State of New Hampshire

Department of Safety

Division of Fire Standards and Training and Emergency Medical Services
Richard M. Flynn Fire Academy
98 Smokey Bear Blvd, Concord, New Hampshire
Mailing Address: 33 Hazen Drive, Concord, New Hampshire 03305-0002

John J. Barthelmes
Commissioner

Perry E. Plummer
Director

MEMORANDUM

To: NH School Nurses
NH School Administrators
NH SAU Superintendents

From: NH Bureau of EMS

Re: Public Access Defibrillation Programs in Schools

Many of you may have seen or heard news reports about schools around the country implementing Public Access Defibrillation (PAD) programs which provide for rapid defibrillation of heart attack victims. Interest in school based PAD programs has resulted from many schools being used as a gathering site for large community events and in these circumstances; the likelihood of defibrillator usage is increased. In addition, interest has peaked due to recent technological modifications made by certain defibrillator manufacturers that make it possible to use an automated external defibrillator (AED) on a child under the age of 8 years old.

The Bureau of EMS and the EMS for Children Project at Dartmouth Medical School have developed the attached document to help schools and communities identify issues that should be considered prior to implementing such a program.

Early CPR and defibrillation are major determinates of successful resuscitation from cardiac arrest. When defibrillation is used by the public in an urban setting with widespread knowledge of CPR and a rapid EMS response, short-term survival rates of adult victims have been clinically proven to increase. Although the adult survival rates are promising, there is a need for more research about the long-term survival rates of these patients and the cost effectiveness of PAD programs. Currently, a multi-community study is underway to learn more about the efficacy and cost effectiveness of PAD programs on the adult population.

With this in mind, we urge you to share the enclosed information with your school officials, community leaders, local physicians, and EMS providers to determine if a school based PAD program is appropriate for your school.

If you have questions, please feel free to contact William Wood, Preparedness Coordinator for the Bureau of EMS, 603-223-4228, or email: William.Wood@dos.nh.gov

Public Access Defibrillation in New Hampshire Schools

A Resource Document
Developed by

NH Bureau of Emergency Medical Services

and

EMS for Children Project at Dartmouth Medical School

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NH Bureau of EMS
Toll Free: 1-888-827-5367

33 Hazen Drive, Concord, NH 03305
Business: (603) 271-4568

Background

Although sudden cardiac deaths occur more commonly in adults (225,000 adult deaths annually)[1,] an estimated 5000 to 7000 children (without symptoms) die suddenly in the United States annually.[2] Approximately 1 to 2 children and adolescents (18 years of age or younger) die each year in New Hampshire from diseases affecting the heart. This contrasts with approximately 890 cardiac deaths in adults (21 to 74 years of age) annually in New Hampshire[3]. Current research suggests that the vast majority of sudden cardiac deaths in children and adolescents are directly related to undetected cardiac anomalies.

Cardiac arrest is an abrupt disruption of the heart function causing lack of blood flow to vital organs. Abnormal heart rhythms are the cause of most cardiac arrests. Ventricular fibrillation, a specific type of chaotic heart rhythm, is the most common abnormal rhythm associated with cardiac arrest. The treatment for ventricular fibrillation is defibrillation, shocking the heart into a regular rhythm. Untreated cardiac arrest due to ventricular fibrillation ultimately leads to cardiac death.

The emergency response to cardiac arrest includes early access to emergency medical care, early cardiopulmonary resuscitation (CPR), early defibrillation, and early advanced cardiac life support. Today a new generation of defibrillators, called automated external defibrillators (AEDs), makes it possible for trained lay rescuers to deliver defibrillation. Nationwide and within our state, the concept of public access defibrillation is growing in popularity.

Sudden cardiac death in children and adolescents is a devastating event that raises anxiety and concerns within the general community. The purpose of this document is to provide information that can be helpful to school personnel as they review their current emergency response procedures and consider the use of automated external defibrillators.

What Causes Sudden Cardiac Death in Children and Adolescents?

The most common cardiac causes of sudden death are specific conditions present since birth. These include:

- Hypertrophic cardiomyopathy (an enlargement of the heart)
- Congenital coronary artery anomalies (the blood vessels around the heart are abnormal)
- Aortic stenosis (narrowing of the aorta)
- Other heart abnormalities
- Dysrhythmias (abnormal cardiac rhythms)

Sudden death may also occur in young sports participants with normal hearts when a projectile strikes the child in the chest. This phenomenon is termed *commotio cordis* (heart concussion) and predominantly affects children and adolescents 5 to 15 years of age without preexisting heart disease.[4] *Commotio cordis* has been reported in baseball, ice hockey, lacrosse, softball, and as a consequence of fistfights. This is a very rare cause of sudden death resulting in 45 reported deaths in the U.S. annually.

