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## Automated External Defibrillators in the Public Domain Am I Ready to Use One?

N.A. Mark Estes III, MD

The majority of deaths yearly in the United States (approximately 1 million) are the result of cardiovascular disease. Many of these deaths occur because of sudden and unexpected disturbances of the normal heart rhythm that result in ineffective pumping of the blood to the brain and other vital organs. Cardiac arrest from these life-threatening disturbances of the heart rhythm is a leading cause of disability and a major source of healthcare costs in the United States. It is estimated that more than 350 000 cases of cardiac arrest occur annually in this country.

Cardiac arrest is usually caused by a disturbance of the cardiac rhythm called “ventricular fibrillation,” wherein the left chamber of the heart develops a very rapid rhythm that prevents blood from pumping out to the body and that is incompatible with life. Immediate therapy with defibrillation is the only effective treatment. Defibrillation involves delivering a shock to the chest wall through adhesive pads or paddles to reestablish a normal cardiac rhythm. Although standard defibrillators must be operated by trained medical

personnel, automated external defibrillators (AEDs) are now available for use by trained medical and minimally trained lay personnel. Using AEDs can result in more cases of survival from cardiac arrest.

### “Chain of Survival” and the Importance of Defibrillation

To improve the prehospital care of victims of cardiac arrest, the American Heart Association has developed the Chain of Survival, wherein a sequence of interventions results in improved survival after a cardiac arrest. These steps include early access to the emergency medical services by calling 911, early cardiopulmonary resuscitation (CPR) when needed, early defibrillation when indicated, and early advanced medical care. Research shows that early defibrillation is the most important single intervention. Immediate defibrillation can result in survival rates of more than 90%. Each minute of cardiac arrest, however, leads to a 10% reduction in survival, so early treatment is very important. The AED can be used by trained medical and laypersons in locations such as shopping malls, golf courses, businesses, airports, airplanes, casinos, convention

centers, hotels, sports arenas, and other public locations. Use of the AED by untrained bystanders also can lead to improved survival for victims of cardiac arrest.

### AED Design and Function

AEDs are lightweight, portable devices containing a battery, capacitors, and electronic circuitry to analyze the cardiac rhythm and inform the operator when a defibrillation shock is needed. The adhesive electrode pads that are placed on the victim’s chest are used to monitor the heart rhythm and to deliver a shock when needed. These devices have been shown to be extremely safe and have neither delivered any inappropriate shocks to patients nor caused harm to users or bystanders. They are highly accurate in detecting life-threatening heart rhythms and are effective in delivering shock therapy.

Laypersons trained in the use of an AED may go for many months or even years without operating an AED. Individuals not trained in AED use may find themselves needing to provide assistance to a victim of cardiac arrest. Because of these considerations, operation of the AED has been made

The information contained in this *Circulation* Cardiology Patient Page is not a substitute for medical advice, and the American Heart Association recommends consultation with your doctor or healthcare professional.

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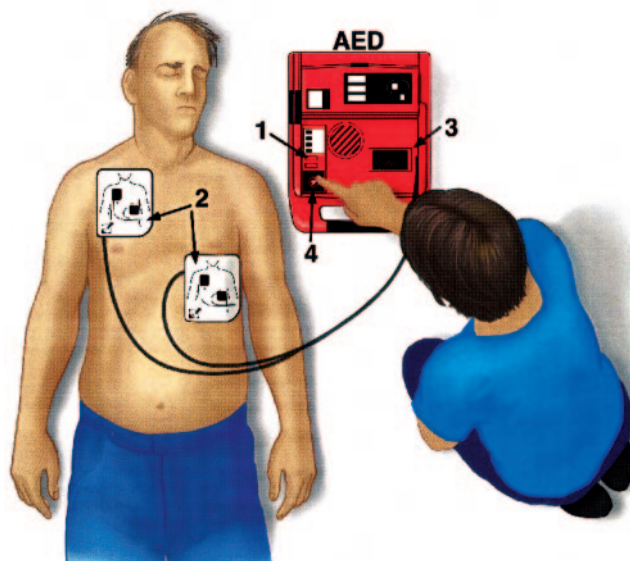
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1. Activate AED.
2. Apply pads.
3. AED analyzes heart rhythm.
4. When prompted by voice command, press shock.



