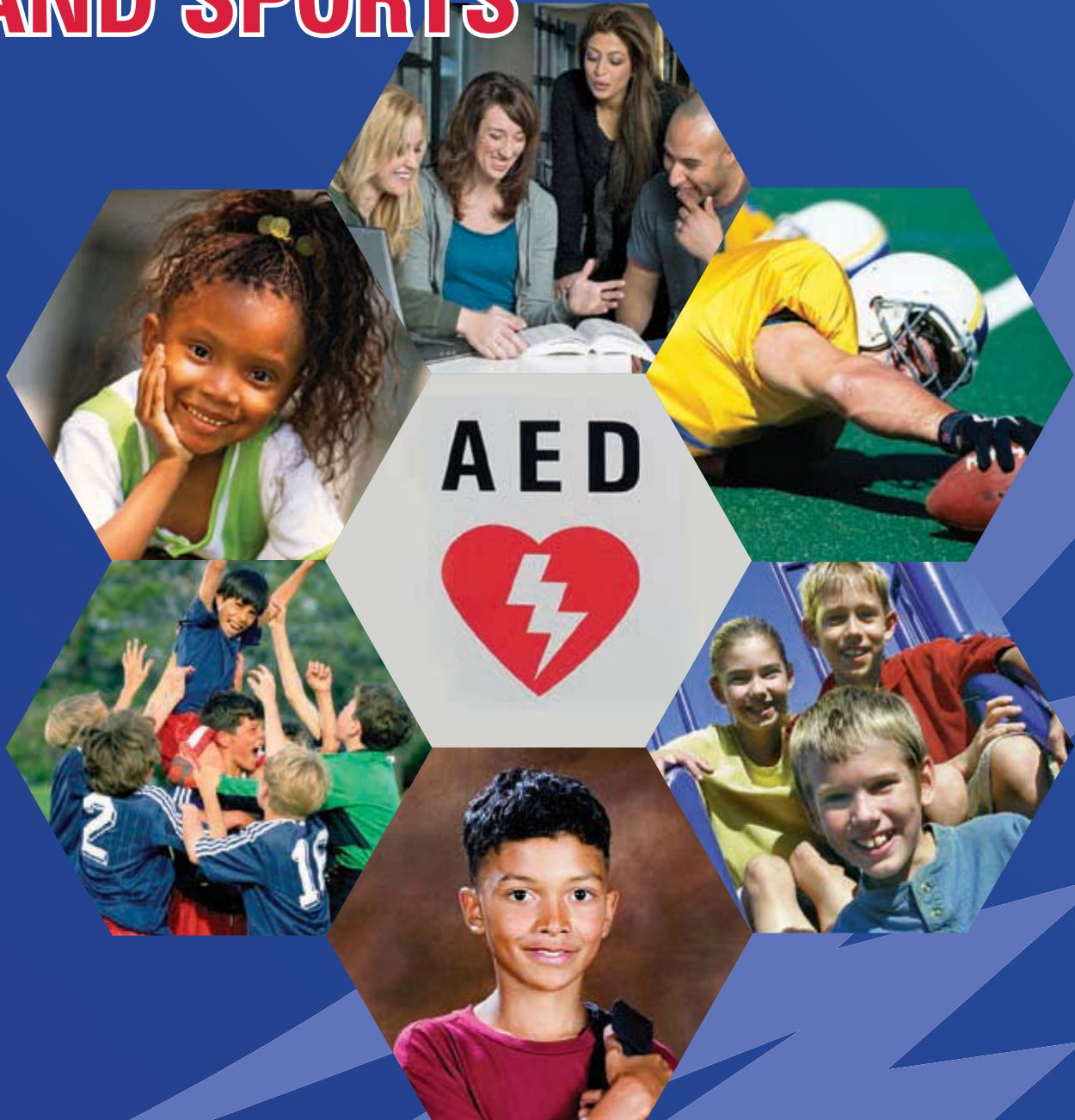


SAVING LIVES IN SCHOOLS AND SPORTS



Sudden Cardiac Arrest Association

POWER AND PASSION... SAVING LIVES

An educational supplement by the Sudden Cardiac Arrest Association

Introduction

By Dr. Vince Mosesso, MD, FACEP



One might ask why we chose to target schools and youth athletics for this educational supplement on the importance of the immediate bystander actions of calling 9-1-1, doing CPR, and using an automated external defibrillator (AED) in the prevention of unnecessary deaths from sudden cardiac arrest (SCA).

After all, those who resist AEDs in schools argue that SCA among school age children and youths is, fortunately, infrequent. A study in the city of Pittsburgh, with a population of 370,000 at the time, found six SCAs in schools over a three year period. Another study focused specifically on SCA in schools in Seattle and King County, WA. The authors found that SCA occurred once per 111 schools annually (1 per 8 colleges, 1 per 125 high schools, and 1 per 200 lower level schools). Not unexpectedly, the great majority occurred in adults—either faculty, staff, or visitors. Considering these numbers, you might ask, “Are schools the right target?”

We think the response is an overwhelming “Yes!” Let’s consider the rationale for saying that AEDs in schools and sports venues are a wise investment:

- SCA must be treated within minutes for a successful outcome. Emergency responders often cannot, and should not, be expected to get to a victim of SCA fast enough wherever he or she is due to notification and response logistics. School athletic facilities can be particularly challenging due to their geographic location, size, and complexity.
- The presence of AEDs in schools, and more precisely, AED programs, improves public awareness of what SCA is, what AEDs are, and the importance of immediate bystander action. This occurs through the transfer of knowledge from students and staff to family and friends and by direct observation of parents and visitors who see and learn about AEDs when they visit the school. As noted, most cardiac arrests in schools occur in adults—both staff and visitors. Many, if not most schools serve as community meeting centers and so sustain high adult traffic during non-school hours.
- We know there are a significant number of young athletes with undetected, underlying heart disease that predisposes them to SCA, especially at times of exertion. It is a moral imperative to be prepared for this event when the life-saving solution is so simple, available, and affordable.

