

Resuscitation Service

Providing for Life



Automated External Defibrillator (AED) Handbook

1ST EDITION 2003

Based on the Resuscitation



Council (UK) guidelines 2000

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Automated external defibrillation

Introduction

It is a well documented fact that chances of survival following a sudden cardiac arrest are minimal, ^{(1) (2) (3)}. Resuscitation training is common place in health care with the aim of improving survival rates among victims of cardiac arrest both in the hospital setting and in the community, ^{(4) (5)}.

In Europe cardiovascular disease accounts for around 40% of all deaths under the age of 75 years. One third of patents with coronary artery disease die before reaching hospital. ^{(6) (7)} In most of these deaths the presenting rhythm is ventricular fibrillation or pulseless Ventricular tachycardia. Both of these rhythms are potentially reversible by defibrillation, with each minutes delay before of attempted defibrillation the chance of a successful outcome reduces by 7-10% ⁽⁷⁾

Basic life support can extend the time window for successful defibrillation but is unlikely to revive a casualty and restore a normal perfusing rhythm.

“The Chain of Survival” ^{(7) (8) (2)} has been a well documented model for effective CPR for the past decade. The model, acknowledged as the gold standard of resuscitation practice, sets out the four components required to achieve survival following cardiac arrest; early access to help, early basic life support, early defibrillation and early advanced life support, ^{(8) (6)}.

With the introduction of “the chain of survival”⁽⁸⁾ and the recognition of ventricular fibrillation (VF) as the most common cause of cardiac arrest ⁽⁹⁾ came a change in the nursing role and that of all health care professionals. Rapid defibrillation is considered the only treatment for VF ⁽⁹⁾⁽¹⁰⁾ and for early defibrillation to be a realistic goal of resuscitation, nurses and health care professionals would have to be trained in the use of defibrillators, which had previously been the considered the role of the doctor, ^{(11) (1)}.

The interventions that contribute to a successful outcome have been conceptualized in the form of the “chain of survival”

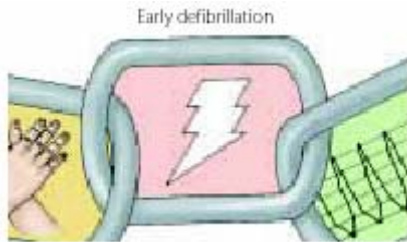


The chain of survival is only as strong as its weakest link and each link is dependent on the others.

The chain of survival is:

- ❖ Early access to the victim
- ❖ Early Basic Life Support
- ❖ Early Defibrillation
- ❖ Early Advanced Life Support

In order to achieve an outcome which means the patient survives with intact neurology all links in the chain must be effective.



Developments in Public Access Defibrillation and first responder defibrillation by health care professionals within the hospital and clinical setting are placing the focus firmly on the third link of the chain of survival. “Healthcare providers with a duty to perform CPR should be trained, equipped and authorised to perform defibrillation”(5)

Definition of defibrillation and its history

Definition:

“ The termination of fibrillation or absence of VF/VT at 5 seconds after shock delivery”

The first documented evidence of a successful defibrillation was reported by Abilgaard in 1775 who induced VF in a chicken and after defibrillation with an



alternating current (AC) shock the bird was reported to have flown off “eluding further experimentation”.

The first successful human defibrillation was performed in 1956 by a cardiologist, Dr Paul Zoll. It was not until 1966 that the first pre hospital defibrillation took place, Professor Frank Pantridge, Consultant Cardiologist at the Royal Victoria Hospital, Belfast developed the first mobile coronary care unit

on board it had a defibrillator that weighed 120lb and was powered by a 12 volt car battery. The “Belfast experience” gained world recognition. By 1969 the first prototype of an AED had been developed and it saw the first successful conversion without a physician, however it was not until 1980 that the first AED were produce commercially. The Metro Centre shopping complex was the first public place within the UK to receive Public access defibrillators, these were installed in April 2000 many places since have received public access defibrillators as part of the national defibrillator program.

What Is an AED



An AED is a small light weight defibrillator that will analyse and interpret the patients heart rhythm and will determine if the patient requires a defibrillatory shock, if so the AED will prepare for its administration. The AEDs contain built-in fail safe computer software which after analysing the rhythm will not deliver an electric shock to a person whose heart does not require defibrillation. Little knowledge is required of the operator apart from recognising and determining cardiac arrest and applying two adhesive pads in the correct position onto the patients bare chest and following the guided step by step prompts of the AED. These may be audible voice prompts or written instructions on the screen of the AED, in some cases it may well be a combination of both depending on the manufacture of the machine.

