Technical Information Bulletin

U.S. Department of Labor
Occupational Safety and Health Administration

Cardiac Arrest and Automated External Defibrillators (AEDs)

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Purpose

1. To inform employers about the use of automated external defibrillators (AEDs), a life-saving technology, in the treatment of cardiac arrest at work.
2. To provide an information resource to aid in decision-making about these devices at individual worksites.

Background

Sixty-one million Americans have cardiovascular disease, resulting in approximately 1 million deaths per year. One-third of these deaths (300,000-400,000) are due to cardiac arrest, the sudden and unexpected loss of heart function. Survival rates for out-of-hospital cardiac arrest are only 1 to 5 percent. Most often cardiac arrest is due to chaotic beating of the heart (ventricular fibrillation), which can be restored to a normal rhythm if treated early with electric shock (defibrillation). Treatment of witnessed ventricular fibrillation with immediate defibrillation can result in greater than 90 percent survival. With each minute of delay in defibrillation, nearly 10 percent fewer survive, so that at 10 minutes, survival is dismal. In June 1999, Chicago's O'Hare and Midway Airports installed automated external defibrillators (AEDs) to respond in 1 minute to cardiac arrest. In the first 10 months, 14 cardiac arrests occurred, and 9 of the 14 victims (64 percent) survived.

Description of Hazard

In 1999 and 2000, 815 out of 6,339 (13 percent) workplace fatalities reported to OSHA were due to sudden cardiac arrest. Work factors that may aggravate or contribute to cardiovascular disease are carbon monoxide, carbon disulfide, halogenated hydrocarbons, smoking, extreme heat or cold, stress, and shift work. Electrical hazards may produce cardiac arrest (ventricular fibrillation). Exposure to noise, lead, or arsenic may produce high blood pressure, increasing the risk for heart disease.

AED Use

Use of automated external defibrillators began in the 1970s, enhancing the ability of emergency medical service personnel to treat cardiac arrest. Defibrillation is just one part of the treatment which also

includes calling for emergency medical service assistance, cardiopulmonary resuscitation, and for the administration of medications and other life support measures. Early defibrillation, however, is the most critical of all the steps because it is definitive therapy for ventricular fibrillation.

AEDs cost between $3,000 and $4,500 plus the expense of maintenance and instruction. The past decade has seen advances in miniaturization and improvement in their reliability and safety. The AED is lightweight, runs on rechargeable batteries, analyzes the heart rhythm, and automatically indicates when to shock. These developments have markedly reduced response time and minimized the need for training. In a study of mock cardiac arrest, the mean time to defibrillation was 67 seconds for trained emergency service technicians while only 90 seconds for untrained sixth-grade students, indicating that even the untrained can use these devices successfully.

Many communities have trained first responders (police and firefighters) to use AEDs. Recognizing the need for faster response, the American Heart Association (AHA) has proposed public access defibrillation (PAD), a program that places AEDs close to the victim (in public places) and uses trained lay personnel for defibrillation. Specifically, the program should be designed to reduce the time to defibrillation to no more than 3-5 minutes. Using this program, a study of cardiac arrest in casinos found that defibrillation by a trained security officer within the first 3 minutes produced a 74 percent survival rate whereas defibrillation more than 3 minutes after collapse had 49 percent survival rate. Another study assessing survival for airline passengers with cardiac arrest found that 92% responded to defibrillation, while 40% survived to go home. In both instances, cardiac arrest victims could be readily observed and treatment initiated almost immediately.

Research on AEDs is ongoing. To determine if trained lay persons are as effective as trained emergency medical service personnel, the National Heart, Lung, and Blood Institute of the National Institutes of Health initiated a study in August 2000 that will be completed in 2003. The study will also look at whether it is realistic and cost-effective to train a large number of people to use these devices.

The Department of Health and Human Services and the General Service Administration published Guidelines for Public Access Defibrillation Programs in Federal Facilities following passage of Public Law 106-505 November 13, 2000, the *Public Health Improvement Act* . The Act authorized placement of AEDs in federal buildings and provided immunity from civil liability for anyone using an AED in a federal building. Several states have adopted legislation that allows a layperson to use an AED and provides legal immunity for proper use.

The American College of Occupational and Environmental Medicine, the professional association representing occupational physicians, has issued guidelines for establishing and managing a workplace AED program.

Conclusions

The sooner defibrillation is started, the more likely the victim will survive. The optimum time for defibrillation is 3 to 5 minutes after the onset of the cardiac arrest. The AED is a safe, effective, easily learned method of treating victims of cardiac arrest.

Recommendations

About 400 workplace deaths from cardiac arrest are reported to OSHA annually. Assuming an average time to defibrillation of 5 minutes would produce a 40 percent survival rate, 160 lives per year could be saved. Employers should consider use of AEDs at their worksites to reduce the time to defibrillation with the goal of improving survival. Consult the American Heart Association (http://www.cpr-ecc.org/Cpr_aed/cpr_aed_menu.htm) for further information on public access defibrillation programs, the American College of Occupational and Environmental Medicine (http://www.acoem.com/paprguid/guides/aed.htm) for guidelines on workplace programs, and OSHA (http://www.osha.gov) for additional documents relating to AEDs.

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