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The use of Automated External Defibrillators

Introduction

This chapter contains guidelines for the use of automated external defibrillators (AEDs) by laypeople, first responders and healthcare professionals responding with an AED outside hospital. These guidelines are appropriate for all types of AED, including those that are fully automatic. Guidelines for in-hospital use of AEDs are provided in the electrical therapies section of the advanced life support guidelines.

In the UK approximately 30,000 people sustain cardiac arrest outside hospital and are treated by emergency medical services (EMS) each year.²² Electrical defibrillation is well established as the only effective therapy for cardiac arrest caused by ventricular fibrillation (VF) or pulseless ventricular tachycardia (VT). The scientific evidence to support early defibrillation is overwhelming; the delay from collapse to delivery of the first shock is the single most important determinant of survival. If defibrillation is delivered promptly, survival rates as high as 75% have been reported.^{23, 24} The chances of successful defibrillation decline at a rate of about 10% with each minute of delay;²⁵ basic life support will help to maintain a shockable rhythm but is not a definitive treatment.

The Resuscitation Council (UK) recommends strongly a policy of attempting defibrillation with the minimum of delay in victims of VF/VT cardiac arrest.

Guideline changes

There are no major changes to the sequence of actions for AED users in Guidelines 2010. The ILCOR Consensus on Science and Treatment Recommendations²⁶ makes the following recommendations which are relevant to the RC(UK) AED guidelines:

1. An AED can be used safely and effectively without previous training. Therefore, the use of an AED should not be restricted to trained rescuers. However, training should be encouraged to help improve the time to shock delivery and correct pad placement.
2. Short video/computer self-instruction courses, with minimal or no instructor coaching, combined with **hands-on practice** can be considered as an effective alternative to instructor-led BLS and AED courses. Such courses should be validated to ensure that they achieve equivalent outcomes to instructor led courses.²⁶

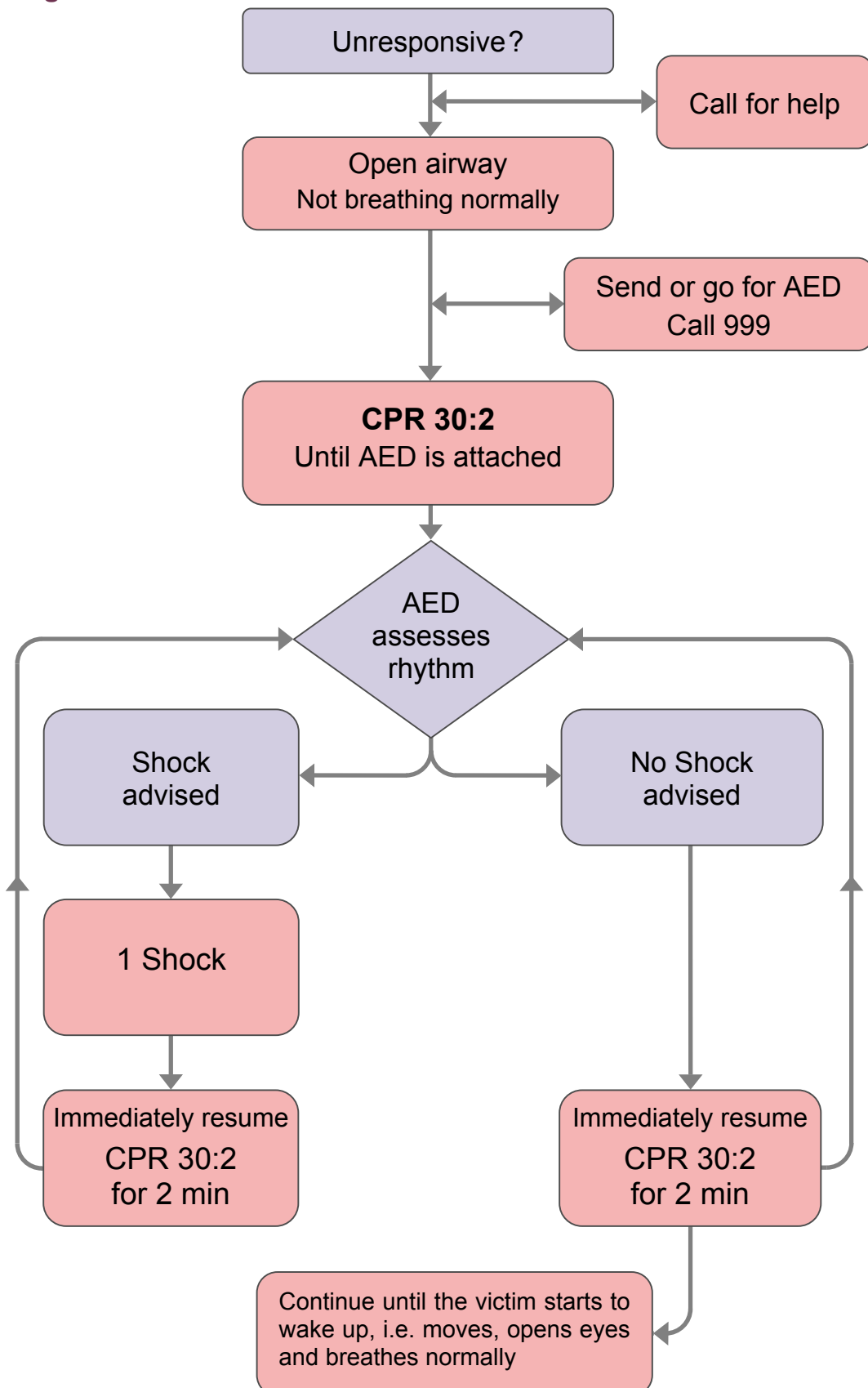
3. When using an AED minimise interruptions in chest compression. Do not stop to check the victim or discontinue cardiopulmonary resuscitation (CPR) unless the victim starts to show signs of regaining consciousness, such as coughing, opening his eyes, speaking, or moving purposefully AND starts to breathe normally.

