PUAOPE010C Operate an automated external defibrillator in an emergency

Learner Guide

What is a cardiac arrest?

A cardiac arrest occurs when the heart suddenly stops beating and the person stops breathing. A cardiac arrest can occur for many reasons including medical conditions and traumatic injuries.

A cardiac arrest patient requires immediate defibrillation and cardio-pulmonary resuscitation (CPR). CPR involves chest compressions and rescue breaths to keep that person 'alive' by enabling oxygen rich blood to flow round their body via the chest compressions mimicking the heart's 'push'.

Defibrillation involves delivering an electrical shock to the heart in order to restore a normal heart rhythm.

What is a heart attack?

A heart attack on the other hand is a condition where the blood supply to the heart muscle itself is compromised. This leads to the heart tissue being starved of oxygen and can lead to tissue death.

The pain from a heart attack arises directly from the starved tissue, and although arising in the centre or left side of the chest, can radiate to the neck and left arm.

A heart attack does not usually result in loss of consciousness. The patient is still breathing and has a pulse (the majority of the heart is able to function and pump blood around the body).

A heart attack can lead to a cardiac arrest when the heart is so damaged it stops beating.

What is defibrillation?

The heart is a muscle which is controlled by electrical activity. Normally, this electrical activity keeps the heart pumping in a co-ordinated way. This co-ordinated electrical activity allows the heart to pump blood around our body.

The heart can sometimes go into a funny rhythm, where all the electrical activity is disorganised and random.

When this happens, the heart is no longer able to pump blood around the body. The funny rhythm is caused by disorganised electrical activity and the pumping action of the heart no longer works. The person will stop breathing and this is a cardiac arrest!

A defibrillator is a device which delivers an electrical shock to the heart to stop all this disorganised electrical activity, this gives the heart a chance to start in a normal rhythm again.

An AED is an Automated External Defibrillator – a defibrillator which can be used by anyone with no medical training as everything is fully automated.

An AED will analyse the heart rhythm in a patient, if appropriate it will then deliver a controlled electrical shock to the patient.

Watch the following video which explains more about defibrillation:

https://youtu.be/BuUUm2waYtw

The chain of survival

The Chain of Survival is an important concept to understand when learning about cardiac arrest.

Put simply, the chain of survival is just a serious of steps (forming a virtual “chain”) which give the best chance of survival from a cardiac arrest (where the heart stops beating). If all the steps of the chain are followed promptly, then the patient has the best chance of survival.

The ‘links’ of the chain are as follows:

Early recognition and call for help

Early contact should be made to the emergency services after a cardiac arrest is recognised. In addition, serious conditions which may lead to a cardiac arrest (e.g: a heart attack) should be recognised and help called for promptly.

Early CPR

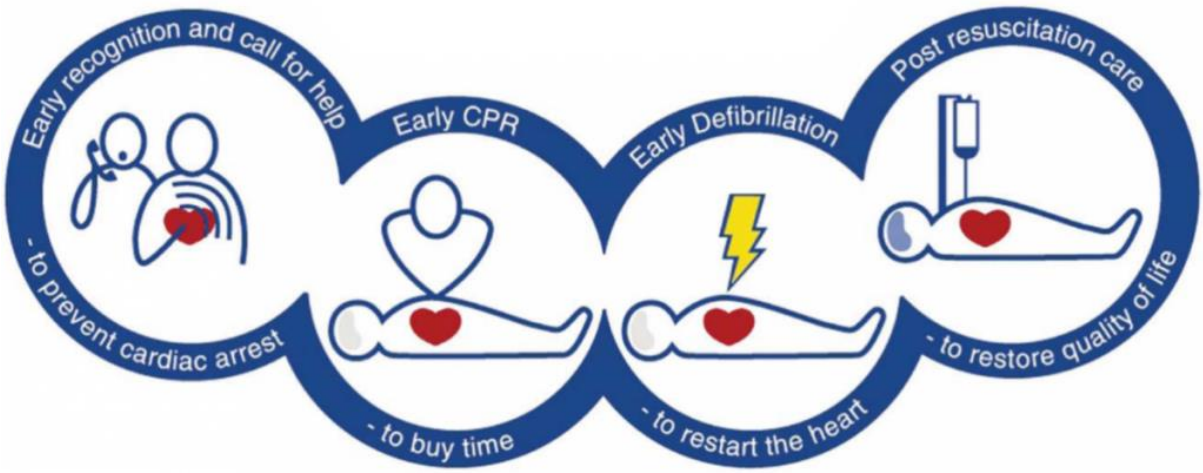
Cardiopulmonary resuscitation should be commenced immediately after a cardiac arrest has occurred (ie, the patient has stopped breathing). Anyone can perform CPR, and ideally there should be no interruption in CPR before the ambulance or defibrillator arrives.

