

# The use of automated external defibrillators



**Figure 1.** A victim of sudden cardiac arrest with electrodes attached to the chest from an automated external defibrillator.

Sudden cardiac arrest, particularly from coronary heart disease remains one of the commonest causes of death in the UK and many such deaths occur outside hospital (Resuscitation Council (UK), 2001).

Many cases of sudden cardiac arrest are caused by the onset of ventricular fibrillation (VF) or pulseless ventricular tachycardia (VT). These are shockable heart arrhythmias which can be treated using an automated external defibrillator (AED). Some arrhythmias do not respond to shocks using an AED. Following the onset of VF and VT cardiac output ceases and cerebral hypoxic injury starts within 3 minutes. If complete neurological recovery is to be achieved, early successful defibrillation with a return of spontaneous circulation is needed.

GPs provide the initial medical care for many victims of myocardial infarction (MI), a group of patients at high risk of developing ventricular fibrillation. Approximately 5% of all MI patients experience a cardiac arrest in front of their GP (either in the surgery or at the patient's home) (Colquhoun, 1993).

When cardiac arrest complicates the early stages of acute MI, for example, a rhythm likely to respond to attempted defibrillation is present in 90% of patients. Approximately 60% of those who arrest at home (and 75% of those who arrest on surgery premises) subsequently survive to leave hospital after early defibrillation by their doctor (Resuscitation Council (UK), 2001).

The AED incorporates developments in electronics that make it a different machine from that which most doctors and nurses will remember from their hospital experience. Operation has been simplified, the only requirement of the operator being to attach two adhesive electrodes to the chest wall of the patient and to activate the machine by a single control (Colquhoun, 1993) (Figure 1).

AEDs eliminate the need for training in the complex skills of ECG recognition. The simplicity of operation decreases the time and

*Jane Lambert explains the key things you need to know about resuscitating a patient using an automated external defibrillator*

**Jane Lambert** is Independent Resuscitation Officer, Director of ECG Ltd, a private training company in Milton Keynes. She worked for many years as a Senior NHS Resuscitation Officer

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Figure 2. Algorithm for use of automated external defibrillators (Resuscitation Council (UK), 2005)



**Figure 3. Giving a shock using an automated external defibrillator.**

expense of initial training and increases considerably the range of people who can operate the defibrillator.

Currently, survival from out-of-hospital cardiac arrest in the UK is poor. Ambulance response standards require that an ambulance reaches 75% of cardiac arrests within 8 minutes. But a short time to defibrillation from the onset of collapse is a key predictor of outcome from out-of-hospital cardiac arrest (Woollard-Malcolm, 2001).

The Resuscitation Council (UK) (2005) recommends that every health-care practice should be equipped with an AED and that most health professionals should be trained to use it. The success of defibrillation is time dependent, with the chances of successful defibrillation declining by about 10% every minute attempted defibrillation is delayed.

Guidelines from the Resuscitation Council (UK) (2005) include an algorithm for resuscitation (Figure 2).

### Basic features

Modern AEDs are light, portable, compact, relatively inexpensive and easy to use. Most of the machines perform self-checks and advise if any servicing or replacement of batteries is required.

They use voice and visual prompts to guide rescuers, and are suitable for use by lay rescuers as well as health professionals. There are two types of AED; most are semi-automatic, but a few fully automatic AEDs are available.

All AEDs analyse the patient's rhythm, determine the need for a shock, and then deliver a shock. A semi-automatic AED advises the need for a shock, but this has to be delivered by the operator when prompted (Figure 3).

If practices have their own defibrillator



**Figure 4. Electrodes with diagrams showing where they should be positioned on the chest.**

then this procedure is usually performed early rather than waiting for an ambulance to arrive, therefore increasing the chance of a successful outcome.

### Use

Once cardiac arrest is confirmed cardiopulmonary resuscitation should be started while someone is calling for an ambulance and getting the AED (tasks should be assigned if more than one person is available). If alone, a member of staff may need to call the ambulance and return with the AED before starting CPR.

