Guidelines for the use of Automated External Defibrillators

Resuscitation Guidelines 2000

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Introduction

Electrical defibrillation is well established as the only effective therapy for cardiac arrest due to ventricular fibrillation (VF) or pulseless ventricular tachycardia (VT). The scientific evidence to support early defibrillation is overwhelming, the single most important determinant of survival being the delay from collapse to delivery of the first shock. The chances of successful defibrillation decline at a rate of 7 - 10% with each minute; basic life support will help to sustain a shockable rhythm but is not a definitive treatment.

The 'chain of survival' concept

The chances of survival following cardiac arrest are considerably improved if appropriate steps are taken to deal with the emergency. These steps are:

- Recognition of cardiac arrest
- Early activation of appropriate emergency services
- Early basic life support
- Early defibrillation
- Early advanced life support
The Resuscitation Council (UK) strongly recommends the implementation of early defibrillation.

Manual defibrillation has been widely available for many years, but the requirement for training in arrhythmia recognition limits the application of this technique to medical practitioners, nurses working in critical care areas and ambulance paramedics.

Recent developments in automated external defibrillators (AEDs) have enabled increasing numbers of individuals to perform defibrillation safely and effectively. Such individuals (designated first responders) include ambulance technicians, general ward nurses, members of first aid and rescue organisations, police officers, fire-fighters, airline cabin crew, security personnel and specially trained members of the public.

Increased provision of early defibrillation through the widespread deployment of AEDs is now considered a realistic strategy for reducing mortality from cardiac arrest due to ischaemic heart disease. The following recommendations are intended to provide guidance to those responsible for the provision of cardiopulmonary resuscitation in various settings.

**Recommendations**

1. **Training in AED use**

   Any individual with responsibility for the management of cardiac arrest in the hospital or community should be trained in, and authorised to perform defibrillation using an AED. Such individuals include:

   - Medical practitioners of all disciplines and seniority
   - Clinical medical students
   - All registered nurses and pre-registration student nurses
   - All emergency ambulance service personnel
   - Occupational first aiders
   - Members of voluntary aid societies and other life saving organisations.

   The Resuscitation Council (UK) also recommends the provision of AEDs and training in early defibrillation for other individuals who may be called upon to provide emergency cardiac arrest management. These might include police officers, fire-fighters, security personnel, airline cabin crew and others.

   AED use by lay bystanders, operating outside a medically controlled system, is an attractive concept, but evidence of the safety and efficacy of this strategy is insufficient to recommend widespread lay use at this time. Therefore, the direct sale of AED equipment to lay individuals who are not part of a medically controlled programme is not supported.

2. **Equipment specification**

   Automated external defibrillators must be totally reliable, simple to operate, of low weight, require little routine maintenance and be competitively priced. Recording facilities are considered essential to facilitate evaluation and audit. Standardisation of consumables (electrode pads etc.), connecting cables,
control switches and testing procedures is strongly recommended. There is no consensus on standards for battery capacity at present. Equipment should be configurable to facilitate upgrading as new guidelines and treatment algorithms are developed.

Monophasic defibrillators should deliver energy in accordance with current advanced life support algorithms (200, 200, 360 joules). Some newer devices deliver lower energy shocks using biphasic waveforms. These are currently undergoing evaluation, and the results to date would support their use.

Because it is occasionally necessary to cut through clothing and/or shave a victim's chest to facilitate electrode placement, it is recommended that AEDs are provided with a sturdy carrying pouch, which should contain spare electrodes, strong scissors and a disposable safety razor, as well as spare electrodes.