Early defibrillation

A defibrillator is an electrical device which delivers a shock to the heart in an attempt to correct any abnormal electrical activity. Earlier defibrillation is associated with better survival from a cardiac arrest.

Post resuscitation care

Appropriate post-resuscitation care in a hospital / facility is essential to improving long term prospects for the patient. This care should be accessed as quickly as possible after the cardiac arrest has occurred.



Overview of an AED

AEDs are sophisticated machines designed to deliver electrical shocks to victims of cardiac arrest. They are fully automated, and require little user input. Therefore many AEDs are designed to be used by bystanders with no formal training.

AEDs are often found in many public places and in many institutions including government buildings, schools, colleges, universities and major shops. They are also found on public transport. AEDs in public places may be called Public Access Defibrillators.

There are various different models and manufacturers of AEDs. Therefore every machine is slightly different and this course will not go into detail on different models.

In general however AEDs have the following features and equipment

The main AED unit

The main unit contains the AED's sophisticated computer and battery pack.

On some models there will be an on / off button. Other models will turn on automatically when you open the unit (like the model shown in the picture)

The AED unit is connected to the chest pads via a lead. This lead can be unplugged to change the pads if required

There may be a 'shock' button to deliver in electrical shock. However be advised some models are fully automated and will shock whenever they are ready to.

There may also be a speaker, battery life indicator and written instructions on the main unit

Pads and leads

The AED delivers an electrical shock to a patient via two chest pads. These pads are plugged into the unit.

Each pad is covered in a strong adhesive, allowing it to be stuck to the patient's bare chest.

AEDs should contain at least one set of spare pads.

You may find both adult and pediatric pads in some models

Accessory equipment

An AED may contain other items including:

> Small towel: this is used to dry the chest of the patient before applying pads

> Razor: excessive chest hair may prevent the pads sticking so a razor is provided

> Scissors: pads should be applied to bare skin so scissors may be provided to cut through clothing

Safety considerations

AEDs are very safe devices.

However, there are a number of safety aspects to consider when using an AED.

Water

Water and electricity don't mix! A towel should be provided along with an AED, this is to dry the patient's chest.

Electricity will take the path of least resistance, so if there is water on the chest then the shock will travel through the water instead of the heart muscle.

Direct contact

No one should touch the patient during delivery of the electrical shock by an AED. The AED will instruct everyone to stand clear. As the operator you should repeat this command and ensure everyone is clear of the patient.

It is important however to deliver the shock as quickly as possible, so do not spend excessive time on this.

Explosive environment

An AED is delivering an electrical shock. Therefore there is always the risk of a spark. You should not use in AED in an explosive environment where there is a build up of flammable vapors. One example would be a gas/petrol station forecourt.

Another consideration is the use of Oxygen by emergency medical staff. If Oxygen is being used, it should be at least 1 metre away from the AED and consideration should be given to the possibility of Oxygen building up in the atmosphere.

Chest hair

The chest pads should be applied to bare skin. Excessive chest hair can disrupt the contact of the pads with the skin and result in burns when the electrical shock is applied.

A razor is supplied so you can shave excessive chest hair.

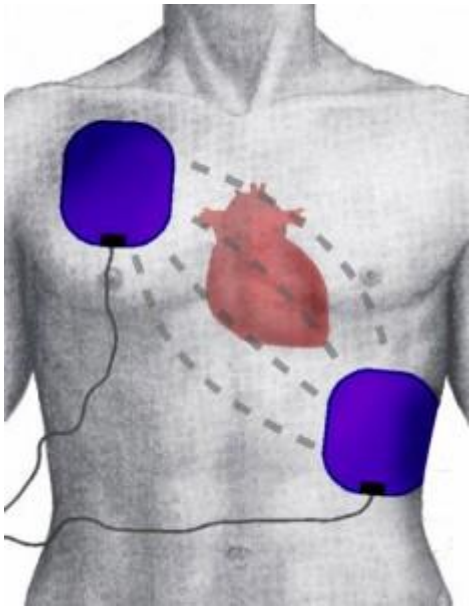
Once again, do not spend a long time on this! Shaving cuts/rash is the least of your patient's worries…

Using an AED

Using an AED is easy – it is fully automated! The machine will also give voice prompts to guide you.

Watch the following video which demonstrates the use of an AED.

https://youtu.be/NI-P3ysiQSk



Remember to consider all the safety aspects discussed in the last unit. For example, ensure the chest is dry before applying the pads.

It is important to ensure the chest pads are positioned correctly. They are very sticky due to the strong adhesive – take care to get the position right the first time!

AED procedure

1. If alone, connect the AED before starting CPR

(if in a group, one person can start CPR once another sets up the AED)

2. Once the AED is connected it will analyse the heart rhythm. The AED will either decide to deliver a shock or instruct you to continue CPR for 2 minutes.

