

# ***ELECTRICAL SAFETY SUB GROUP***

## ***USE OF AUTOMATED EXTERNAL DEFIBRILLATORS***

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# Sudden Cardiac Arrest

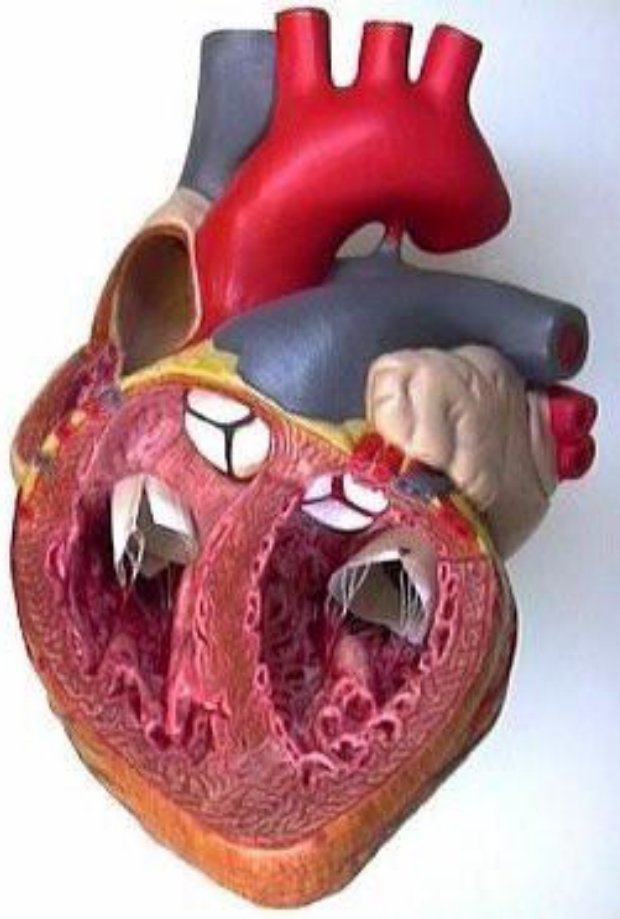


# Sudden Cardiac Arrest

## If someone has collapsed with SCA...

- On average, the wait for an ambulance in populated areas of the United States is about 11 minutes.
- Early defibrillation has emerged as the most important intervention with survival decreasing by 10% with each minute of delay in defibrillation.

# Ventricular Fibrillation (VF)



# Ventricular Fibrillation (VF)

- VF
  - a condition in which the cardiac muscle of the ventricles tremble rather than contract normally
  - a medical emergency
  - if the arrhythmia continues for more than a few seconds, blood circulation will cease, and death will occur within 10 minutes.

# The Chain of Survival

- A sequence of prehospital steps for improved survival after sudden cardiac arrest.
  - **Immediate deployment of emergency medical services**
  - **Prompt cardiopulmonary resuscitation**
  - **Early defibrillation when indicated, and**
  - **Early initiation of advanced medical care.**

# **MODERN AEDS**

- **AEDs require only a simple tutorial to use effectively**
- **AEDs have been deployed in many public places including office buildings, transportation hubs, gyms; police cars, schools, and governmental institutions.**
- **The price of an AED is modest and units sell for as little as \$1000.00.**

# MODERN AEDS

- Modern AEDs have sophisticated diagnostic capabilities
  - Change to a biphasic waveform has greater efficacy and reduces power requirements for defibrillation.
  - Once the AED is activated, and electrode patches are attached the device will evaluate the EKG signal to see if VF has occurred.
  - A low-voltage, 30-kilohertz signal is sent through the two electrodes and a peak detector analyzes the signal.

# MODERN AEDS

To deal with possible confounding rhythms and interferences from such things as pacemakers, atrial fibrillation (a fairly benign condition) or external AC sources the AED defibrillation-detection algorithm performs a simple spectral analysis leading to a tentative diagnosis which is repeated during a three-second window, to produce three diagnoses.