It is important to note that abnormal cardiac rhythms can also result from body fluid problems. Two examples include:

- Sweating routines to achieve rapid weight loss
- Dehydration resulting from anorexia and bulimia

What are the Risks for Sudden Cardiac Death in Schools?

In general, children and adolescents are at low risk for sudden cardiac arrest. Children less than ten years old experience fewer sudden deaths than older children. Sudden death related to undetected cardiac anomalies appears to occur most often among high school athletes and results in approximately 12 deaths per year in U.S. high school athletes[5]. The chance of a sudden cardiac death in a high school is rare. Based on known probabilities, this chance can be calculated. In a high school of 2,000 students, it is estimated that one cardiac arrest will occur in the student population every 219 years.

Sudden cardiac death occurs much more commonly in adults. For the adult population of 1,000 within a school, a sudden death will occur every 4.38 years. In addition to those adults employed by schools, community groups may use the school building for various events. Many school districts extend the use of school buildings to senior citizens whose population is at greatest risk for sudden cardiac death.

Treatment of Sudden Cardiac Arrest

The American Heart Association has developed a "chain of survival" that provides a framework for emergency response to cardiac events as follows:

- Early Access - to emergency medical care through 911 or other emergency number
- Early Cardiopulmonary Resuscitation (CPR) - to provide oxygen to vital organs, including the brain
- Early Defibrillation - to return the heart to its normal rhythm
- Early Advanced Cardiac Life Support - to stabilize the victim

Sudden cardiac arrest in all patients can lead to ventricular fibrillation. During ventricular fibrillation, the heart's electrical impulses become chaotic and the heart no longer pumps blood effectively. Defibrillation is the definitive treatment for ventricular fibrillation and restores a functional heart rhythm. When a person suffers a sudden cardiac arrest, his or her chance of survival decreases by seven percent to 10 percent for each minute that passes without defibrillation.[6]

Public access defibrillation programs allow trained lay people to use an automated type of defibrillator in combination with CPR. An automated external defibrillator (AED) is a device used to administer electric shock through the chest wall to the heart. Built-in-computers assess the individual's heart rhythm, judge whether defibrillation is needed, and then administer the shock. Audible and/or visible prompts guide the user through the process[7]. To be effective, this shock must be delivered at the earliest time after ventricular fibrillation occurs.

Some medical experts suggest that the use of this new technology in a community wide program might increase the initial survival rate of cardiac arrest victims from two percent to as much as 40 percent. There is ongoing research on the use of AEDs on patients aged 50 years or greater to determine both cost-effectiveness and its ability to increase patient survival rates.

New Hampshire Public Access Defibrillation Program

During the summer of 2002, New Hampshire adopted legislation enabling the public to use automated external defibrillators and obtain training in their use. The legislature encouraged access to AED's in businesses, schools, fire and police departments, and other organizations throughout the state.

The New Hampshire legislation provides individuals and organizations with limited liability. Section 153-A:31 states:

> Any person who, in good faith and without compensation, renders emergency care by the use of an automated external defibrillator shall not be liable for civil damages for any acts or omissions unless the acts or omissions were grossly negligent or willful and wanton. Any person, association, corporation or other organization that acquires and maintains an automated external defibrillator for emergency care shall not be liable for civil damages other than for gross negligence or willful and wonton acts or omissions. This section shall not limit civil liability protection provided by any other law.

To be authorized to use an AED, the public or private organization is required to register the AED with the NH Department of Safety within 30 days of acquisition. Organizations must train every individual expected to use the AED in cardiopulmonary resuscitation and AED use.

Schools as a Location for a Public Access Defibrillation Program

Schools must be prepared to manage medical emergencies. Each school should have a current emergency plan that is periodically updated and practiced with drills and other exercises to test its components. This emergency plan should include policy and procedures on how to handle sudden cardiac arrest in students and adults that both work at and/or routinely visit schools for a variety of reasons, including sporting events. Many communities utilize their school buildings for public meetings and other civic events. Plans should address emergencies occurring during these times also.

The plan to handle sudden cardiac arrests in the school might include implementation of a Public Access Defibrillation (PAD) Program. ***The decision about implementing a PAD Program is a local decision.*** The local board of education should obtain wide community input as communities may want to consider placement of AEDs in sites of highest risk.