How to use an AED as part of basic life support

It is important ensure that the environment is safe and that there is no risk to you as the rescuer. You will then need to make a rapid assessment of the patient to establish responsiveness by **squeezing** both shoulders, **shaking** the patient gently and **shouting** into both ears “ are you alright , can you open your eyes”. If there is no response or signs of life from the patient you should then call for help. This can be done in many ways firstly by shouting for help loudly, by pulling emergency buzzers or by using a P.A system to summons help to the scene. You must then go on to assess their Airway, Breathing and Circulation.

Airway

The next step is to check the patient’s airway for signs of obstruction. Many of these patients will vomit either prior to or during their collapse. If you open the airway before checking the mouth you may cause the patient to aspirate which may be detrimental to their outcome. If there is obstruction use suction or other means to try and clear the obstruction. Avoid the use of fingers, as this may be a risk to you. Leave well fitting dentures in place but remove those that are ill fitting.

Now you should open the patients airway using either a head tilt chin lift manoeuvre or jaw thrust in the case of suspected trauma. This will help to ensure that the tongue, the most common cause of airway obstruction, does not obstruct the natural passage of air.



Breathing

Observe the casualty for signs of spontaneous breathing. If possible expose the chest but do not allow this to delay your assessment. Move down to the casualty's level turning your head so you can visualize the

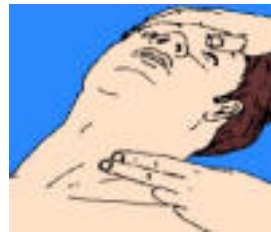


Look, listen and
feel for breathing
and pulse

chest and place your ear over their open mouth. Look, listen and feel for 10 seconds for any sign that the casualty is breathing. If you are a trained health care professional you should also feel for a pulse simultaneously.

Circulation

Checking for a pulse in a collapsed adult is best achieved by the use of the carotid pulse,



as radial pulses may be weak or absent in the very sick patient, although the femoral artery may also be used. To locate the carotid artery, maintain head tilt with one hand on the victim's forehead and locate the trachea with 2 or 3 fingers of the other hand. Slide these fingers into the natural groove between the trachea and the muscles at the side of the neck, where the carotid pulse can usually be felt. It is worth remembering that rescuers require far too much time to perform the pulse check, in one study 50% of the rescuers took 24 seconds to decide whether a pulse was present or not. So it is advisable to also look for any signs of life such as movement, coughing ect, by the patient.

If after 10 seconds you cannot detect any signs of a pulse and or breathing go for help immediately before commencing CPR. On your return from activating emergency help bring with you a pocket mask and if available an AED. On your return do not recheck the casualty for breathing or circulation. If someone has responded to your initial call for help, send him or her to alert the cardiac arrest team or if you are out side of the hospital grounds they may phone for an ambulance and bring back a pocket mask as well as an AED to the scene.

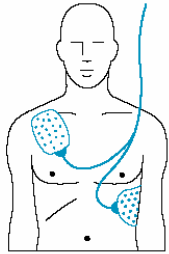
If a AED is immediately brought to the scene of the collapsed patient then it will take priority over basic life support and must be attached to the patient. If there is no AED available then basic life support must be commenced until an AED is mobilised to the patient.

Firstly the AED must be turned on this is done by pressing the on/off switch, the AED will the prompt you to apply the two adhesive pads



to the patients bare chest. The pads must be applied firmly ensuring that there is no air bubbles present.

After this has been done you must plug in the connector which is located at the end of the cable into the AED. There is only one hole in which the connector can be



placed into the AED and it is often highlighted by a flashing light which will be located next to the hole.

If you find that there is poor contact between the pads and the patients bare skin due to excessive chest hair then the hair may be removed the best way that this can be achieved is by pulling the pads off in a swift manner which will result in the majority of hair being removed at the same time, it a bit like waxing!! A new set of

pads can now be applied.