Types of automated external defibrillator

AEDs are sophisticated, reliable, safe, computerised devices that deliver electric shocks to victims of cardiac arrest when the ECG rhythm is one that is likely to respond to a shock. Simplicity of operation is a key feature: controls are kept to a minimum, voice and visual prompts guide rescuers. Modern AEDs are suitable for use by both lay rescuers and healthcare professionals.

All AEDs analyse the victim's ECG rhythm and determine the need for a shock. The semi-automatic AED indicates the need for a shock, which is delivered by the operator, while the fully automatic AED administers the shock without the need for intervention by the operator. Some semi-automatic AEDs have the facility to enable the operator (normally a healthcare professional) to override the device and deliver a shock manually, independently of prompts.

AED algorithm



Sequence of actions when using an automated external defibrillator

The following sequence applies to the use of both semi-automatic and automatic AEDs in a victim who is found to be unconscious and not breathing normally.

1. **Follow the adult BLS sequence as described in the basic life support chapter. Do not delay starting CPR unless the AED is available immediately.**
2. **As soon as the AED arrives:**
 - If more than one rescuer is present, continue CPR while the AED is switched on. If you are alone, stop CPR and switch on the AED.
 - Follow the voice / visual prompts.
 - Attach the electrode pads to the patient's bare chest.
 - Ensure that nobody touches the victim while the AED is analysing the rhythm.
- 3A. **If a shock is indicated:**
 - Ensure that nobody touches the victim.
 - Push the shock button as directed (fully-automatic AEDs will deliver the shock automatically).
 - Continue as directed by the voice / visual prompts.
 - Minimise, as far as possible, interruptions in chest compression.
- 3B. **If no shock is indicated:**
 - Resume CPR immediately using a ratio of 30 compressions to 2 rescue breaths.
 - Continue as directed by the voice / visual prompts.
4. **Continue to follow the AED prompts until:**
 - qualified help arrives and takes over OR
 - the victim starts to show signs of regaining consciousness, such as coughing, opening his eyes, speaking, or moving purposefully AND starts to breathe normally OR
 - you become exhausted.

Placement of AED pads

Place one AED pad to the right of the sternum (breast bone), below the clavicle (collar bone). Place the other pad in the left mid-axillary line, approximately over the position of the V6 ECG electrode. It is important that this pad is placed sufficiently laterally and that it is clear of any breast tissue.

Although most AED pads are labelled left and right, or carry a picture of their correct placement, it does not matter if their positions are reversed. It is important to teach that if this happens 'in error', the pads should not be removed and replaced because this wastes time and they may not adhere adequately when re-attached.