# IMMUNITY FROM LEGAL LIABILITY

- The Federal Cardiac Arrest Survival Act (CASA) 22 encourages AED use in federal buildings.
- CASA provides conditional immunity from legal liability for harm resulting from use or attempted use of an AED by lay responders.

# SECURITY

- Concern - AED's voice recording and internal memory capability could be used to compromise security of information and technology.
  - Analysis indicates the perceived security risk is low in comparison to other cyber security threats.
  - Voice recording - some AED units have background recording capability others do not.
  - Internal memory - EKG and physiological data is used for future technology research. Other devices, i.e., jump drives, disks, etc. are easily concealed and do not require any adaptation to be exploited.
- If necessary, traditional security measures are adequate i.e., secure storage, assignment to cleared personnel, etc.

# MAINTENANCE

## Automated External Defibrillator Maintenance Checklist



Date \_\_\_\_\_ Location \_\_\_\_\_

Inspection Performed by \_\_\_\_\_

Criteria	Status	Corrective Action / Comments
<b>AED</b>		
Placement visible, unobstructed and near phone		
Verify battery installation		
Check the status/ service indicator light		
Note absence of visual/ audible service alarm		
Inspect exterior components and sockets for cracks		
<b>Supplies</b>		
Two sets of AED pads in sealed package		
Check expiration date on pad packages		
Pocket mask with one-way valve		
Examination gloves		
Razors		
Absorbent gauze or hand towels		

*Please refer to manufacturer's User's Manual for more information and proper annual maintenance procedures.*

# Benefits

- 1 per 1,000 adults 35 years of age and older will experience SCA in a given year.
- Ensuring AED availability at Department of Energy (DOE) sites would serve as a means of preventative intervention for over 14,000 DOE employees and 193,000 contract workers.
- The long term survival benefit to victims of SCA is high if treated with **CPR plus Defibrillation** within the first 3-5 minutes after collapse.
- Survival rates as high as 74% are possible if treatment and defibrillation is performed in the first 3 minutes.
- Survival rates are only 5% where no AED programs have been established to provide prompt CPR and defibrillation.

# RESOURCES

- Numerous sources of information exist
  - 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.
  - Department of Health and Human Services and General Services Administration “*Guidelines for Public Access Defibrillation Programs in Federal Facilities*” May 23, 2001
  - 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.

# REFERENCES

- Gallagher, EJ; Lombardi G; Gennis P (December 1995). "Effectiveness of bystander cardiopulmonary resuscitation and survival following out-of-hospital cardiac arrest". *JAMA* 274 (24).
- "CPR statistics" American Heart Association. Accessed 9/3/2008.  
<http://www.americanheart.org/presenter.jhtml?identifier=4483>
- American Medical Association H-440.890 Availability of Automated External Defibrillators (Res. 413, A-02; Res. 424, A-04)
- American Medical Association Medical Student Section 130.002 MSS Use of Automatic External Defibrillators (MSS Sub Res 12, A-98)
- "Idiot-proofing the Defibrillator" By Mark W. Kroll, Karl Kroll, and Byron Gilman First Published November 2008 (IEEE Spectrum)  
<http://spectrum.ieee.org/nov08/6921>
- "Automated External Defibrillation Implementation Guide 2004," *American Heart Association* 70-2272 September 2004.
- "Community Lay Rescuer Automated External Defibrillator Programs," *Journal of the American Medical Association, American Heart Association Circulation, AHA Policy Recommendation*, May 8, 2006.
- Good Samaritan Protections Regarding Emergency, "Use of Automated External Defibrillators, Public Health Improvement Act," Public Law 106-505, Section 404.
- "The Automated External Defibrillator-Clinical Benefits and Legal Liability," *Journal of the American Medical Association*, February 8, 2006.
- Department of Health and Human Services and General Services Administration. "Guidelines for Public Access Defibrillation Programs in Federal Facilities" May 23, 2001.
- Occupational Safety and Health Administration "Cardiac Arrest and Automated External Defibrillators" (AEDs) TIB 01-12-17