliver a shock within 3 minutes of collapse. Based on the 2015 AHA emergency

cardiovascular care guidelines, schools can prioritize campuses for an AED program based on at least one of the following: a reasonable probability of AED use within 5 years of CERP implementation; children, adolescents, or adults in the school considered to be at high risk for SCA; or the unlikelihood to achieve an EMS call-to-shock interval of ≤5 minutes (Hazinski et al., 2004). If sufficient numbers of AEDs are not available or a CERP cannot be established in all schools in a district, priority should be given to schools determined to have the highest probability of SCA and/or to schools at the furthest distance from EMS.

An AED program, in similar fashion to a CERP, includes five components (Hazinski et al., 2004):

- medical oversight,
- appropriate training of anticipated rescuers in CPR and AED use,
- coordination with EMS,
- AED maintenance (battery and pads), and
- an ongoing quality improvement program to monitor training and evaluate response with each use of the AED.

Emergency equipment may vary by school, depending on the emergencies for which they are preparing. For a SCA, the minimum is a working AED, a CPR mask/face shield, scissors, razor, latex-free gloves, and paper towels.

Distribution of the Plan Throughout the School Campus

For a successful program, all those working within a school system must be aware of the importance of AED accessibility and ongoing CPR training of staff. A school's existing multidisciplinary Health and Wellness Committee or local EMS personnel may assist in setting priorities and establishing the means of CERP implementation within the context of other health-related policies.

A written CERP for treatment of SCA that is well rehearsed through drills will help to ensure an efficient and organized response should a cardiac emergency

occur. This should be distributed to all school faculty and staff at least annually.

Training in CPR/AED Use

Ideally, schools should strive for current training of all staff in first aid, CPR, and AED use. A sufficient number of trained responders—including staff and, in some cases, students—can generally be defined as allowing a rescuer to retrieve and bring emergency equipment to any area of the campus within three minutes of a suspected SCA.

The training should include two critical teaching points:

Ability to recognize the possibility of a SCA: know to call 9-1-1, be familiar with chest compressions, and know the purpose and function of an AED.

Skills practice (psychomotor skills): the level of proficiency gained from CPR skills training is directly related to the amount of time provided for skills practice during training (Cave et al., 2011).

Drills

Involving staff is an important step toward effective CERP implementation. Doing practice drills enhances staff familiarity, and schools are strongly encouraged to practice the CERP using drills throughout each school year (National Association of School Nurses, 2012). A school's model for running other types of drills (fire, lockdown, etc.) can be used. Drills help streamline rapid communication and coordinated responses in the event of a SCA.

Beyond current hands-only CPR training, all school staff can be involved in the CERP by rehearsing (a) when to alert 9-1-1 and other school personnel, (b) how to retrieve an AED and other emergency equipment, (c) how to clear crowds, and (d) how to quickly direct EMS personnel upon arrival at the school.

A drill summary checklist can be utilized for planning purposes and for objective postdrill reviews (available at www.heart.org/cerp). A successful cardiac emergency response drill is

defined as successful completion of the full drill in ≤5 minutes. Schools that have multiple cardiac emergency response teams (e.g., for different wings; for preschool, after-school, or sports programs) should consider multiple venue-specific drills.

Local EMS Integration With the Plan

It is important to work directly with the local emergency response system (including EMS, fire, and police departments) to integrate the CERP into the community's EMS responder protocols. This step includes providing these departments with a copy of the school's CERP, reviewing and coordinating the CERP with them, informing them of the number and location of on-site AEDs, and including them in school drills (U.S. Department of Education, 2013). Development of the school's CERP may also need coordination with campus safety officials, the school nurse and other on-site first responders, administrators, athletic trainers, and other members of the medical team within the school and/or community (Olympia, 2016).

Ongoing and Annual Review and Evaluation of the Plan

Annual Review. An annual review needs to take place, in addition to postincident and postdrill reviews. Included in the annual review are postincident reviews, drill summary checklists, an inventory of emergency supplies, and a record of routine AED maintenance per the manufacturer's guidelines.