The victim's chest must be sufficiently exposed to enable correct pad placement. Chest hair will prevent the pads adhering to the skin and will interfere with electrical contact. Shave the chest only if the hair is excessive, and even then spend as little time as possible on this. Do not delay defibrillation if a razor is not immediately available.

Defibrillation if the victim is wet

As long as there is no direct contact between the user and the victim when the shock is delivered, there is no direct pathway that the electricity can take that would cause the user to experience a shock. Dry the victim's chest so that the adhesive AED pads will stick and take particular care to ensure that no one is touching the victim when a shock is delivered.

Defibrillation in the presence of supplemental oxygen

There are no reports of fires caused by sparking where defibrillation was delivered using adhesive pads. If supplemental oxygen is being delivered by a face mask, remove the face mask and place it at least one metre away before delivering a shock. Do not allow this to delay shock delivery.

Minimise interruptions in CPR

The importance of early, uninterrupted chest compressions is emphasised throughout these guidelines. Interrupt CPR only when it is necessary to analyse the rhythm and deliver a shock. When two rescuers are present, the rescuer operating the AED applies the electrodes while the other continues CPR. The AED operator delivers a shock as soon as the shock is advised, ensuring that no one is in contact with the victim.

CPR before defibrillation

Provide good quality CPR while the AED is brought to the scene. Continue CPR whilst the AED is turned on, then follow the voice and visual prompts. Giving a specified period of CPR, as a routine before rhythm analysis and shock delivery, is not recommended.

Voice prompts

The sequence of actions and voice prompts provided by an AED are usually programmable and it is recommended that they be set as follows:

- deliver a single shock when a suitable rhythm is detected;
- no rhythm analysis immediately after the shock;
- a voice prompt for resumption of CPR immediately after the shock;
- a period of 2 min of CPR before further rhythm analysis.

AED use by healthcare professionals

All healthcare professionals should consider the use of an AED to be an integral component of BLS. Early defibrillation should be available throughout all hospitals, outpatient medical facilities and clinics. Sufficient staff should be trained to enable a first shock to be provided within 3 min of collapse anywhere in the hospital. Hospitals should monitor collapse-to-first-shock intervals and monitor resuscitation outcomes.

The RC(UK) advises that untrained employees working in healthcare establishments not be prevented from using an AED if they are confronted with a patient in cardiac arrest. The administration of a defibrillatory shock should not be delayed while waiting for more highly trained personnel to arrive. The same principle should apply to individuals whose certified period of qualification has expired.

Further information on AED use by healthcare professionals is provided in the in-hospital cardiac arrest chapter of these guidelines.

Storage and use of AEDs

AEDs should be stored in locations that are immediately accessible to rescuers; they should not be stored in locked cabinets as this may delay deployment. Use of the [UK standardised AED sign](#) is encouraged, to highlight the location of an AED. People with no previous training have used AEDs safely and effectively. While it is highly desirable that those who may be called upon to use an AED should be trained in their use, and keep their skills up to date, circumstances can dictate that no trained operator (or a trained operator whose certificate of training has expired) is present at the site of an emergency. Under these circumstances no inhibitions should be placed on any person willing to use an AED.

Children

Standard AED pads are suitable for use in children older than 8 years. Special paediatric pads, that attenuate the current delivered during defibrillation, should be used in children aged between 1 and 8 years if they are available; if not, standard adult-sized pads should be used. The use of an AED is not recommended in children aged less than 1 year. However, if an AED is the only defibrillator available its use should be considered (preferably with the paediatric pads described above).

Public access defibrillation (PAD)

Public access defibrillation is the term used to describe the use of AEDs by laypeople.²⁷ Two basic strategies are used. In the first, AEDs are installed in public places and used by people working nearby. Impressive results have been reported with survival rates as high as 74% with fast response times often possible when an AED is nearby.²³

In a complementary strategy, first responders are dispatched by an ambulance control centre when they might reach a patient more quickly than a conventional ambulance. The greater delay in defibrillation resulting from the need for such responders to travel to a patient has been associated with more modest success rates. However, this strategy does enable treatment of people who arrest at home, the commonest place for cardiac arrest to occur.

Further information may be found on the [RC\(UK\) web site](#).