



TechNote



The U.S. Department of Homeland Security established the System Assessment and Validation for Emergency Responders (SAVER) Program to assist emergency responders making procurement decisions. The SAVER Program conducts unbiased operational tests on commercial equipment and systems and provides those results along with other relevant equipment information to the community in an operationally useful form. SAVER provides information on equipment that falls within the categories listed in the DHS Authorized Equipment List (AEL).

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Automated External Defibrillators

Background

According to 2007 American Red Cross statistics, sudden cardiac arrest claims more than 200,000 lives in the United States annually. Sudden cardiac arrest occurs when the muscles of the heart beat irregularly, causing the interruption of normal blood flow patterns. Without treatment, irreversible brain damage or even death can quickly occur. Cardiopulmonary resuscitation (CPR) increases the chance of survival, but the survival rate can be greatly increased when CPR is used in conjunction with early defibrillation. In defibrillation, an electric shock stops the beating of the heart momentarily, giving it an opportunity to restart with normal rhythms. Chances of survival decrease by about ten percent for each passing minute after sudden cardiac arrest, attesting to the urgency of early defibrillation.

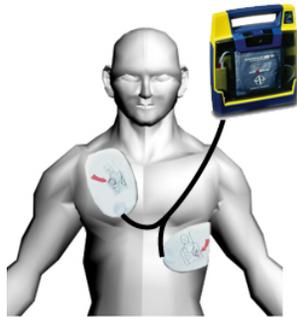
Automated External Defibrillators (AEDs) are portable defibrillation devices used to assess a victim's heart rhythm and determine whether a shock should be administered to attempt to restore a normal heart rhythm. AEDs are lightweight, battery-operated, and transported easily. Many are located within community or public buildings, such as department stores or offices, for quick access. In addition, AEDs are easy to use and require minimal training. Most AED manufacturers provide training videos and literature with the purchase of an AED. Additional training meeting standards set by the American Red Cross or the American Heart Association is also mandated by legislation in a majority of states.



Fundamentals

Each AED has a pair of sensor pads that attach directly to the victim's skin in the sternal-apical position (upper right chest and lower left chest). All AEDs are equipped with adult sensor pads, but most also offer pediatric pads that can be used on children from 1 to 8 years of age. The sensor pads contain electrodes that detect the electrocardiogram (ECG) signal of the victim and feed it to the monitor. The AED analyzes the ECG and determines whether the victim is afflicted with one of several types of heart arrhythmias, such as Ventricular Fibrillation (VF) or Ventricular Tachycardia (VT). If the arrhythmia is deemed "shockable," the AED will transmit a "Shock" message to the rescuer, then either deliver a shock automatically or advise the rescuer to administer a shock by pressing a button. If the AED detects normal heart rhythms or a palpable pulse, a "No Shock Advised" message will be transmitted and no shock will be administered.

After administering a shock, the rescuer should immediately begin CPR. Some AEDs have voice or visual prompts that give CPR instructions, but if instructions are not provided, the rescuer should follow the American Heart Association Guidelines for CPR and AED usage. After about two minutes of CPR, the AED should be used to reanalyze the cardiac rhythm and determine if another shock is necessary. If another shock is not required, CPR should be resumed if there is no pulse.



Choosing an AED

AEDs are manufactured and sold under guidelines approved by the Food and Drug Administration (FDA). Features to consider when choosing an AED include:

- Clear and loud prompts to instruct the rescuer throughout the rescue process.
- Shock advisory and CPR instruction to indicate when a shock is necessary, when to proceed with CPR, and when a second shock may be necessary.
- ECG display to allow the rescuer to view the effects of defibrillation on the victim.
- A daily self-check that indicates audibly if maintenance is needed.
- Nonpolar, preconnected electrodes that allow the sensor pads to be placed on either sternal-apical location.
- A low-charge indicator that audibly indicates when the battery is low.



Operational Considerations

Prior to using an AED, it should be determined that the victim is unresponsive, does not have a pulse, is not lying in water, and is isolated from other people. Once the determination has been made to use the AED, the device is removed from its storage container and positioned near the victim. When the AED is turned ON, voice or visual prompts instruct the rescuer throughout the rescue process. The AED performs a cardiac rhythm analysis on the victim and determines whether a shock is necessary. Some AEDs have a shock override feature that allows a shock to be manually delivered even if a “No Shock Advised” message is transmitted, but this should only be done by a trained professional.

AEDs commonly use one of two waveforms in delivering shock signals: monophasic damped sinusoidal and biphasic truncated exponential, a newer technology. The American Heart Association encourages phasing out models with monophasic damped sinusoidal technology in favor of newer technology. Biphasic truncated exponential waveforms can defibrillate at lower energy levels, which are less stressful on the heart, and can deliver the correct dose of current on the first shock.

A number of factors, such as excessive chest hair, pacemakers, or nearby electrical devices, can interfere with AED cardiac rhythm analysis. To aid the rescuer, some AED kits include a razor for shaving chest hair prior to defibrillation. An AED may have an “artifact detection” feature that minimizes the effects of a pacemaker and electrical device interferences. Movement caused by seizures, irregular breathing, or repositioning the victim can also interfere with AED cardiac rhythm analysis and should be minimized by the rescuer whenever possible.

For More Information

American Heart Association guidelines for AED usage can be found at

http://circ.ahajournals.org/cgi/content/full/112/24_suppl/IV-35

American Red Cross AED training and general information can be found at

<http://www.redcross.org/services/hss/courses/aed.html>

Food and Drug Administration guidelines for approved AEDs can be found at

<http://www.fda.gov/hearthealth/treatments/medicaldevices/aed.html>