Once the pads are in place and plugged into the AED the machine will prompt you again it will state that it is analysing the patients heart rhythm and that no one should be touching the patient. The reason for this is because if the patient is being moved or chest compression's have been commenced then this will be interpreted by the machine whilst it is analysing and may lead to an inaccurate interpretation of the patients heart rhythm.

After the machine has analysed the patient rhythm it will state **either “shock advised” or “No shock advised”**

If a shock is advised then the machine will prompt you to stand clear and it will automatically select the desired energy and charge. As the operator of the machine you have to ensure the safety of the patient, your self and that of all the other people who may be present.

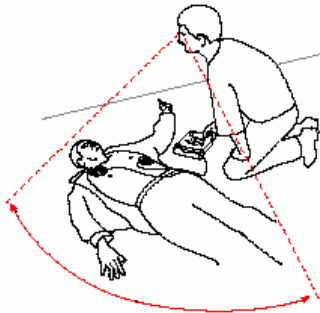
There are three main safety issues with regards to defibrillation,

- 1) The patient should not have fluid on there chest or be in a pool of water.
- 2) Free flowing oxygen should be removed from the patient head and chest area by at least one metre
- 3) There should be no direct or indirect contact with the patient whilst defibrillation is taking place.

The reasons behind these safety issues are if the patients chest is wet then the electricity will remain mostly on the service of the patient chest as opposed to deporizing through the patients chest wall as a result the shock can be ineffective, there is a risk of the electricity arcing . Also if your patient is lying in a pool of water and you are standing in the same pool of water you will defibrillate the patient and shock yourself at the same time.

Oxygen as we know is combustibile as a shock is delivered it may act as an ignition and cause the oxygen to catch light or may cause an explosion. The Oxygen needs to be removed from the patients chest and head area by at least one meter, as long as it has been removed it is safe.

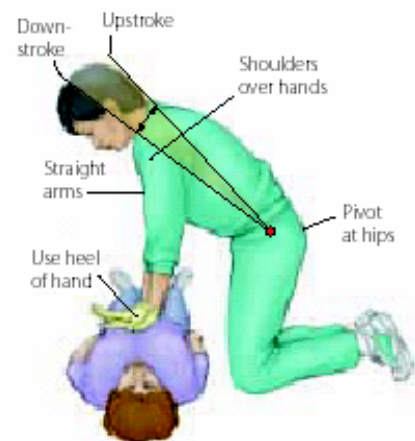
If any person is touching the patient or any thing connected to the patient such as the bed ect. whilst the patient is being defibrillated they two will inadvertently be shocked which may lead to them sustaining a cardiac arrest.



As long as each one of the three main safety issues has been addressed it is safe to prepare to defibrillate the patient. You must shout “STAND CLEAR OXYGEN AWAY” and look around each side of the patient to make sure that no one is in contact with them and shout “SHOCKING” at this time you can press the shock button on the AED.



Your first shock has now been delivered the AED will now reanalyse the patients ECG. After the machine has analysed the patient rhythm it will state either “**shock advised**” or “**No shock advised**” if a shock is advised you must follow the above safety steps and shout “STAND CLEAR OXYGEN AWAY” look around each side of the patient to make sure that no one is in contact with them and shout “SHOCKING” at this time you can press the shock button on the AED, this must happen prior to each shock given to the patient. You will never give more that three shocks in succession, if the shock delivered has been a success or you have given a group of three shocks the AED will now prompt you to reassess your patient and check airway, breathing and circulation. If the patient is not breathing and has no pulse you must commence basic life support at a ratio of 15 compression’s to two effective ventilation’s.

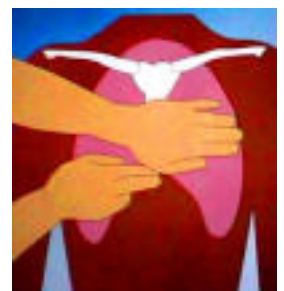


Cardiac Compressions

Proper hand placement is determined by identifying the lower half of the sternum. Find the costal margin and run your fingers along it until you reach the base of the sternum (xiphoid process). The heel of one hand should be placed two fingerbreadths above the xiphoid process. Place the other hand on top the first so that the hands are parallel. Do not compress over the lowest portion of the base of the sternum (xiphoid process).



Fingers may be interlaced or extended but should be kept off the chest.