- Although less frequent, many more years of life are lost when a child is stricken down from SCA than an adult. The total years of life lost among young people rivals the total in adults.
- School-based AED programs, together with CPR and AED training of all students (as a requirement for graduation from high school), will generate a culture of understanding of the need for and a willingness to provide immediate assistance to victims of SCA—hopefully for many years after their school years and wherever they encounter SCA.
- A recent study of first responders and physicians staffing sporting events identified 21 episodes of sudden cardiac arrest (SCA) in athletes of all ages. Of the 15 older athletes (*over the age of 30*) who experienced SCA, 78 percent received defibrillation at the scene, and all of these survived to hospital discharge. Of the six younger athletes (*under age 30*) who experienced SCA, 50 percent were successfully defibrillated, and survived to hospital discharge. These results dwarf the survival rates of only 5-7 percent for SCA victims nationwide.
- And finally, AED programs in schools work. In the Seattle study, survival from SCA at schools was a remarkable 39 percent.

Over the past decade, more than 20 states have enacted laws to require AEDs in at least some school and athletic facilities. The debate about their value is quickly put to rest when you hear reports such as two Houston, TX students being revived within a month of each other at the start of the 2008-2009 school year. This supplement provides examples of the successes achievable with proper preparation and deployment of AEDs, but also the unfortunate tragedies in their absence. Other articles provide an easy to understand description of how an AED works and the fundamental principles for an effective public access defibrillation program.

It is now time that we all work together to eliminate preventable deaths from SCA, which continue to occur all too often. Establishing Emergency Action Plans (EAPs) in schools (and school athletic programs) that include response planning, training in CPR, and deployment of AEDs and providing CPR and AED training to all students will greatly reduce the risk that we and our children will face from sudden cardiac arrest.

The bell has rung ... it’s time to act!

1. Frank RL, Rausch MA, Menegazzi JJ, Rickens M. The locations of non-residential out-of-hospital cardiac arrests in the City of Pittsburgh over a three year period: implications for automated external defibrillator placement. *Prehosp Emerg Care* 2001;5(3):247-51.
 2. Lofti K, White L, Rea T et al. Cardiac arrest in schools. *Circulation* 2007;116(12):1374-1379.



Protecting Kids and Saving Lives

No school administrator, teacher, or athletic coach wants to think about the prospect of the injury or death of a child who is under their responsibility. Certainly no one working with young people would knowingly let them play on unsafe playground equipment, sit in a classroom that did not meet building code, or participate in sports without the proper protective gear. The school nurse's office or athletic trainer's equipment box is expected to be stocked with bandages, cold packs, and other standard first aid supplies. Yet every day on school campuses and athletic fields, many of our youth are left unprotected from a public health crisis that the Heart Rhythm Society estimates kills from 5,000 to 7,000 children and young people per year – nearly 20 children per day – and for which there is a simple-to-use device that is becoming a standard of care in public facilities, offices, health clubs, shopping malls, and even many schools. The Sudden Cardiac Arrest Association hopes you will carefully review this material and then take the important step of making sure that CPR skills and an automated external defibrillator (AED) are incorporated into your emergency response program.

Sudden Cardiac Arrest

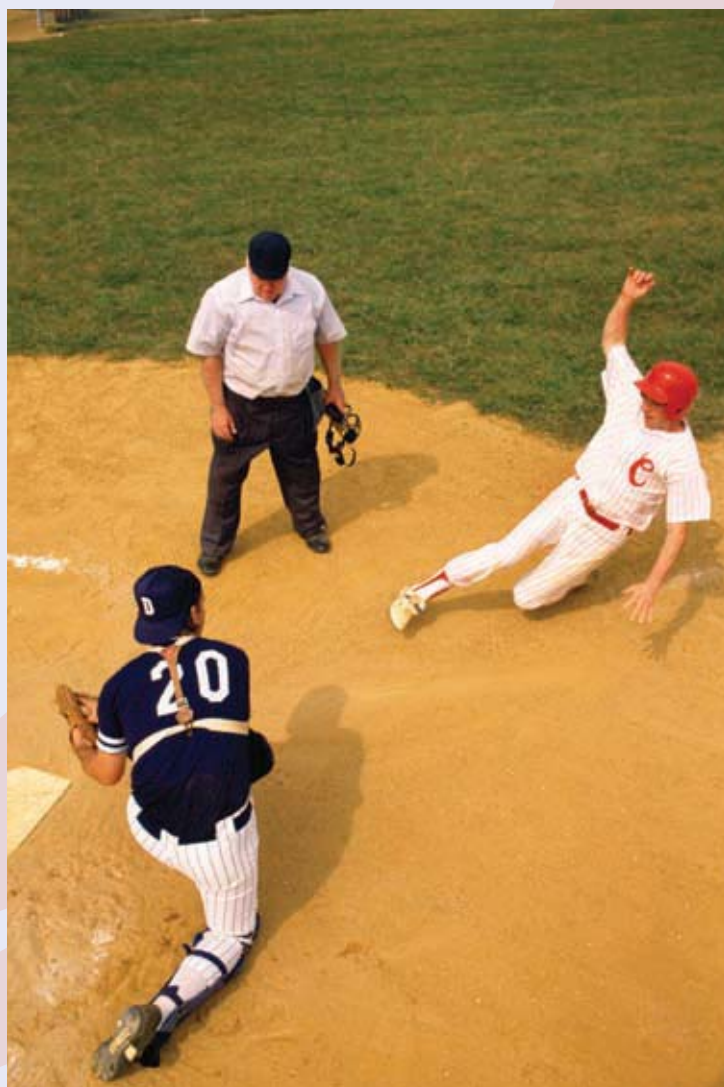
In the United States, sudden cardiac arrest (SCA) affects more than 300,000 people annually and is the leading cause of death, each year killing more than breast cancer, lung cancer, and HIV/AIDS combined. While most SCA deaths occur in adults, SCA is also the leading cause of death in young athletes and can also strike children participating in normal school or sports activity. Even the most healthy-appearing competitive athletes and students may harbor unsuspected cardiovascular disease with the potential to cause sudden death.

The news media routinely report on incidents of students and young athletes collapsing and dying without warning, and the vast majority of those cases are SCA-related. SCA results from a disruption in the heart's electrical system, which generally causes the heart to beat very rapidly (ventricular fibrillation) followed quickly by a lack of a pulse. Victims typically lose consciousness in a matter of seconds. Without immediate CPR to help the heart continue to transport blood to and maintain the supply of oxygen to vital organs, and the shock of an AED to restore the heart's natural rhythm, victims usually die. Waiting for an ambulance or paramedics to arrive is often too late.