Postevent Incident Guidelines. After an incident, the emergency response team meets to review the CERP components and the team's implementation. The goal is to identify those actions consistent with a well-run and well-equipped team and those actions needing improvement or clarification. The CERP should also include a postevent communication plan utilizing specific notification systems for a designated spokesperson to communicate with school staff, students, the media, and the community regarding the outcome of the SCA in a manner that respects the

Table 1. Scan of Related State Laws

As of August 2015, 54 state laws addressed CPR, AEDs, or CERPs in schools.
<ul style="list-style-type: none"> • Only six states require CPR training for all teachers, and in three states it is required only for physical education teachers and coaches. (Apart from these laws, many schools require physical education teachers and coaches to be CPR certified.) • Some of these laws specify that CPR training must include test demonstration on a mannequin, meaning that online course certifications are not accepted. • In states requiring it for all teachers, it may be a requirement for teacher certification and recertification.
Regarding AEDs, 17 states require schools to have an AED, while four states urge schools to have an AED.
<p>Laws related to CERPs are equally varied.</p> <ul style="list-style-type: none"> • Four states require a CERP, while one state encourages a CERP. • In two states, only athletic departments must have a CERP. • Currently, 15 states and the District of Columbia have no laws related to CPR, AEDs, or CERPs.

Note. Education Commission of the States (2015). AED = automated external defibrillator; CERP = cardiac emergency response plan; CPR = cardiopulmonary resuscitation.

victim's confidentiality and dispels false rumors (American Academy of Pediatrics Council on School Health, 2008).

Legal Considerations

There are federal and state Good Samaritan laws (see Table 1) that provide immunity to laypersons who voluntarily provide care during an emergency (Health Resources and Services Administration, 2006; Sutton, 2010). As of publication, we could find no cases of school employees who were found negligent or grossly negligent after using an AED. Rather, legal cases revolve around the failure to summon medical assistance or use an AED after a SCA (*Limones v. School District of Lee County*, 2015; *Thompson v. Rochester Community Schools*, 2006).

In addition, each state has common laws (based on case law or precedent) that may pertain to standards of care and civil liability. Some laws may penalize those who fail to respond. It is best to have legal counsel review the school's CERP in the context of federal and state laws, including specific laws providing legal protection for lay rescuers within their jurisdiction.

School-Sponsored and Shared Use Agreements

In addition to their use as educational facilities, schools often are de facto

community centers where the public congregates for events both school sponsored and otherwise. Outside organizations may have shared use agreements to utilize school property. A modified CERP may be needed to cover these events, taking into account the extent and nature of the use as well as the day and time of the use. An authorized representative of the outside organization and an authorized member of the school administration should sign the modified CERP.

American Heart Association Recommendations

While good starting points, the mere presence of an AED and/or bystanders with CPR training is not adequate should a SCA occur. Development of the 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,

containing minimum, 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 (similar to fire extinguisher protocols)
- Disseminating the plan throughout the school campus
- Maintaining ongoing staff training in CPR/AED use
- Practicing using drills (akin to fire and lockdown drills)
- Integrating local EMS with the plan
- Ongoing and annual review and evaluation of the plan

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.

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

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Kathleen C. Rose, RN MHA-N NCSN-E

Consulting School Nurse

Cape Coral, Florida

Kathleen has 30 years experience in school nursing with the Lee County (FL) School District. Recently completing her term on the NASN Board of Directors, she is a member of the Florida Association of School Nurses and continues to advocate for school nurses and school nursing as a Consulting School Nurse.

Monica Martin Goble, MD

Pediatric Cardiologist

University of Michigan Congenital

Heart Center

Ann Arbor, Michigan

Dr. Goble is a pediatric cardiologist at CS Mott Children's Hospital and associate professor of medicine at the University of Michigan.

Stuart Berger, MD

Ron Courson, ATC, PT, NRAEMT, CSCS

Gwen Fosse, RN

Randall Gillary, JD

Joe Halowich, MS, MCHES

Julia H. Indik, MD, PhD

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