

CLINICAL PRACTICE GUIDELINES

## Automatic External Defibrillator: Training and Practical Issues

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resuscitation*

**ABBREVIATIONS**

AED = automatic external defibrillator  
ALS = advanced life support  
BLS = basic life support  
CPR = cardiopulmonary resuscitation  
EMS = emergency medical system  
PAD = public access defibrillation  
VF = ventricular fibrillation  
VT = ventricular tachycardia

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**ABSTRACT**

Sudden cardiac death is the single most important cause of death in the industrialized countries. In general, traditional Emergency Medical Systems (EMS) have been only minimally effective in treating out-of-hospital cardiac arrest, and this occurred mainly due to unacceptably long times from patient collapse to defibrillation. The use of automated external defibrillators (AED) by non-medical personnel, offers an appealing solution of this problem. It can be used safely and effectively by a variety of crews of social security services and public responders who have the potential of approaching the victims of cardiac arrest earlier than the ambulance crews. Therefore time to defibrillation may be shortened. For public access defibrillation (PAD) programs to be effective, they should be integrated into an emergency medical system strategy for treating patients with cardiac arrest. All aspects of implementation should be planned very carefully. Recommended elements for PAD programs include a planned and practiced approach, training of anticipated rescuers in cardiopulmonary resuscitation (CPR) / AED, link with the local EMS, continuous program review and quality improvement. Emphasis should be placed not only on making potential rescuers familiar with CPR/AED practice, but also in giving detailed directives for successful resuscitation of cardiac arrest victims in the specific location where the PAD program has been implemented.

**INTRODUCTION**

Sudden cardiac death is the single most important cause of death in developed countries. Twenty percent of deaths in men and 15% of women are sudden and unexpected. The vast majority of out-of-hospital sudden deaths occur at residential places and only 15% at public places. Approximately 60% of deaths are unwitnessed. Prevention strategies are feasible for high-risk groups of patients with established cardiac disease. Primary prevention is not as easy in the general population because the overall incidence of sudden death is low and it is unexpected in most cases.

Survival of patients suffering sudden cardiac arrest is related to the successful activation of the so-called ‘chain of survival’.<sup>1</sup> Arrest should be recognized immediately and the emergency medical system (EMS) should be activated as soon as possible. Good quality bystander cardiopulmonary resuscitation (CPR) should be performed while ambulance is en route, and defibrillation of ventricular fibrillation (VF)/ pulseless ventricular tachycardia (VT) should be attempted as soon as possible. Finally

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advanced life support (ALS) measures and post resuscitation care including targeted temperature management should be undertaken to complement basic life support (BLS) measures for successful resuscitation. All links of the chain of survival are important for successful resuscitation, but *time to electrical defibrillation* is the single most important determinant of survival after VF cardiac arrest. The possibility of survival after out-of-hospital arrest due to a shockable rhythm is eliminated by approximately 10% for each minute after patient collapse.

In traditional 2-tiered-system EMS, defibrillation was performed by highly trained personnel of the second tier and was therefore considerably delayed. The implementation of *automatic external defibrillators (AEDs)* in the pre-hospital care of victims of cardiac arrest is a major advance. It gives the opportunity for defibrillation to be performed by non-ALS ambulance crews in the first EMS tier. AEDs may be effective even when operated by properly trained police officers, firefighters and lay rescuers who have the potential to be present at the scene of cardiac arrest earlier than ambulance crews. Increased survival of victims of out-of-hospital cardiac arrest has been possible in cases where non-medical rescuers were functioning within organized systems of care that were successful in reducing time to shock.<sup>2-4</sup> Public access defibrillation (PAD) programs were not successful in residential areas where they still face their major challenge.

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#### DESIGNING A PUBLIC ACCESS DEFIBRILLATION (PAD) PROGRAM

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According to current guidelines from the European Resuscitation Council,<sup>1</sup> PAD programs should be actively considered for implementation in public places where cardiac arrests are usually witnessed and trained rescuers are quickly on scene. According to the criteria used in the PAD trial,<sup>2</sup> suitable sites might include those where the probability of cardiac arrest is at least once in every 2 years. In this trial, AEDs were also deployed in places that 1 out-of-hospital cardiac arrest was anticipated during the study period (i.e. sites having >250 adults over 50 years of age present for >16 hours/day).

Location of AEDs within a particular location should be easily accessible but at the same time safe, minimizing the possibility for improper/ unauthorized use, damage or theft. The location must be well known to all trained staff and should be inspected at regular intervals. AEDs should be in close proximity to a telephone so that EMS can be alerted as soon as possible. Additional items that may be necessary to a successful rescue should be stored with the AED: A set of simplified CPR/AED directions, protective gloves, CPR face masks, disposable razors, absorbent towel, blunt end scissors, spare batteries and electrode pads.

The United States authorities have issued detailed guidelines to tackle relevant issues for implementation of PAD in

federal locations:<sup>5</sup>

1. Ascertain Training/Certifying and Retraining Personnel in Cardiopulmonary Resuscitation (CPR) and the Use of the AED
  - Training of healthcare professionals and lay rescuers in the use of AED is challenging. Numerous methods exist to deliver BLS/ AED training. Instructor-led courses are used most frequently. Alternative methods, such as well designed self-instruction programs (e.g., video, DVD, computer driven) with only minimal or no instructor coaching can be equally effective. It is essential that courses include hands-on practice as part of the program.
  - Better outcomes are expected with increasing numbers of personnel who are fully trained. Clustering together trainees that work together is more likely to build a better sense of team and responsibility than individual, separate training.
  - Training should also incorporate elements of 2 rescuer techniques to promote the idea of a “response team” approach.
  - All PAD training programs should include information regarding the needs of the specific PAD program.
  - Refresher training should be conducted at regular intervals
  - Computer-based programs and video teaching materials may be used for more frequent review
  - Aside from re- certification, mock drills and practice sessions should also be deployed.
2. Obtaining Medical Direction / Oversight
  - A physician should act as a consultant in the program.
  - Medical oversight does not mean that a physician is required for PAD program to be held on a day-to-day basis.
  - Physicians can also provide guidance in linking PAD programs with the community and with local EMS and hospital systems
3. Understanding Legal Aspects
  - PAD programs intending to deal with emergent medical situations may end up with victim’s death regardless of the degree of care exercised by those who act as first responders.
  - Probably the most important legal concern for the implementation of a PAD program is the potential liability of lay people responding to an emergent situation.
  - Any PAD program should be reviewed by legal consultation to ensure compliance with local legislation.
4. Development / Regular Review of PAD and Emergency Plan/ Protocols
5. Including a Notification System to Activate Responders
  - Recently, major advances have been achieved in this field with the use of smart phones. Local rescuers can be informed by SMS for the position of the victim, the nearest AED and the roles that each of them should play in treating a certain case of cardiac arrest.
6. Integration with local Security and EMS

## AUTOMATIC EXTERNAL DEFIBRILLATOR

7. Maintaining relevant Equipment on a Regular Basis and After Each Use
8. Development of Quality Assurance and Data/Information
9. Management Plans
10. Development of Measurable Performance Criteria
11. Documentation and Periodic Program Review of New Technologies

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### CONCLUSION

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Public access defibrillation (PAD) programs are effective in saving lives of out-of-hospital cardiac arrest victims. To accomplish this, meticulous care is needed in all aspects of establishing a PAD program: A planned and practiced approach, training of anticipated rescuers in CPR / AED, link with the local EMS and continuous program review and quality improvement.

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