The good news is that the simplicity of AEDs make rapid, public response possible. More than 20 states and hundreds of school districts now require AEDs to be standard equipment in at

least some schools and at athletic facilities, and national sports organizations are starting to incorporate sudden cardiac arrest awareness and prevention in their programs. But more needs to be done, and the Sudden Cardiac Arrest Association has developed this material to encourage and assist more school and sports leaders to become a part of this new "standard of care" for protecting our children and young adults.

"Protecting Kids and Saving Lives" continued on page 4



According the American Heart Association, for every minute that passes between cardiac arrest and defibrillation, a person's chance of survival decreases up to 10 percent.

Heart Attack or Sudden Cardiac Arrest?

HEART ATTACK

- A heart attack, or myocardial infarction (MI), is caused by a circulation or **plumbing problem of the heart**, when one (or more) of the arteries delivering blood to the heart is severely reduced or blocked. Oxygen in the blood cannot reach the heart muscle, and the heart muscle becomes damaged.
- This damage to the heart muscle can lead to a malfunction of the heart's electrical system, causing dangerously fast or slow heart rhythms that can cause SCA.
- Many SCAs occur in patients with coronary heart disease. If the patient suffers a heart attack, there is a higher risk for SCA.
- Symptoms of an impending heart attack include chest pain, radiating pain (left arm, between shoulder blades, jaw), difficulty breathing, dizziness, nausea and vomiting, and profuse sweating.



SUDDEN CARDIAC ARREST

- Sudden cardiac arrest (SCA) is a condition that occurs when the heart abruptly ceases to function due to an **electrical problem**. The signals that control the heart's pumping ability suddenly become rapid and irregular, and blood is no longer pumped to the rest of the body.
- There are also mechanical occurrences (with a normal electrical signal) that may precipitate SCA. Sometimes SCA is caused by severe hemorrhage and other issues.
- There are often no warning signs or symptoms.



Protecting Kids and Saving Lives *continued from page 3*

Emergency Action Planning

A consensus statement issued in 2007 by the Inter-Association Task Force on Emergency Preparedness and Management of Sudden Cardiac Arrest in High School and College Athletic Programs recommends that access to an automated external defibrillator (AED) to provide early defibrillation should be part of standard emergency planning for athletic activities. The highlights include:

- Athletic personnel need to recognize the threat of SCA to student athletes and to acknowledge their professional responsibility in developing an adequate response.
- Every school, institution, or athletic program should have a written and structured emergency action plan (EAP) that involves local EMS officials and is specific to the venue.
- The proper management of SCA should make the assumption that athletes who collapse and are unresponsive are victims of SCA until proven otherwise.
- Coaches, officials, and others should be trained and prepared to implement immediate CPR.
- Early defibrillation is essential and a target goal of less than 3-5 minutes from time of collapse to first shock is strongly recommended.

The recommendations conclude with this important statement:

It is critically important to properly prepare for sudden cardiac arrest in school and other athletic venues. Institutions should invest



athletic department "ownership" in emergency preparedness for SCA by involving athletic administration and sport coaches as well as sports medicine personnel. This includes developing a written emergency action plan and reviewing the EAP at least once a year with all athletic personnel, along with CPR, AED, and first aid refresher training. Development and implementation of an EAP ensures that athletes will have the best possible care provided when SCA or another medical emergency situation does arise.

For more information please visit:

<http://www.nata.org/newsrelease/archives/000547.htm>

Case Study: Texas

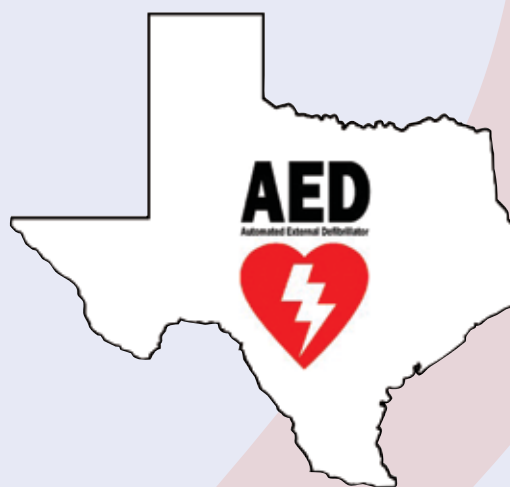
State lawmakers have become increasingly aware of the need to have at least one defibrillator at a school. New York, Colorado, Ohio, and Pennsylvania were among the first states to adopt legislative mandates that in some form, require schools to have an automated external defibrillator (AED). Many states are following suit.

In 2007, Texas passed legislation requiring every public school campus to have an AED, and an individual present who is trained to use the device. Under the new law, schools are required to have an AED available at all University Interscholastic League athletic practices and competitions. Instruction and certification in cardiopulmonary resuscitation (CPR) is also required for some students and school personnel. The enacted legislation followed the deaths of several teenage football players in Houston to SCA and the remarkable story of survival of Matt Nader in Austin.

There are several other key provisions to the law. Schools, school district officials, and others who may be called upon to use the AED in an emergency will have immunity from liability, known widely as Good Samaritan protection. The bill also requires that there be appropriate emergency training, including the development of emergency guidelines.

Funding for the purchase or lease of the defibrillators came from federal grants, public-private partnerships, and state money to cover the \$16 million cost to put the AEDs in more than 8,000 public schools across the state.

For more information on AED-related state legislation, please visit: <http://www.ncsl.org/programs/health/aed.htm>



Matt's Story



Matt Nader was only seventeen on September 15, 2006, when his heart went into ventricular fibrillation during a football game.

He remembers that day so clearly. It was an important game against a major rival. All day he felt unusually nervous about the game. He couldn't shake it. One of his co-captains tried to

joke with him before the game, sensing that Matt wasn't his usual self. He was pensive and felt tired waiting on the sidelines.

Matt remembers going to the sidelines and taking his place on the bench. He asked his coach if he did okay. Did he make his block? His coach told him he did. Matt began to feel a burning sensation in his chest. His vision blurred, and that's the last thing he remembered. He had fallen straight backwards when he lost consciousness. His legs were still up on the bench. His skin was clammy, dusky. His curly hair was soaking wet.

Matt's parents rushed from the stands to the sideline to assist. Not feeling a pulse, they began to administer CPR. The parent of another player on the team and a cardiologist called for the automated external defibrillator that the school had purchased four years earlier and always traveled with the team. After the defibrillator was activated and provided a shock, Matt was breathing again on his own.