Lock your elbows, with arms straight and shoulders positioned directly over the patient's chest. The thrust for each chest compression should be straight down on the patient's torso. Depress the chest approximately 4-5 cm with each compression or 1/3 of the chest depth.

The pressure must be released after each compression to allow blood to flow into the chest and heart. Correct hand position should be maintained throughout the compression cycle. Chest compressions provide only about one third of normal cardiac output and this decreases with prolonged CPR. Only by following the recommended guidelines for hand positioning and force with blood flow be optimised during CPR.



Effective ventilation's

We can perform effective rescue breathing by using one of the two following methods: mouth-to-Mask or mouth-to-mouth. Remember **that UCLH Trust has a non mouth to mouth policy**

Effective rescue breaths causes the chest wall to rise and fall with each breath. Exhaled air will give the patient about 16% oxygen which is enough to sustain life in comparison to room air, which is 21% oxygen.

Mouth-to-Mask

A pocket mask device is an apparatus that is placed over a patients mouth and nose. They should have a one-way valve so exhaled air from the victim does not enter the rescuer's mouth and therefore reduces the risk of cross infection, you should then follow these steps:

1. Make sure the victim's head is positioned with the neck extended and the head tilted backward to open the airway.
2. Place the mask over the patient mouth and nose ensure a tight seal to prevent air from escaping by holding the mask with your Thumbs and using your fingers to lift the jaw, and tilt the head. (as shown)
3. Take a deep breath.
4. Slowly blow air into the victim's mouth via the pocket mask until you see the chest rise.
5. Remove your mouth from the mask to allow the air to come out and turn your head away as you take another breath.
6. Repeat one more breath.

If the first two breaths do not go in, retilt the victim's head and try breaths again you have up to five attempts.

- Masks. Thumbs hold mask, fingers lift the jaw, and tilt the head.



Mouth-to-Mouth Method

The mouth-to-mouth method of rescue breathing is the simplest, quickest, and most effective method for providing oxygen to a victim, however there remains a risk of cross infection from the patient to the rescuer! Mouth-to-mouth breathing is preferred over mouth to-nose breathing, especially if there is bleeding from the nose, injury, or blockage.

To perform mouth-to-mouth rescue breathing, follow these steps:

1. Make sure the victim's head is positioned with the neck extended and the head tilted backward to open the airway.
2. Pinch the victim's nose closed to prevent air from escaping, using the same hand that is on the victim's forehead to keep the neck extended.
3. Take a deep breath.
4. Make a tight seal with your mouth around the victim's mouth.
5. Slowly blow air into the victim's mouth until you see the chest rise.
6. Remove your mouth to allow the air to come out and turn your head away as you take another breath.
7. Repeat one more breath.

If the first two breaths do not go in, retilt the victim's head and try breaths again.

Basic life support should be continued until the AED prompts you to stop this will happen after a period of one minute, the AED will state that it is analysing the patient's heart rhythm and that no one should be touching the patient. After the machine has analysed the patient's rhythm it will state **either "shock advised" or "No shock advised"**

If a shock is advised then the shocking sequence will begin again, the machine will prompt you to stand clear and it will automatically select the desired energy and charge, remember as the operator of the AED you have to ensure safety at all times.

If no shock is advised then the machine will prompt you to reassess your patient and check airway, breathing and circulation. If the patient is not breathing and has no pulse you must commence basic life support at a ratio of 15 compression to two effective ventilation's until prompted by the AED again. If however when you reassess the patient they are now breathing and have a pulse you must maintain a clear open airway this can be achieved by head tilt chin lift if required or by placing the patient in the recovery position, you must also administer the patient oxygen if possible. Always leave the AED machine switch on and attached to the patient until expert help arrives as it will constantly monitor your patient.

Moving the Patient into Recovery Position



1. Raise arm nearest you over the head. 2. Tuck the other arm against the victim's side.



3. Adjust victim's legs so they are straight . 4. Support the head and neck with one hand. Firmly grip the clothing or edge of the hip with your other hand. Roll the victim over.

Remember the recovery position is used in the management of patients who are both breathing and have a perfusing circulation but are unresponsive. It aim of this maneuver is to ensure that the airway of the victim is protected from aspiration and/or obstruction. the victim remains in the recovery position for longer than 30 minutes then they should be turned onto the opposite side, regular assessment of the lowermost arm should be made for signs of impaired circulation.

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