UNIT 8 USE OF AUTOMATED EXTERNAL DEFIBRILLATOR (AED)

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8.0 INTRODUCTION

The Automated External Defibrillator (AED) is used during emergency for resuscitation of victim. As you have learnt in the Unit 3 of Block 2 of the theory course of this programme on “CPR and AED”, you know that the use of AED should be done immediately or as soon as it is available to resuscitate the victim in case the victim is not responding, not breathing and has no pulse. The purposes and procedure for using AED has been discussed in this unit. So, let’s begin.

8.1 OBJECTIVES

After completion of this unit, you will be able to:

- assess a victim for use of AED;
- acquire skills in applying and using AED; and
- perform Defibrillation during emergency situations.

8.2 ASSESSING A VICTIM FOR USE OF AED

Firstly you have to ensure that the environment is safe for you and the victim. We have discussed this part in detail in Unit 1 (Recognizing emergencies) and Unit 3 (CPR and AED) of Block 2 of Theory course. After this the most important thing is to assess whether the victim needs CPR. If the victim needs CPR and you assess him for signs of sudden
cardiac arrest, he will require AED. In this section, you will learn the skills for the assessment of the victim for use of AED.

**Purpose**

The main purpose of assessing the victim is to conduct thorough assessment and find out which procedure must be started to resuscitate the victim in emergency.

**Articles required**

For this activity you need to have a volunteer. However he/she should be explained that he/she would have to be placed in a specific position by changing the posture. In case you wish to practice AED, take a manikin instead.

**Procedure**

**Step 1**  
Ask the volunteer to act as victim. Ask him/her to lie down on their back.

**Skills:**  
The volunteer should lie down comfortably on his back with his hand on the side of his/her body and both the feet straight.

**Step 2**  
Conduct assessment as per the flow-diagram given below:

**Step 3**  
Tap the person on one of his shoulders and speak loudly, “Hello, Are you Okay?”

**Skills:**  
Tapping of shoulder and speaking. “Hello, Are you Okay?” should be done simultaneously.

**Step 4**  
If the person does not respond or check for pulse and breathing.

**Skills:**  
The pulse at apical site can be checked. The breathing should be checked by observing the chest rise with each effort of breathing in.
Step 5  If a victim is not responding and not breathing, CPR should be started immediately.

**Skills:** Start CPR. This has been discussed in the previous unit of this Block on “CPR and Recovery Position”.

Step 6  Use AED if it becomes available.

**Skills:** Use has been discussed in the Section 8.3 of this Unit.

Thus, by assessing a victim for responsiveness and breathing you can decide what first aid care is to be provided to save his/her life.

### 8.3 AUTOMATED EXTERNAL DEFIBRILLATOR (AED)

In the previous section we learnt how to assess the victim in emergency and decide the next step of action i.e. whether to give CPR or not. In this section, we will learn about AED and procedure to be followed when using AED. So, let’s begin.

#### 8.3.1 Concept and Purpose

We have already discussed about AED in detail in Theory course Block 2, Unit 3 on “CPR and AED”. Here, we shall be discussing AED in detail.

**Definition**

Automated External Defibrillator (AED) is a portable electronic device which, when applied to the victim detects and assesses the rhythm of heart automatically and tells the users about steps to be taken next.

**Role of AED**

An automated external defibrillator or AED is a device used in the treatment of Sudden Cardiac Arrest (SCA).

Sudden Cardiac Arrest or SCA is a condition in which the heart stops beating suddenly and often without any warning. When this happens, blood stops flowing to the brain and other vital organs like heart. If not treated quickly it usually causes death. Each minute of SCA without treatment can decrease chance of survival by 7-10 percent.

**Sudden cardiac arrest**

SCA is not the same as a heart attack. A heart attack occurs if blood flow to any part of the heart muscle is blocked. During a heart attack, the heart is damaged but usually doesn’t suddenly stop beating. SCA, however, happens after or during recovery from a heart attack or even otherwise in healthy people when the electrical activity of heart becomes disorganized. This is called Fibrillation or Ventricular Fibrillation. This causes problem in heart’s function i.e. pumping of blood which can reduce the supply of blood to various parts of body especially brain which can cause unconsciousness and even death (Fig. 8.1).
When AED is used, it prompts users to press a button to deliver an electric shock to the heart from outside (via the chest wall) which, in majority of cases, restores a normal rhythm. The device is quite simple to operate since it gives verbal instructions or prompts on how to use it. All one has to remember is to switch it on.