Within two days of getting his implantable cardioverter defibrillator (ICD), Matt was back in school. A couple of days later he joined state representative Donna Howard to testify before the University Interscholastic League (UIL) medical advisory board to ask that AEDs be mandatory for all UIL events. Then he was asked to join Lieutenant Governor David Dewhurst at a press conference to announce legislation to get funding for at least one AED in every public school.

Matt quotes Nietzsche, when he says "what doesn't kill you makes you stronger."

Adapted from a guest column by Dr. Barbara Bergin for SCAA.

How an AED Works

When someone collapses from sudden cardiac arrest, damage to the brain and vital organs begins in as little as four minutes if untreated. Often the heart does not stop completely, but goes into ventricular fibrillation, in which the heart quivers rapidly but does not pump blood effectively. A shock from an AED can reverse this condition,

restore the heart's natural rhythm, and prevent permanent damage and death, but is much more effective if it is delivered in the first few minutes after collapse. It is important to perform CPR until the arrival of a defibrillator for use.

Using an AED is easy.
Just follow these simple steps:

- 1 Turn on the AED.
- 2 Attach the electrode pads to the victim's chest.
- 3 Press the ANALYZE button or allow the device to analyze automatically.
- 4 Press the SHOCK button if advised.

Inside the Machine

The AED's computer can tell if the heart is in a treatable rhythm. A shock is only administered if needed.



AED Vital Stats

SIZE: Approximately 3" x 10" x 10"

WEIGHT: 3 to 8 pounds

BATTERIES: Long-lasting lithium with no recharging required

VOICE PROMPTS: Included in all models (many with foreign language options), provide step-by-step instructions automatically when the unit is turned on

VISUAL DISPLAY: Included in some models; assists in coaching the user

LIST PRICE: About \$1,300 to \$2,500 for a single unit

For more information, please visit
www.suddencardiacarrest.org

AEDs in Schools: Are they Effective?

Automated External Defibrillator (AED)

An AED is a small, portable, battery-operated device that uses a computerized algorithm to determine if a person's heart rhythm (based on analysis of ECG recording through two electrodes adhered to the chest wall) should be "shocked," or in medical terms, defibrillated. Defibrillation, the delivery of a brief, high energy electric current through the heart, does not "restart" the heart but rather "stuns" the heart, briefly stopping ventricular fibrillation (VF) and other cardiac electrical activity. If the heart is still viable, its normal pacemakers may then resume firing and produce an effective heartbeat that may ultimately produce adequate blood flow. AEDs have been proven safe as they are very accurate in their rhythm evaluation; it is almost impossible for a person not in cardiac arrest to receive a shock from an AED. Further, these devices are easy for laypersons to use, and provide step-by-step voice and visual prompts once powered on.

An AED should be applied as soon as possible and turned on for rhythm analysis in any collapsed and unresponsive victim. CPR should be implemented while waiting for an AED if not immediately available. Interruptions in chest compressions should be minimized and CPR stopped only for rhythm analysis and shock. CPR should be reinitiated immediately after the first shock with repeat rhythm analysis following two minutes or five cycles of CPR.

Despite the fact that AEDs are becoming more commonplace, misconceptions about them abound, particularly in schools. For instance, many individuals who have conducted training on AEDs find that some people are afraid of trying them out, as they believe they are too complicated to use.

Since one of the challenges in raising AED awareness is getting the public to overcome misconceptions about AEDs, it is important to know what they are and what they do.

An AED often is no bigger or heavier than the average laptop computer, and delivers a small but powerful shock that may be able to reset the heart rhythm of someone in cardiac arrest. Often confused with a heart attack, sudden cardiac arrest happens when the heart abruptly and unexpectedly ceases to function normally and is no longer able to pump oxygen-rich blood to the rest of the body.

Once the adhesive pads are placed on the victim, the AED can monitor the person's heart rhythm, determine if they are in need of a shock, and instruct the user to administer a shock or CPR. All

AEDs roughly work in the same manner, but there may be small differences between different brands. For instance, some devices offer just the basic functions, with a voice prompt telling the user when a victim needs a shock and when to deliver it. Others are more advanced, offering the user CPR coaching, and advising where to put hands and how many compressions to give. The ultra-advanced AEDs give users real-time feedback about improving their CPR skills.

But no matter what type of AED an employer or school gets, one thing is for sure: They all are very easy to use.

The Sudden Cardiac Arrest Association (SCAA) fully supports efforts to require the installation of automated external defibrillators (AEDs) at schools nationwide.

"Public access to AEDs is an appropriate response to the public health crisis of sudden cardiac arrest (SCA), which kills nearly 300,000 Americans each year. Many deaths from SCA can be prevented with rapid response and treatment," said Chris Chiames, SCAA's executive director. "By placing AEDs on school grounds, not only are students safer, so are teachers, staff, administrators, parents, and visitors to school facilities. Equally important, an entire generation of students and their parents are being educated about sudden cardiac arrest and the need for all of us to be prepared to respond to an event through CPR and the use of an AED. The public benefits of such an effort are enormous and as a result, lives will be saved."

"There is ample proof that AEDs save lives, and the public placement of AEDs is a visible and constant reminder that sudden cardiac arrest does not have to have a tragic ending. When people know that there is an AED on the premises, they are not only more inclined to act, but they are also better informed on what to do in such an emergency," said Chiames. "Because SCA can occur anywhere and at anytime, the Sudden Cardiac Arrest Association believes that AEDs should be placed in all kinds of public facilities where people congregate to strengthen the chain of survival, expand access to defibrillation, and decrease the number of deaths from SCA."

Thousands of Americans are alive today because public buildings, police cars, commercial airliners, and other locations are now equipped with AEDs, but that number could be higher with broader AED implementation. Schools are a vital component of our local communities and a natural gathering place.

10-Step AED Program

1 Pick a program coordinator and a medical consultant. A physician's prescription may be necessary to buy an AED. The prescription can come from any licensed MD or DO (such as the school physician, a volunteer parent, or even your own doctor). In the case of an event involving the AED, the physician and program coordinator should review the incident and response, and assess whether any quality-improvement adjustments could be made to the emergency response plan.