Shock: ensure everyone is clear of the patient before delivering the shock. A loud verbal command of "stand clear" is suggested

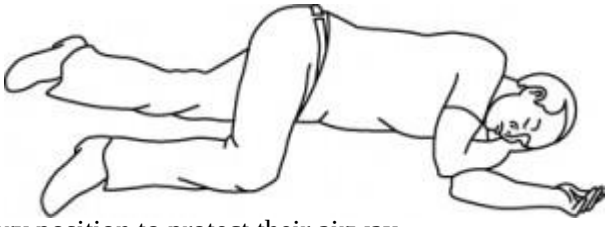
Continue CPR: immediately begin CPR on the patient

3. The AED will continue in this cycle of analysing and then deciding to shock or continue CPR

Other important considerations

Remember to ensure you give high quality CPR to the patient throughout the resuscitation. There should be minimal interruptions in chest compressions. Do not stop CPR unless the patient shows signs of recovery and starts breathing normally

Post resuscitation care

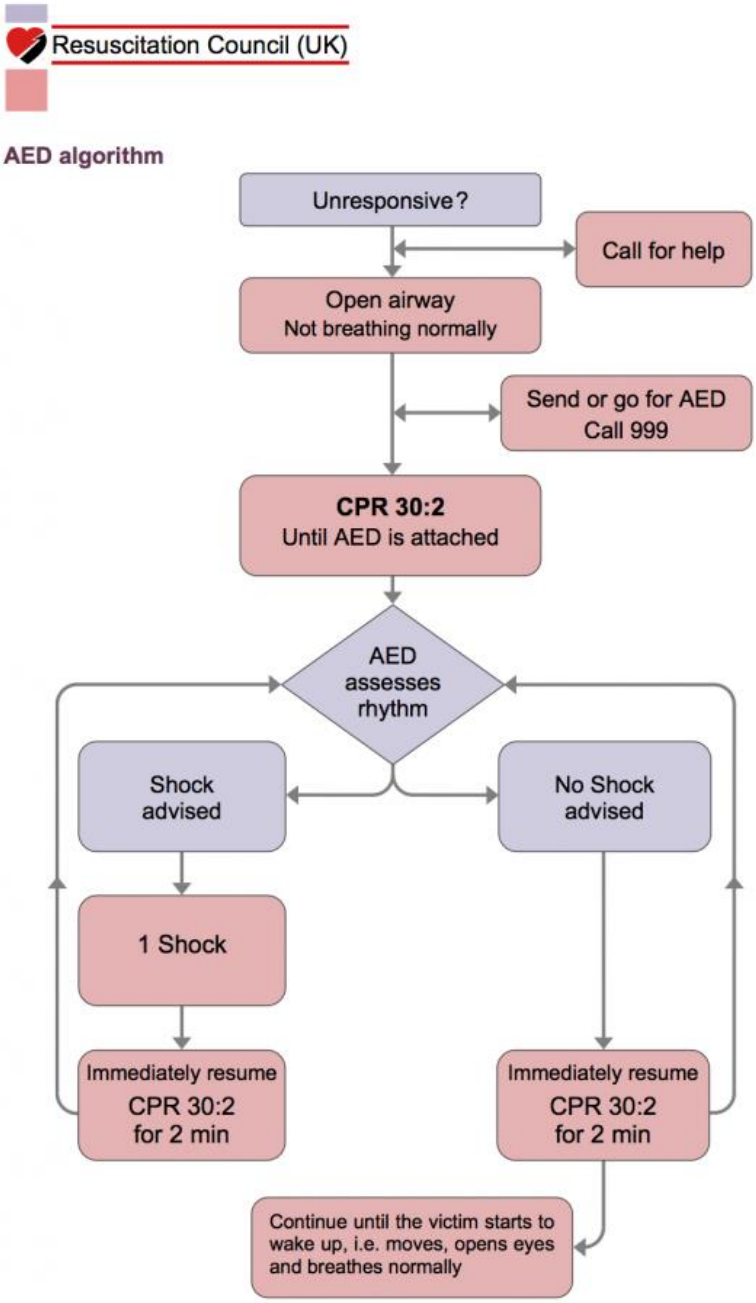


Use of an AED may result in the patient breathing spontaneously. If this occurs the AED will not deliver further shocks unless the patient suffers another cardiac arrest.

If the patient is breathing normally then turn them into the recovery position to protect their airway.

You should leave the AED connected to the patient.

Remember to continuously monitor the patient to ensure they are still breathing. There is a possibility that they may suffer another cardiac arrest and require further CPR & defibrillation.



Real Life Examples

The following video shows a real life cardiac arrest

https://youtu.be/w32PUDL2lb8

This is another example of early CPR and defibrillation working to save a life. Remember back to the chain of survival discussed in the first unit.

This video is an example of the chain of survival working.

Note: some of the CPR protocols in this video are out of date

https://youtu.be/ICODRFoWZkw