**Working of AED**

You have already learnt in Theory Block 1, Unit 2 on “Understanding Human Body” that the heart has muscles and normally a heart beats in a very coordinated manner. It has an internal electrical system that controls the rate and rhythm of the heart. With each heartbeat, an electrical signal spreads from the top of the heart to its bottom. As the signal travels, it causes the heart muscles to contract and pump blood.

Problems in the electrical system of heart can cause heart to beat abnormally called arrhythmias which mean problems or abnormality in the rhythm of the heart. If these become severe they can cause the heart to stop pumping blood altogether to the body.

The most common cause of SCA is an arrhythmia called ventricular fibrillation. In this condition, the heart does not beat normally, instead the muscles start shaking uselessly. The result is that the heart is unable to pump out any blood and the flow of blood stops.

If this situation is allowed to continue, the heart comes to stand still and can stop working altogether. This may lead to heart coming to a stop completely. Under these circumstances, the chances of survival of the person affected decrease rapidly. The only way to correct this type of rhythm is giving a shock to the heart muscles.

AED is hence, able to detect this type of rhythm abnormality and then prompt the rescuer to press a shock button on the device. It keeps guiding the user about ‘What to do next’. The AED is designed to deliver a shock only if the patient has a “shockable” rhythm. The AED has a microprocessor installed that evaluates the heart rhythm and find if it is a rhythm for which a shock is required or not. Hence, AED will it self guide you if shock is required or not.
Types of AED

Some of the defibrillators can itself deliver the shock by analyzing the rhythm and are said to be fully automated. If they prompt other person to deliver shock by pressing buttons they are semi-automated. One piece AED is also available (Fig. 8.2) in which the pads are connected to each other by a central regulator.

When to use AED

Sudden loss of consciousness, inability of the victim to respond and no or abnormal breathing, is an indication to use the AED as soon as possible. You need to judge the signs of Sudden Cardiac Arrest and proceed to give shocks by help of AED.

Purpose

It detects arrhythmias and gives shock to revert these arrhythmias. Its operation is simple and quick.

8.3.2 Procedure

When using AED, the procedure is as follows:

Articles required

The following articles/equipments are required:

1. An adult CPR manikin

Steps of Procedure for using AED

Step 1 Sit on your knees on the side of the manikin (victim).

Skills: As the scenario is such that the person is not responding and not breathing, The first step will be to activate Emergency Medical Services (ambulance) and ask for AED located nearby. Meanwhile, you will start CPR and use AED as it arrives.

Step 2 As you receive the AED, place it on your side and switch on the AED’s power (Fig. 8.3).
**Skills:** Note the on/off button on AED and switch on the device. The device will start giving you step-by-step instructions. The first aid provider will hear voice prompts or messages telling him how to proceed.

**Step 3** After you hear the voice prompts from the AED, expose the chest (Fig. 8.4).

![Fig. 8.4: Expose the Chest](image)

**Skills:** In real situation, notice the victim’s chest. See for the growth of hair, any injury and integrity of the skin of the chest since this is important to avoid injury to the victim when giving shock. Look for oiling and powder if applied. Try to clean the chest if possible since these are bad conductors of electrical current which can make AED use unsuccessful.

**Step 4** Now, look for the sticky pads present along-with AED (Fig 8.5).

![Fig. 8.5: Sticky pads of AED](image)

**Skills:** These are with sensors and also called electrodes. Apply these pads to the chest as pictured on the AED pad’s instructions, and explained by the voice prompts messages.

**Step 5** Place one pad on the right side of the centre of chest above the nipple (just below the right collar bone) (Fig. 8.6).

**Step 6** Place the other pad slightly below and to the left of the left nipple on the other side of the chest (the ribcage) (Fig. 8.6).

![Fig. 8.6: Placement of Pads/Electrodes](image)
Step 7 Press the pads firmly to make sure that the sticky pads have a good connection with the skin. If the connection isn’t good, the machine may speak the phrase ‘check electrodes’ (Fig 8.7).

![Fig. 8.7: Pressing the pads firmly](image)

**Step 8** Check that the wires from the electrodes are connected to the AED.

**Skills:** Make sure no one is touching the person, AED will analyze the condition of heart beat.

**Step 9** The device will inform the user by saying, ‘analyzing rhythm. Do not touch the patient’.

**Skills:** Stay clear while the machine checks the person’s heart rhythm.

**Step 10** If a shock is needed, the AED will let you know when to deliver it. It will say “SHOCK ADVISED, STAND CLEAR”. Tell others to get everything cleared around the victim (Fig. 8.8).