2 Review the state laws and regulations. Virtually all U.S. states have Good Samaritan laws that provide immunity from legal liability when using an AED to help someone. Some states also have laws that mandate the presence of an AED in schools or at school events. Laws vary from state to state.

3 Conduct a needs assessment and build a budget. Before you determine what you'll need to buy and the related costs, consider these points:

- It would be ideal to have an AED at every sports event, keeping in mind that different teams may be playing or practicing simultaneously in different locations. Do an assessment on the average number of sports events on any given day to determine how many portable devices your school may need.
- Are phones readily available for anyone in the school to call 9-1-1 at any time, day and evening? If not, consider budgeting for phones as part of the AED program.
- An AED should be placed on the victim within 3 to 5 minutes of collapse. Therefore the unit should be placed where it can be reached within 90 seconds while walking at a fast clip. This will allow you to return to the victim with the device, within the recommended time frame.
- Public-access AEDs are often mounted in cases similar to fire extinguisher cabinets. Cases can be equipped with various features, such as an alarm or auto-dial system that alerts 9-1-1 or security when the door is opened or the device is removed. Basic cabinets start at about \$200.
- Advertising the AED's location is important. If the building layout is complicated, you may need extra signs. You can download the universal AED symbol for free from www.suddencardiacarrest.org.
- Along with each AED, the following items are necessary: a battery; 2 sets of adult electrode pads (additional pediatric pads if desired); and an ancillary equipment pouch holding a towel, scissors, razor, pocket CPR mask, and a pair of non-latex gloves.

4 Seek funding. Identify funding sources, such as booster clubs, local hospitals, or foundations.

5 Select a device. There are a number of companies that manufacture AEDs and a variety of models available. Devices vary slightly in design and price, but they all are reliable and have been approved by the FDA.

6 Select a location. The device should not be locked up in an office; choose a visible location that can be reached whenever people are at the school. Some suggestions: the auditorium, gym, front entry, and outside the nurse's office on the wall.

7 Develop a response plan. Procedures should be written and drills performed. Also, a copy of the plan should be kept with the AED. The procedures manual should address:

- How and when to call 9-1-1.
- Location of AEDs.
- Simple diagram and steps for using the AED.
- Emergency contact numbers and procedures.
- Post-event review forms.

8 Coordinate with EMS. Your local emergency medical services should be made aware of the location of all AEDs in the building, and they can also advise as to whether the program should be registered with the state EMS authority.

9 Conduct training. Ideally, all faculty, staff, students, and users of the school should be trained in CPR and AED use. If this is not possible, identify people such as athletic directors, health teachers, janitorial staff who are around after hours, student leaders, and coaches to be trained first. You can use in-house or outside instructors. Tip: Try your local fire department, hospital, or ambulance services.

10 Create public awareness. Install signs indicating that an AED is available. Conduct assemblies and drills for occupants of the building. Send letters to parents and groups that use the school facilities (e.g., community sports teams, voting commissions, social programs) to convey:

- The location of all AEDs.
- How to contact 9-1-1.
- That they are allowed to use the AEDs.
- That AEDs are simple and safe to use.
- That when an AED is turned on, the voice prompts will guide the user through the rescue.

The Shocking Truth About AED Liability

There is a misperception that having an AED places greater liability on the entity that installs the device. AED advocates are sometimes told by school or athletic administrators that they do not want to have AEDs because of the fear of increased liability. SCAA's position, shared by many others in the field, is quite clear on that point of view: it is misguided and incorrect.

Good Samaritan laws exist in virtually all states. This means individuals cannot be held liable for the harm of a victim by providing improper or inadequate care if the harm was not intentional. While most states require EMTs (e.g., firefighters and police) to know how to use AEDs as part of their job description, these states also permit the use of AEDs by non-EMT first responders and laypersons. The inclusion of AED training in basic life support courses and their growing presence at schools, health clubs, offices, churches, airports, and other facilities indicates that the skill of using an AED is no longer "advanced."

There are no known cases of lay bystanders being sued for trying to help, although there have been cases where people or organizations

have been sued for not helping when they could. Furthermore, there is growing case law and legal precedent where entities have been held negligent for *not* having an AED.

It is true that AEDs must be maintained, and someone on site should be assigned the task of routinely checking the battery and monitoring when the AED is taken from its regular storage space to be available on a field trip or athletic competition. Best practices guidelines also recommend periodic staff refresher training and review of the emergency plan, but these are procedures and practices routinely assigned on school campuses and sports organizations as it relates to equipment.

The local or state emergency medical services (EMS) department is generally a good place to start when seeking answers about implementing an AED program and understanding liability issues. But the "fear of liability" issue as an excuse for not having AEDs is not supported or justified.

Act Now!

Tips to Get Youth Mobilized

More than 20 states have already adopted laws advocating emergency training for students in conjunction with AED placement at schools and athletic events. Increasingly, school systems are becoming aware of the need to engage students in preventive education and taking action in health emergencies. What are some easy ways to get students more effectively involved? Following are several tips that can be implemented on a volunteer basis for school community service credit:



- **CPR/AED Training:** Develop a training program to be conducted by students, for students. Wellness or public safety clubs can take the lead in establishing "healthy heart" program modules to ensure that peers are properly trained in CPR and use of an AED. This training may even be extended to include the instruction of elementary school-age children. Many similar programs already exist on the collegiate level, where EMT students conduct emergency medical training for peers.
- **Fundraising:** If funds are not available to your school or athletic program, students can organize and participate in fundraising activities to purchase AEDs and other lifesaving or training equipment. Implementing an AED program is a great project for student-led service organizations, as well as those working on Boy Scout and Girl Scout service awards.
- **Public Speaking:** Students are enthusiastic and passionate advocates for AEDs in schools and community centers. They are very powerful messengers who can speak to community groups and even local or state governments to call for improved emergency response planning, more publicly accessible AEDs, and adopting healthier lifestyles.

AEDs in Schools Save Adult Lives Too

The merits of defibrillators being used as educational tools for cardiac health have been discussed, and the impact on saving the lives of school children and athletes is highlighted in the news media and health journals. The need for AEDs in schools is also being demonstrated by the incidence of adult lives that are saved. A recent Seattle-based study of SCAs in schools found that more than half of the cases were among adults not employed by the school.