Important general considerations include:

- Children and adolescents are at low risk for sudden cardiac arrest
- AEDs must be equipped with special pads for use in children under 8 years of age
- Sudden death related to undetected cardiac anomalies appears to occur most often in high school athletes
- Teaching staff, school support staff, and other adults use school buildings and attend school-sponsored events
- Adults over age 50 are five times more likely to experience sudden cardiac arrest than children and adolescents

School specific factors to consider are:

- Age and cardiac histories of school staff
- Types of activities and events hosted in the school buildings and the populations in attendance
- Types of policies and procedures that are already in place to support student and staff wellness (required physical exams, injury prevention efforts, etc.)
- The attention currently given to the use of protective sports equipment and equipment safety measures
- Whether there is a history of student or staff deaths
- Availability and response times for emergency medical services including 911 access and AED availability among first responders such as police, ambulance and fire departments
- Relative effectiveness of the school's current emergency plan in dealing with sudden cardiac and other emergencies and how the use of AEDs would fit with the rest of the emergency plan
- Consideration of legal issues such as informed consent

Schools need to have a comprehensive emergency response plan, which is coordinated with the local emergency medical service system. If PAD is chosen to be part of the school's emergency plan, it is imperative that adequate planning and support for the program be available. Key elements of a school-based PAD Program include:

- A core emergency response team of trained personnel, including the school nurse, and a method to activate this team
- Scheduling of trained staff to be present whenever school is in session or activities/events are occurring
- A well-defined emergency plan that clearly states all policies and procedures relative to the use of AED
- Strategic placement and availability of the AED unit(s) for access within a 1 to 1.5 minute walk from any location at the school.
- A rapid and effective communication system, especially with regard to events held at remote locations
- Maintenance of CPR certification including the use of AED and review of procedures every 3 - 4 months by appropriate staff
- Regular maintenance of the AED unit(s) according to the manufacturer's specifications
- Periodic testing and repair/replacement of non-functioning units
- Physician oversight to review the school’s PAD program and to review instances of AED use and missed opportunities for AED use

Schools may need more than one AED to maintain the goal of no more than 4 to 5 minutes from the time of the victim’s collapse to defibrillation with the AED. Strategic placement and immediate availability of AEDs as well as trained staff are critical to the school’s PAD program. When determining the number of AEDs needed, the following should be considered:

- Size and physical layout of the building or buildings
- Number and ages of individuals in the building
- Types and locations of athletic events
- Location of curricular and extracurricular events
- Other design features that might be unique to the school facility

How Can Schools Help Reduce the Risk of Sudden Cardiac Death?

The prevention of heart disease in adults begins in childhood. Schools can help promote healthy hearts by encouraging healthful behavior in students and staff. The five major risk factors regarding heart disease are: tobacco use, high cholesterol, elevated blood pressure, obesity, and lack of physical activity. A coordinated school health program offers many effective strategies to address student and staff health promotion and risk reduction strategies.

To help prevent the occurrence of sudden death in young athletes, school sports programs should follow current clinical guidelines for performing a sports pre-participation health evaluation (PPE). Specific information about the PPE can be found in *Care of the Young Athlete* developed by the American Academy of Orthopedic Surgeons (AAOS) and the American Academy of Pediatrics (AAP), 2000.

For Further Information Contact:

New Hampshire Bureau of EMS
Department of Safety
33 Hazen Drive
Concord, NH 03305
Phone: (603) 223-4228
Fax: (603) 271-4567

NH EMS for Children Project
Dartmouth Medical School
1 Medical Center Drive
Lebanon, NH 03766
Phone: (603) 653-1131
Fax: (603) 653-1139

For CPR and AED Training Contact:

- American Heart Association
- American Red Cross
- National Safety Council

References

[1] *Death Rate Statistics: 1999.* American Heart Association. www.americanheart.org. November 2003.

[2] Berger S., Dhala A., Griedberg D.Z. Sudden cardiac death in infants, children and adolescents. *Pediatric Clinics of North America*, Vol. 467(2), April 1999; p.221. (Sudden Infant Death Syndrome (SIDS) deaths are excluded from this estimate.)

[3] New Hampshire State Department of Health and Human Services. Bureau of Health Statistics and Data Management. Data from 1999-2001 (averaged).

[4] Marion B.J., Poliac L.C., Kaplan J.A., Mueller F.O. Blunt impact to the chest leading to sudden death from cardiac arrest during sports activities. *New England Journal of Medicine*.1995; 333: 337-42.

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[6] Statistical data taken from the American Heart Association. *Heartsaver AED*. Dallas, TX: 1998, p.1-4.

[7] *Questions and Answers: AEDs.* American Heart Association. www.americanheart.org. November 2003.