![Fig. 8.8: Stand clear and clear others](image)

**Skills:** At this point, Make sure no one is touching the victim including you yourself are not touching the victim. People in contact with the person who is going to receive the shock may also receive the shock themselves which is not wanted in this situation. So, look around and alert others to clear from around the victim. You can also say “CLEAR” to others.

**Step 11** When sure all is clear, press the shock button to deliver the shock (Fig. 8.9).
Use of Automated External Defibrillator (AED)

Fig. 8.9: Press shock button to deliver shock

**Step 12**  
Start CPR immediately after shock (Fig. 8.10).

Fig. 8.10: Resume CPR

**Skills:** Sometimes if a shock is not required, the AED will state *NO SHOCK ADVISED* and tell you to resume CPR and thereafter follow the steps below.

**Step 13**  
After 2 minutes i.e. 5 cycles of CPR, AED will again check the heart beat and prompt according to the need.

**Skills:** You can continue giving CPR upto 5 cycles for 2 minutes and then, AED will again instruct to repeat analysis of rhythm to find out if shock is required or not. You can stop CPR when analysis occurs and repeat the steps as prompted. Continue like this until emergency medical help arrives or the person begins to move or breathe. If pulse and breathing returns, assess the victim and place him in Recovery Position.

**Step 14**  
Record and Report.

**Note:** If there are two rescuers, one can operate AED and other can give CPR. The person who will operate the AED will sit on one side and have the AED on the same side. The person who will give the CPR will sit on other side of the victim, on side opposite to the AED operator.
### Remember:

The AED use in children can be done effectively.

- For children under 1 year – do-not use AED or use only if appropriate Infant AED if available.
- For children between 1-8 years –use pediatric pads if present. They are placed one on centre of the chest in front and other on the centre of the upper back on back side (Fig. 8.11).

![Fig. 8.11: Placement of Electrodes in children of 1 to 8 years](image)

- For children above 8 years – use adult AED/standard AED

### 8.3.3 Safety and Precautions

The safety precautions to be followed are as follows:

#### A. Using AED:

1. Check the system regularly.
2. A schedule for regular change of batteries should be there.
3. Attach the AED only to victims who are unresponsive, who are not breathing normally and who have no pulse.
4. It is safe to use AED in all weather conditions, including rain and snow.

#### B. Before operating AED:

1. Before using an AED, check for puddles or water near the person who is unconscious. Move him or her to a dry area and stay away from wet areas yourself when delivering shocks (water conducts electricity).
2. If the person’s chest is wet, dry it quickly, as much as possible.
3. If the person has a lot of chest hair, one may have to trim it. (AEDs usually come with a kit that includes scissors and/or a razor) or you can stick the pads and remove which will remove the hair away and use new electrodes to give shock.
4. If the person is wearing a medicine patch on chest, remove it and clean the medicine from the skin before applying the sticky pads.
5. Remove metal necklaces and bras. The metal may conduct electricity and cause burns. You can cut the centre of the bra and pull it away from the skin.
6. Check the person for implanted medical devices, such as a pacemaker or implantable cardioverter defibrillator (ICDs). (The outline of these devices is visible under the skin on the chest or abdomen, and the person may be wearing a medical alert bracelet) (also discussed in Theory Unit 3, Block 2). For these cases, move the defibrillator pads at least 1 inch away from implanted devices or piercings so the electric current can flow freely between the pads.

7. If the victim is lying on a metal surface, avoid contact of the electrodes with the metal surface.

C. Operating the AED

1. Stand clear around the victim when the AED has been applied while analysis of rhythm and when delivering shock.

2. Do not apply shock if someone is around flammable materials, such as gasoline or freeflowing oxygen.

3. Wipe any oil, water present on the chest of the victim.

4. Do not use a cellular phone or radio within 6 feet of the AED. This may interrupt analysis.

5. If at any time the victim becomes responsive and/or starts breathing normally, the rescuer should stop CPR and AED and keep a close watch on responsiveness, breathing and circulation. The victim can be placed in Recovery Position.

It is important to remember that Automated external defibrillators (AEDs) are safe to use. There are no reports of AEDs harming bystanders or users. Also, there are no reports of AEDs delivering inappropriate shocks.