3. Organisation of programmes for AED defibrillation

AEDs must be deployed within a medically controlled system under the direction of a suitably experienced medical practitioner. This individual should be a consultant in Accident and Emergency Medicine, Cardiology or Anaesthesia or a doctor from another discipline who has clinical expertise in resuscitation. This "medical director" is responsible for setting and maintaining standards of training and assessment, and ensuring that the competence of AED users is maintained through periodic refresher training. Training and assessment must be provided by appropriately trained individuals, for example doctors, resuscitation training officers, nursing staff, ambulance service trainers and other individuals such as first aid trainers accredited in AED training. The medical director of any AED scheme should ensure that due emphasis is placed on the other components of the 'Chain of Survival'. In particular, AED users must recognise the importance of sending for advanced life support providers if these skills are not already available - in hospital this will usually be the cardiac arrest team, in the community an emergency ambulance. Therefore it is essential that AED operators in the field have their own mobile communication such as radios or mobile telephones. Basic life support skills must be taught, assessed, and refreshed in accordance with current guidelines.

Mechanisms should be in place to audit the use of AEDs. The Utstein style of uniform reporting of resuscitation attempts is recommended. Where AEDs are deployed for use by non-medical personnel such as fire-fighters or security guards, such individuals should report within 48 hours the use of the AED to the medical director (or designated deputy). Each event should be documented using a standardised proforma and the memory module from the AED should be returned for analysis. The medical director should also ensure that appropriate support is available for AED users to receive 'critical incident debriefing' following a resuscitation attempt.
4. Defibrillation by ambulance staff

All emergency ambulances in the United Kingdom are equipped with a defibrillator. In some services ambulance paramedics use manual defibrillators, while technicians exclusively use AEDs. The Resuscitation Council (UK) supports the deployment of defibrillators on all ambulance vehicles which might respond to a cardiac arrest. This includes rapid response cars and motorcycles, and cars provided for use by officers and managers.

It would seem sensible for each ambulance service to deploy a standard model of AED to make it easier for any appropriately trained individual to defibrillate should the need arise. Ambulance paramedics may have the option of manual override, although in practice this is rarely indicated.

The Local Ambulance Paramedic Steering Committee (LAPSC) or equivalent body should take responsibility for ensuring that all ambulance staff providing defibrillation have received the necessary training and assessment, and that clinical audit mechanisms are in place.

Statutory ambulance services may identify, train, and equip first responders to provide basic life support and AED defibrillation prior to the arrival of trained ambulance crews. These individuals will be mobilised by ambulance control prior to the arrival of the ambulance. Ambulance services should be responsible for ensuring that each employee's competence and skill in basic life support and AED use is maintained. Each service should be responsible for insurance and liability arrangements, and for the provision and maintenance of AED equipment.

5. Defibrillation by doctors

In the hospital setting it is recommended that an AED should be placed, wherever possible, on general medical and surgical wards and in other clinical areas so that should a cardiac arrest occur the patient can be defibrillated promptly prior to the arrival of the hospital resuscitation team. It is, therefore, important that both senior and junior hospital doctors in all specialties are familiar with basic life support and the use of an AED. Resuscitation training for clinical medical students should include the use of an AED. Time needs to be formally allocated to train all doctors in the use of an AED. The Medical Director of the hospital must ensure that this training takes place and that competence is maintained. It is unacceptable for patients who suffer cardiac arrest to await the arrival of the cardiac arrest team before a defibrillator is available.

General practitioners should be proficient in basic life support and, certainly when responding to a patient with symptoms of chest pain, should bring an AED with them. There is substantial research to show that general practitioners are capable of performing successful early defibrillation.

6. Defibrillation by registered nurses

Cardiac care unit (CCU) nurses have provided early defibrillation for over thirty years. The Resuscitation Council (UK) recommends the expansion of training in defibrillation to include nurses practising in other clinical areas within the
hospital, including general wards and other departments. This can be achieved using AEDs. Hospitals should develop systems to train and assess the competency of registered nurses in the use of an AED. Directors of Nursing should provide appropriate professional support to enable this development. The UKCC document "The Scope of Professional Practice" (UKCC 1992) provides a framework for this logical and desirable development in nursing practice. Ideally, each general ward and department should be equipped with an AED, more sophisticated equipment (e.g. cardiac arrest trolleys) being located strategically throughout the hospital.