An AED is used on a victim of sudden cardiac arrest. After 911 has been called, the AED is turned on (1). The adhesive pads are then applied (2). The AED automatically analyzes the cardiac rhythm (3). If a life-threatening cardiac rhythm disturbance is present, a voice prompt from the AED advises that a button be pushed to deliver a shock (4).

straightforward to ensure timely delivery of a life-saving shock. After the AED is turned on, self-adhesive electrode pads are applied to the chest wall, as shown in the Figure. When activated, an automated voice inside the AED guides the user through several simple steps. The heart rhythm is automatically interpreted by the AED, and the voice prompt recommends either that a shock be delivered by pushing a button on the device or that monitoring be continued without a shock. AEDs have been designed to markedly reduce the time to defibrillation and minimize the need for training. One study of a mock cardiac arrest showed that the average time to defibrillation from arrival at the scene was only 90 seconds for a group of untrained sixth-grade students compared with 67 seconds for trained emergency medical technicians and paramedics.

### Recognizing a Victim Who May Need an AED

Cardiac arrest strikes immediately and without warning. The victim becomes unresponsive suddenly and collapses. Typically, the victim does not respond when called and shaken gently. The breathing pattern is usually abnormal, and the victim may stop breathing completely. This results in the skin color becoming dusky or blue after a few minutes because of the lack of oxygen. Movements that resemble a seizure may be seen. There are no signs of circulation, and no pulse can be detected. Recognizing the signs of a cardiac arrest is an essential first step in activating the Chain of Survival, followed by notifying emergency medical services by calling 911. This is then followed by early CPR when needed, early defibrillation when indicated, and early advanced medical care.

### Am I Ready to Use One?

The American Heart Association supports the establishment of programs to train and equip lay responders to activate the Chain of Survival and to use the AED in the event of a cardiac arrest. AEDs are commonly placed in public locations because research has shown that their use results in improved survival after cardiac arrest. Because most cardiac arrests occur in the home, it has been suggested that family members of individuals at risk for sudden cardiac arrest should be trained to use the AED. To date, research has not shown whether AEDs used in the home are as effective as they are when used in public locations. Accordingly, the American Heart Association has not recommended broad adoption of home use of the AED. Interested individuals may obtain an AED with a prescription from a physician or over the counter without the need for a prescription. If you elect to purchase a home AED, it is important to have family members properly trained in CPR and use of the AED. It must be remembered that for the person at high risk for sudden cardiac arrest, the treatment of choice is an implanted defibrillator that can detect the development of life-threatening heart rhythm disturbances and automatically deliver a shock. (See also the Cardiology Patient Pages by Reiffel and Dizon, "The Implantable Cardioverter-Defibrillator: Patient Perspective" [*Circulation*. 2002;105:1022–1024], and by Sears et al, "How to Respond to an Implantable-Cardioverter Shock" [*Circulation*. 2005;111:e380–e382].) These implanted devices can be effective even if the sudden cardiac arrest occurs when the victim is alone or asleep or if there is no AED available.

Broad legal protection in the form of "Good Samaritan" laws exists to protect all who purchase and operate an AED. The risk of legal action due to owning or using an AED is minimal. In fact, there may be some legal risk in not providing access to an AED as a matter of prudent protec-



tion in some public locations. The American Heart Association encourages people to discuss their risk for sudden cardiac arrest and the home use of an AED with their physician. This is especially important for those who are not candidates for the implantable defibrillator. Family members of those at risk for sudden cardiac arrest should learn to identify

signs of cardiac arrest, call 911 immediately, and perform CPR.

For more information on AEDs and to you help decide if you can or wish to use one, please consult your doctor.

### **Additional Resources**

American Heart Association. Implementing an AED program. Available at: <http://www.americanheart.org/presenter.jhtml?identifier=3020070>. Accessed November 21, 2005.

American Heart Association. Public access defibrillation trial results reaffirm American Heart Association message on AED programs. Available at: <http://www.americanheart.org/presenter.jhtml?identifier=3024023>. Accessed November 21, 2005.

American Heart Association. AED program implementation resources. Available at: <http://www.americanheart.org/presenter.jhtml?identifier=3027304>. Accessed November 21, 2005.

American Heart Association. AED program implementation resources. Available at: <http://www.americanheart.org/presenter.jhtml?identifier=3027304>. Accessed November 21, 2005.