As soon as the AED arrives, do the following:

- Switch on the AED and attach electrode pads to the chest. Electrodes have a picture of where they are placed (Figure 4)
- If more than one rescuer is present, continue CPR while electrodes are attached (some AEDs switch on automatically once the lid is opened)
- Follow the voice and visual prompts
- Ensure that nobody touches the patient while the AED is analysing the rhythm
- Continue to follow the voice prompts (a shock may or may not be indicated) until either help arrives, or the patient starts to breathe normally, or you become exhausted
- Voice prompts will advise you when to return to CPR.

### Guideline changes

The Resuscitation Council (UK) introduced new guidelines for many aspects of resuscitation in December 2005. These have important implications for the use of the AEDs that general practices currently possess. Two important changes to defibrillation are:

**KEY POINTS**

- The Resuscitation Council (UK) recommends that every healthcare practice should be equipped with an automated external defibrillator
- The success of defibrillation is crucially time dependent, with the chances of successful defibrillation declining by about 10% every minute attempted defibrillation is delayed.
- A short time to defibrillation from the onset of collapse is a key predictor of outcome from out-of-hospital cardiac arrest.
- Modern automated external defibrillators are light, portable, compact, relatively inexpensive and easy to use.
- Automated external defibrillators eliminate the need for training in the complex skills of ECG recognition

**Conflict of interest:**

None

- Place the axillary electrode pad vertically to improve efficiency
- If possible, continue CPR while the pads are being applied.

**A single shock plus CPR**

A third important change to the guidelines is to program the AED to deliver a single shock followed by a pause of 2 minutes for the immediate resumption of CPR.

The old guidelines recommended a repeated series of shocks followed by 2 minutes' CPR. This recommendation was changed because the chances of converting VF in the first shock are as high as 90% (Resuscitation Council (UK), 2005). If the first shock does not convert the VF, this is most likely the result of a lack of oxygen to the heart.

Therefore, practices should contact the company the AED was purchased from to arrange the appropriate changes to the software. This should be done at the earliest opportunity. Until changes are made, the AED should be used in its existing format.

**Can you use an AED on children?**

Most companies who sell AEDs have paediatric pads available for the machine, this will ensure that a lower amount of joules are delivered during defibrillation. Standard AEDs are suitable for use in children older than 8 years. In children between 1 and 8 years paediatric pads should be used if available. If not, the AED should be used as it is. There is insufficient evidence to support a recommendation for or against the use of AEDs in children under 1 year (Resuscitation Council (UK), 2005).

**Training issues**

Most practices visited for training combine both their basic life support and defibrillation training. On the whole it is only clinical staff who attend the defibrillation part of the training, but anyone can be trained to use an AED.

As part of the training, the safety aspects of using an AED are discussed. Staff are familiarized with their machine and then they practice using one of the training AEDs to ensure that they feel confident in its use.

The training is usually concluded by running several scenarios covering all aspects of training so that staff can observe a 'real-speed' demonstration of the sequence of events and actions to be taken in a cardiac arrest situation (Figure 5).



**Figure 5. A 'real-speed' demonstration of resuscitating a patient after a cardiac arrest.**

**Conclusions**

More practices are now being equipped with AEDs. Recommendations from the Resuscitation Council (UK) (2005) are that all practices should have an AED, and a training programme designed to ensure enough staff are able to use it.

An AED can be purchased for about £1400, some companies also offer a leasing scheme.

**Acknowledgment**

Figure 1 is reproduced from the Resuscitation Council (UK)'s AED Algorithm, available online at [www.resus.org.uk/pages/aedalgo.pdf](http://www.resus.org.uk/pages/aedalgo.pdf).

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**Further information**

If your practice does not currently have an AED and you would like to discuss the idea of buying/leasing one, feel free to contact Jane Lambert for advice on 01908 331791. Alternatively contact your current training provider for further information.