Check Your Progress 1

1. True or False:
   a. Do not touch the victim when using AED. True/False ............
   b. Avoid using AED for children below 5 years of age. True/False ............
   c. AED is useful if the victim has “Shockable” rhythm. True/False ............
   d. You can give shock without scene survey. True/False ...
   e. One piece AED is as good as the whole device. True/False ............

2. Fill in the blanks:
   a. The rescuer who performs CPR will sit on ................. side to the rescuer who operates AED.
   b. AED works by giving verbal ........................... to the first aid provider.
   c. If no shock is advised continue CPR till ......................... minutes after which AED will again analyze the heart rhythm.
   d. Ventricular fibrillation is most common ...................... in SCA.
8.4 LET US SUM UP

Thus, in this practical we have given the whole account of AED. We discussed its use, importance, role and its operation. We discussed the procedure and safety precautions that must be taken care of when you are using an AED. It is important to realize that use of AED is the recommended procedure in emergency and be performed diligently. Hope you have gained the knowledge and will practice the skills in using an AED in emergency.

8.5 KEY WORDS

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
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<tbody>
<tr>
<td>Portable</td>
<td>Able to be easily carried or moved</td>
</tr>
<tr>
<td>Warning</td>
<td>With caution or with notice</td>
</tr>
<tr>
<td>Suddenly</td>
<td>Quickly, without caution or warning, not expected</td>
</tr>
<tr>
<td>Chance</td>
<td>A possibility of something happening</td>
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<tr>
<td>Survival</td>
<td>The state or fact of continuing to live or exist</td>
</tr>
<tr>
<td>Happens</td>
<td>Occurs, take place</td>
</tr>
<tr>
<td>Recovery</td>
<td>Come back to previous healthy state</td>
</tr>
<tr>
<td>Disorganized</td>
<td>Not properly planned</td>
</tr>
<tr>
<td>Prompts</td>
<td>Instructions, giving directions, messages</td>
</tr>
<tr>
<td>Verbal</td>
<td>Spoken/oral</td>
</tr>
<tr>
<td>Severe</td>
<td>Extreme, intense</td>
</tr>
<tr>
<td>Signal</td>
<td>Action, gesture or spoken instructions to point to do something</td>
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<tr>
<td>Rhythm</td>
<td>Strong, regular repeated pattern of movement or sound.</td>
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<tr>
<td>Abnormality</td>
<td>An abnormal feature, characteristic, or occurrence</td>
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<tr>
<td>Microprocessor</td>
<td>Internal circuit in a device to maintain its functions</td>
</tr>
<tr>
<td>Revert</td>
<td>Come back to original state or level</td>
</tr>
<tr>
<td>Unsuccessful</td>
<td>Not successful or failed attempt</td>
</tr>
<tr>
<td>Sensors</td>
<td>A device which detects or measures a physical property and records it</td>
</tr>
<tr>
<td>Connection</td>
<td>Relationship in which a person or thing is linked</td>
</tr>
<tr>
<td>Phrase</td>
<td>Small group of words</td>
</tr>
<tr>
<td>Speak</td>
<td>Say something in order to convey information</td>
</tr>
<tr>
<td>Receive</td>
<td>Get something</td>
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<tr>
<td>Analysis</td>
<td>Detailed examination</td>
</tr>
<tr>
<td>Puddles</td>
<td>A small pool of liquid/water</td>
</tr>
<tr>
<td>Delivering</td>
<td>Giving</td>
</tr>
<tr>
<td>Patch</td>
<td>A pad or shield worn over an area</td>
</tr>
<tr>
<td>Implanted</td>
<td>Inserted or fixed</td>
</tr>
<tr>
<td>Piercings</td>
<td>Small hole in a part of body, like ears to wear earring etc.</td>
</tr>
<tr>
<td>Flammable</td>
<td>Material that can burn easily</td>
</tr>
<tr>
<td>Interrupt</td>
<td>Break continuity or stop progress</td>
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8.6 ANSWERS TO CHECK YOUR PROGRESS

Check Your Progress 1
1. a. True b. False c. True d. False e. True
2. a. Opposite b. Prompts c. 2 d. arrythmia

8.7 ACTIVITIES

Activity 1
Perform resuscitation step by step on the manikin provided. Operate the AED on this manikin. Record the procedure in Log-Book

(Supervised Activity)

Activity 2
At your study centre see the Automated External Defibrillator device. Study its various parts and working. Record your observations in Log-Book

(Supervised Activity)

8.8 REFERENCES

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