As schools are population-centric and ideal sites for community gatherings, they are model locations for emergency preparedness

Darrel Arnold's Story



One would never expect that a young, strapping man would collapse on a baseball field. Marina High School baseball coach Darrel Arnold, just 34, went into cardiac arrest. Lucky for Darrel and for all of us that Paul Renfrow, Bob Marshall, and Amanda Frank were nearby and took control of the situation immediately.

Their training and preparation saved the life of a young baseball coach who the students adore. During an after-school baseball game, walk-on coach and district substitute teacher, Darrel reported to Paul that he wasn't feeling well and that something seemed wrong. Darrel sat down on the field and quickly went into severely labored breathing.

Those present thought he might be having some type of seizure. Cardiac arrest didn't seem likely. Unbeknownst to Darrel at the time, he suffers from a genetic condition affecting his heart. Paul, the athletic director and coach, immediately went into action. He called over the school trainer, Amanda Frank, who quickly assessed the situation and asked a parent to call 9-1-1.

Darrel's color was quickly changing to blue so CPR was started while Bob Marshall retrieved an AED device on campus. Paul began the breathing technique while a grandparent did the compression.

Quickly returning to the scene, Bob connected the AED pads to Darrel. The defibrillator analyzed the heart rhythm, calling for the administration of a shock. The shock worked. Darrel's heart started and he went into a recovery seizure by the time the paramedics arrived just eight minutes after the 9-1-1 call. The paramedics stabilized Darrel, then transported him by ambulance to Huntington Beach Intercommunity Hospital.

Later transferred to the cardiac unit at Hoag Hospital, Darrel was hospitalized for six days. He now has a pacemaker and defibrillator implanted under the skin that will assist him in the event of another emergency.

Darrel is a big man, about 6-feet-4-inches tall, and his colleagues describe him as "a gentle giant." His outcome proves that training, quick response to action, and the right equipment on hand saves lives.

Adapted from a guest column by Dr. Van Riley for the Orange County Register.

planning, and preventive health initiatives, including cardiac care. Some links in the chain of survival are often strongest in school settings, where according to the same study, approximately three-quarters of cardiac arrests were witnessed and received bystander CPR. It concluded that those most likely to benefit from a school-based automated external defibrillator program would be faculty, staff, and adult visitors to the school. By placing AEDs in schools and training students and staff, entire generations of adults will be exposed to, and comfortable with the devices.

Shelly Copeland's Story



Shelly Copeland, a third grade teacher in the Hillsborough County School District in Tampa, Florida, was having a fairly routine spring day when she suffered a sudden cardiac arrest in the classroom. The strong chain of survival at Folsom Elementary School was quickly put to work. One of her students jumped out of his seat and ran to the office to seek help. This prompted the school crisis team to spring into action, immediately performing CPR and using an AED to restore Shelly's natural heart rhythm.

When emergency responders arrived at the scene, Shelly's heart went into ventricular fibrillation again in the ambulance and for a third time in the hospital emergency room. Defibrillators were used each time to stabilize her, but doctors were concerned about the risk of brain damage from poorly-oxygenated blood flow. The team at University Community Hospital made a decision to implement a procedure that is a growing and successful trend in sudden cardiac arrest post-care and recovery, but had never before been tried at the facility. They put Shelly into a *hypothermic coma* to reduce the risk of sustaining permanent neurological damage. The process involves lowering the body temperature enough to help the patient's cardiovascular system recover more effectively by slowing the brain's consumption of oxygen. After 12 days of cardiac care and receiving a pacemaker/defibrillator implant, Shelly is here to share her remarkable story with everyone. But it was the quick action of students and staff and the quick availability of an AED that was the important first step.



School Save

Fifteen-year-old Alex West, a sophomore guard and tackle at Houston's Lamar High School, owes his life to the lifesaving actions and emergency preparedness of his football coaches and trainer. During a summer practice, Alex suffered a cardiac arrest, and learned firsthand about getting a second chance at life.



Coaches Lee Malowitz and Steve “Mac” McDonald, along with trainer Mike Dyer, were able to quickly deploy an AED when Alex collapsed and they determined that his heart had gone into ventricular fibrillation. They were able to revive him using a combination of CPR and a shock from the defibrillator.

Doctors have yet to ascertain the cause of Alex's SCA, but are very certain that fast action saved his life. Malowitz, who performed CPR, says that it takes one life-saving moment to make the training time worthwhile. He and McDonald went to Houston City Council one month following Alex's save and announced a Save a Life Community Heart Training Day, an event which later trained more than 1,000 people in CPR and the use of an AED.

“We were really, really fortunate. We were fortunate we had the machine; we were fortunate everyone there had been through a training session just two weeks prior. Everything came together to where this young man survived and is going to go on to live his life,” said McDonald.

Alex is pictured here with coaches Malowitz and McDonald, who along with team trainer Mike Dyer, were honored with Sudden Cardiac Arrest Association Survivor and Hero awards.

Why Waiting can be Fatal



Matthew Krug was a seemingly healthy and active teenager from the Wilmington, Delaware area. A high school sophomore-to-be, Matt was an avid roller hockey player and swimmer. However, just two days after his 16th birthday, Matt suffered a sudden cardiac arrest while playing basketball at a community swimming pool.

Lifeguards and other staff from the community center were on hand to provide immediate CPR until the emergency medical services arrived to attempt defibrillation. After three shocks with an AED, Matt's heart was restored to a normal heart rhythm.

He was transported to the emergency room of a local hospital for intensive care and then transferred to DuPont Hospital, where he remained in a coma for 12 days. He passed away on July 18th. It was later discovered that Matt suffered from hypertrophic cardiomyopathy (HCM). Although it is a predominantly genetic disease affecting some 1 in 500 people, some cases are not genetically linked. Matt's was the latter case.

The Matthew Krug Foundation, established by Matt's father, is a non-profit organization dedicated to saving lives of young people through immediate response to SCA and early detection of HCM. For more information, please visit www.matthewkrugfoundation.org.