7. Defibrillation by other health care workers

There may be occasions when it is appropriate for staff other than nurses and doctors to defibrillate. This may include physiotherapists supervising cardiac rehabilitation exercise classes, and physiological measurement technicians supervising exercise tests. In the community it may be appropriate to train dental surgeons and pharmacists. These individuals should be trained in defibrillation using an AED.

8. Defibrillation by trained lay first responders

AEDs have been used successfully in the community by lay first responders, including police officers, fire-fighters, security staff, airline cabin crew and members of first aid and rescue organisations. The Resuscitation Council (UK) recommends that AEDs be made available wherever large crowds gather, for example at sports stadiums, pop concerts, theatres, cinemas and shopping complexes. The Council strongly recommends that organisations contemplating deployment of AEDs should seek the advice of a recognised training organisation, for example a statutory ambulance service, a voluntary aid society or equivalent body.

Sequence of actions for automated external defibrillation

1. Arrival of rescuers:
   - If two rescuers are present, assign tasks - defibrillation has priority
   - Fetch AED and activate emergency system.

2. Assess victim:
   - Check response: Gently shake his shoulders and shout
   - Open airway; check for breathing: Tilt head and lift chin
   - Give two effective breaths
   - Check for signs of a circulation
     For lay rescuers this means look, listen and feel for normal breathing, coughing, or movement by the victim. Take no more than 10 seconds to do this.
     For health care providers this will also include checking the carotid pulse.

3A. If signs of a circulation ARE present:
If breathing is present put victim into recovery position
If not breathing start rescue breathing and re-check for a circulation every minute.

3B. If NO signs of a circulation:

Start BLS if defibrillator is not immediately available
- Switch on defibrillator and attach the electrode pads
- Follow spoken/visual directions

Ensure that nobody touches the victim whilst the AED is analysing the rhythm.

4A. If a shock IS indicated:

- Ensure that everybody is clear of the victim
- Push shock button as directed
- Repeat "analyse" or "shock" as directed

Do not perform pulse checks between the first three shocks

- After three shocks check for signs of a circulation:
  1. If NO circulation present:
     - Perform CPR for 1 minute
     - There should be no voice prompts during this time. CPR will be timed by the AED timer - this will usually be four cycles of one-rescuer CPR
     - After 1 minute stop CPR and "analyse" rhythm (most AEDs will automatically initiate this analysis)
     - Continue the AED algorithm as directed by voice and visual prompts.
  2. If signs of a circulation ARE present:
     - Check for breathing
     - If breathing is present, put victim into recovery position
     - If no breathing, start rescue breathing and re-check circulation every minute.

4B. If NO shock indicated:

- Look for signs of a circulation
- If no circulation present, perform CPR for 1 minute

There should be no voice prompts during this time. CPR will be timed by the AED timer - this will usually be four cycles of one-rescuer CPR

- After 1 minute stop CPR and "analyse" rhythm (most AEDs will automatically initiate this analysis)
- Continue the AED algorithm as directed by voice and visual prompts.

5. Continue to follow AED instructions until ALS is available

NOTE:
This algorithm is intended to be used flexibly. Whether BLS is initiated, and the stage at which the AED electrode pads are attached, will depend upon the circumstances of the arrest and the training of the responder. For example, a
lay first responder should normally follow the BLS sequence to the point at which it is determined that there are no signs of a circulation; the AED pads should then be attached. On the other hand, an ambulance paramedic may well be following a protocol that requires the electrodes to be applied to any non-breathing victim before other checks are carried out.

Children

AEDs may be used in children of eight years and older (over approximately 25kg) although experience is currently limited.

AEDs can accurately detect VF in all ages but may be inaccurate in the detection of tachyarrhythmias in infants.

AEDs cannot be recommended for use in children under the age of eight years. Facilities that care for children under this age must provide defibrillators capable of appropriate energy adjustment.

AED algorithm

The AED algorithm is available in Adobe PDF format.