Terms You Should Know

SCA Glossary

angina: chest discomfort from inadequate blood flow through partially blocked coronary artery

angioplasty: reconstitution or recanalization of a blood vessel; may involve balloon dilation or placement of a stent

aorta: the main artery that carries blood away from the heart artery vessel through which blood passes away from the heart to the various parts of the body

arrhythmia: irregular heartbeat or one that is too fast or too slow

atherosclerosis: a build-up of cholesterol or other fatty deposits called plaque that can occur on the inner walls of blood vessels and arteries

atrial fibrillation: an irregular heartbeat that causes a fluttering sensation of the heart

atrioventricular (AV) node: a collection of cells that establish an electrical connection between the otherwise electrically isolated atria and ventricles

automated external defibrillator (AED): a portable electronic device that automatically detects irregular heart rhythms, and if a problem is present, will deliver an electric shock to the heart, allowing it to reestablish a normal rhythm

bradycardia: slowness of the heartbeat, as evidenced by slowing of the pulse rate to less than 60 beats per minute in an adult

brugada syndrome: an inherited electrical disease of the heart bundle branch block, which can cause a delay in the conduction of the electrical impulse of the heart to the ventricle

cardiomyopathy: disease of the heart muscle, causes weakening of heart muscle and decreased cardiac output

congenital heart disease: a heart defect present at birth

congestive heart failure: refers to a heart failure condition in which the body has accumulated extra fluid so that the lungs are congested

coronary artery disease (CAD): result of the build-up of plaque deposits on the inner lining of the coronary arteries

defibrillation delivery: of an electric shock to the heart. This helps reestablish normal contraction rhythms in a heart having dangerous arrhythmia or in cardiac arrest

dyspnea: shortness of breath

echocardiogram: the use of ultrasound imaging to view the structure and function of the heart

ejection fraction (EF): the measurement of how much blood is pumped by the ventricles with each heart beat; a rate less than 50% is abnormal

electrocardiogram (EKG or ECG): a method for studying the heart by measuring the electrical impulses of the heart as they are detected on the surface of the body

heart attack: a critical medical situation that occurs when the blood supply to the heart is blocked and death of heart muscle occurs

heart block: impairment of the conduction system of the heart, blocks the heart's electrical pathways

heart failure (HF): a condition where the heart fails in its duties of circulating blood through the lungs and back out to the tissues

hypertension: high blood pressure that is exerted against the walls of blood vessels as blood is pumped through the body

implantable cardioverter defibrillator (ICD): a small battery-powered electrical impulse generator that delivers electrical shocks, or pacing therapy, when the heart suffers arrhythmias. ICDs are implanted through a surgical procedure

long QT syndrome: an inherited electrical disease of the heart

myocardial infraction: irreversible damage to the heart muscle due to a blocked coronary artery

pacemaker: an electrical device which delivers electrical impulses to produce a heartbeat of desired frequency (fixed frequency)

pacing: delivery of electrical stimulation to the heart muscle to produce a heartbeat

palpitation: forcible or irregular pulsation of the heart, usually with an increase in frequency or force, with or without irregularity in rhythm

plaque: a combination of cholesterol, fatty deposits, cellular debris and calcium that form deposits on the inner lining of the coronary arteries

pulse: the rhythmic expansion of an artery that can be felt with the finger on your wrists, neck and temple, reflects the number of times your heart beats each minute

sinus node: the heart's natural pacemaker, produces electrical impulses to keep the heart beating at a healthy pace by causing the heart to contract and pump blood at regular intervals

sudden cardiac arrest: a sudden abrupt loss of the heart's pumping function. The most common cause of the arrest is an irregular heart rhythm (arrhythmia) called ventricular fibrillation (VF), in which the heart ventricles begin to quiver (fibrillate) instead of contract. When this happens, blood is no longer pumped to the rest of the body

syncope: loss of consciousness and postural tone caused by diminished cerebral blood flow

tachycardia: excessive rapidity in the action of the heart, usually above 100 beats per minute in an adult; ventricular tachycardia (VT) occurs within ventricles

valve: membrane in a passage that prevents the reflux of the contents flowing through it

ventricle: the inner chambers of the heart that have thick muscular walls and propel blood out of the heart

ventricular fibrillation (VF): a rapid, disorganized, and chaotic contraction of ventricular muscle accompanied by loss of effective pumping of blood, resulting in loss of consciousness and death if it is not terminated immediately by delivery of shock with a defibrillator

vessel: any channel for carrying a fluid, such as blood vessels, which include arteries, arterioles, capillaries, venules and veins

wolff-parkinson-white syndrome: a syndrome with abnormal ECG and where aberrant conducting pathways allow inappropriate transmission of signals from the atria to the ventricles or back to the atria from the ventricles

The Chain of Survival: What is it?

As awareness of sudden cardiac arrest continues to be spread, there are several integral factors which contribute to the survival of these events.

Taking early action is lifesaving.



1 Early Recognition

Witnessing an emergency event, making an immediate assessment of the situation, and deciding to act.

2 Early Access

Confirming unresponsiveness and calling 9-1-1 or on-site emergency responders and following the instructions of the emergency dispatcher.

3 Early CPR

Beginning cardio-pulmonary resuscitation (CPR) immediately.

4 Early Defibrillation

Immediately retrieving and using an automated external defibrillator (AED) to restore the heart back into normal rhythm.

5 Early Advanced Care

Emergency medical services (EMS) responders begin immediate advanced life support including additional resuscitative measures and/or other therapies.

6 Early Follow-Up Care

Seeking and receiving effective follow-up care after a sudden cardiac arrest.

Sudden Cardiac Arrest Facts

Did you know...

- Sudden cardiac arrest (SCA) is the leading cause of death in the United States, claiming approximately 300,000 lives each year (about 1,000 people a day).
- SCA victims usually collapse suddenly, without warning, and become unconscious. SCA leads to death if it is not treated immediately.
- SCA is not the same as a heart attack. Heart attack victims usually experience chest pain and are conscious.
- On average, only six percent of sudden cardiac arrest victims in the United States survive. But in some settings, survival rates of 20 percent have been achieved. If the chain of survival were properly implemented in our communities, more than 68,000 additional lives could be saved each year.
- The rationale for widespread deployment of automated external defibrillators (AEDs) is this: electrical therapy must be delivered immediately (ideally within five minutes of collapse) for it to be effective. Even the best emergency medical services (EMS) systems do not usually get to the scene this quickly.
- Victims of sudden cardiac arrest who collapse in public places are more likely than those who collapse at home to receive CPR and defibrillation, and to survive.
- Learning to use an AED is simple and intuitive. Formal training can take place in less than one hour, and even untrained bystanders have been able to use AEDs successfully in actual emergencies.
- The median age for victims of sudden cardiac arrest is 65, but many victims are much younger. Even children and teens have become victims, with the Heart Rhythm Society estimating that 5,000 – 7,000 youth in the U.S. die from SCA each year.
- Many AEDs now cost less than \$1,500.
- Nearly one million Americans now have implantable cardioverter defibrillators (ICDs) which provide 24/7 protection and therapy for patients with high risk of SCA.

Why are Kids at Risk for Sudden Cardiac Arrest?

There are several conditions and events that are indicators or causes of sudden cardiac arrest. Some conditions are congenital, or present at birth. Among these conditions are long QT syndrome, hypertrophic cardiomyopathy (HCM), brugada syndrome, wolff-parkinson-white syndrome, and marfan syndrome. It is estimated that 1 out of every 125 infants is born with heart defects each year in the United States, ranging from holes in the heart, leaky valves, or abnormalities in the heart chambers. Some of these heart defects can prevent the heart from pumping a sufficient amount of blood to the lungs and other body organs, which can cause congestive heart failure. Other affected children may have rapid or irregular heartbeats and rhythms, and it may be difficult to breathe, especially during physical activity. The good news is that there are treatment options for these conditions if detected and diagnosed in time.

HCM

Hypertrophic cardiomyopathy, or HCM, is a congenital condition that causes excessive thickening of the heart muscle that may produce fatal heart rhythm disturbances. It affects as many as 1.5 million Americans, making it the most common cause of sudden cardiac arrest in people under age 30. According to the Hypertrophic Cardiomyopathy Association (HCMA), a young athlete dies from HCM every week, with more than half of the deaths occurring in African-American males.

Long QT (and related syndromes)

Long QT is a disturbance of the heart's electrical system, causing an abnormality of the heart's rhythm. Because of this abnormality, those who are affected are susceptible to sudden fainting (syncope) and in some cases, death. Although most episodes occur during periods of physical exertion, they can occur during emotional stress or even sleep. Death from long QT syndrome is preventable through proper diagnosis and treatment.

Comotio Cordis

Comotio cordis is a rare but potentially fatal phenomenon that can result in sudden cardiac arrest. It can occur when a blunt, but often mild, blow to the area of the chest directly over the heart occurs during a precise moment of the heart's cycle, leading to sudden cardiac arrest. It can happen in baseball, lacrosse, hockey, martial arts, and even kickball. Comotio cordis is sometimes referred to as a "concussion of the heart" and is only treatable with cardiopulmonary resuscitation (CPR) and defibrillation to reverse ventricular fibrillation.



Other Causes

Other causes of SCA in teens include cocaine or stimulant abuse and electrolyte imbalances, including sweating routines for weight loss and eating disorders.

Cardiac screening with an echocardiogram (ECG) is strongly recommended for anyone with a family history of congenital heart disease or those who experience symptoms of:

- Chest pain (exercise related)
- Severe breathlessness
- Palpitations
- Prolonged dizziness
- Fainting/Blackouts (Syncope)

Remember, sometimes the smallest symptoms are the most important ones to regard.

US Lacrosse Gets an A+ for Recommendations on Commotio Cordis

The US Lacrosse Sports Science & Safety Committee has developed recommendations based on the recognition of commotio cordis and the subsequent actions that should be taken to save a life. The first key to survival is the recognition of collapse of an athlete after a blow to the center of the chest. US Lacrosse advises that every state athletic organization and youth sports league should consider adopting the following points in developing an emergency action plan.

1. Establish an emergency action plan, including the training for all team personnel in CPR with AED;
2. Provide quick and easy access to an AED;
3. Teach athletes to avoid being hit directly in the chest by a shot;
4. Educate all team personnel to recognize the mechanisms of commotio cordis;

5. Educate all team personnel in the need for IMMEDIATE CPR if commotio cordis is suspected. The longer the delay in beginning CPR and AED treatment, the greater the likelihood of loss of life;
6. Understand that the current chest protection models, although useful in preventing traumatic injury, will not eliminate the threat of commotio cordis; and
7. Require all protective athletic equipment to meet all appropriate safety standards, if they exist. NOCSAE, ASTM, HECC, PECC are such appropriate bodies.

For more information, please visit:

www.uslacrosse.org/safety/commotio_cordis_position.phtml

Guidelines for Youth Sports

In 2005, a group of cardiac experts including physicians, health care specialists, as well as representatives from industry, government, foundations, and the public sector convened for the 36th Bethesda Conference. This consensus conference focused on trained athletes with identified cardiovascular abnormalities, and the potential risk for fatal cardiac arrest in sports participation.



The experts developed recommendations for competitive participation in a number of physical activities. In the matrix to the right, the lowest total cardiovascular demands (cardiac output and blood pressure) are shown in yellow and the highest in red. Yellow, orange, and red depict low, moderate, and high moderate demands, respectively.

Blood Pressure Load →	High	Bobsledding/Luge, Field Events (throwing), Gymnastics, Martial arts, Sailing, Sport climbing, Water skiing, Weight lifting, Windsurfing	Bodybuilding, Downhill skiing, Skateboarding, Snowboarding, Wrestling	Boxing, Canoeing/ Kayaking, Cycling, Decathlon, Rowing, Speedskating, Triathlon
	Moderate	Archery, Auto racing, Diving, Equestrian, Motorcycling	American football, Field events (jumping), Figure skating, Rodeoing, Rugby, Running (sprint), Surfing, Synchronized swimming	Basketball, Ice hockey, Cross-country skiing (skating technique), Lacrosse, Running (middle distance), Swimming, Team handball
	Low	Billiards, Bowling, Cricket, Curling, Golf, Riflery	Baseball/Softball, Fencing, Table tennis, Volleyball	Badminton, Cross-country skiing (classic technique), Field hockey, Orienteering, Race walking, Racquetball/ Squash, Running (long distance), Soccer, Tennis
		Low	Moderate	High
		Cardiac Output →		



This educational supplement was produced by the Sudden Cardiac Arrest Association (SCAA), a non-profit organization headquartered in Washington, DC. We seek to increase awareness, encourage training for immediate bystander action, increase public access to defibrillation and promote the use of available medical devices and therapies. SCAA members are beneficiaries of improved science and medical technology, coupled with the wisdom and caring of thousands.

For more information, please visit our website at
www.suddencardiacarrest.org



Sudden Cardiac Arrest Association

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