

# MACHINE TECHNOLOGY & CARING IN NURSING

(Technology at Fingertips-series-VII)

## DEFIBRILLATOR

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### INTRODUCTION

**Defibrillation** is a common treatment for life-threatening cardiac arrhythmias, ventricular fibrillation, and pulseless ventricular tachycardia. Defibrillation consists of delivering a therapeutic dose of electrical energy to the affected heart with a device called a **defibrillator**. This depolarizes a critical mass of the heart muscle, terminates the arrhythmia, and allows normal sinus rhythm to be reestablished by the body's natural pacemaker, in the sinoatrial node of the heart.



### HISTORY

Defibrillators were first demonstrated in 1899 by Jean-Louis Prevost and Frederic Batelli, two physiologists from University of Geneva, Switzerland. They discovered that small electrical shocks could induce ventricular fibrillation in dogs, and that larger charges would reverse the condition.

The first use on a human was in 1947 by Claude Beck, professor of surgery at Case Western Reserve University.

Beck first used the technique successfully on a 14 year old boy who was being operated on for a congenital chest defect. The boy's chest was surgically opened, and manual cardiac massage was undertaken for 45 minutes until the arrival of the defibrillator. Beck used internal paddles on either side of the heart, along with procainamide, an antiarrhythmic drug, and achieved return of normal sinus rhythm.

### MEANING

Defibrillation involves delivering high intensity electrical charges in order to depolarize the entire myocardium at one time so that the fastest normal pacemaker can regain control of the pacing function of the heart.



### FIBRILLATION

Fibrillation is an arrhythmia that affects either the atria as a pair, or the ventricles as a pair, producing “a-fib”, or “v-fib”, respectively. (Come to think of it, if a person is in VF, do their atria fibrillate as well? Does it matter?) Most cardiac rhythms are organized – they’re regular in some way, producing

some sort of regular (as opposed to disorganized), rhythmic motion of the chambers, hopefully producing a blood pressure. In fibrillation, the cardiac tissue of the chambers involved wiggles about like “a bag of worms”. Does a chamber wiggling like a bag of worms pump any blood, produce a cardiac output, and eject any fraction of its contents? No, it does not!

## TYPES

Manual external defibrillator

Manual internal defibrillator



Automated external defibrillator (AED)

Implantable cardioverter-defibrillator (ICD)

Wearable cardiac defibrillator

## PRINCIPLE OF DEFIBRILLATION

Energy storage capacitor is charged at relatively slow rate from AC line. Energy stored in capacitor is then delivered at a relatively rapid rate to chest of the patient. Simple arrangements involve the discharge of capacitor energy through the patient’s own resistance.

In defibrillation, an electric current of 100-400 joules per second is passed through the chest wall to depolarize the cells of the myocardium and allow them to depolarize uniformly, thereby restoring an organized pattern amongst myocardial cells.

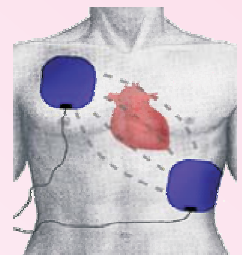
### Automated External defibrillators (AED)

Automated External defibrillator (AED) has a cardiac rhythm analysis system. The AED

interprets the patient’s cardiac rhythm and gives the operator step by step directions on how to proceed if defibrillation is indicated.

## PATIENT PREPARATION

1. Assess the patient to determine if he lacks a pulse. Call for help, start CPR until the defibrillator and other emergency equipment arrive.
2. Connect the monitoring leads of the defibrillator to the patient; assess the cardiac rhythm in two leads.
3. Expose the patient’s chest and apply conductive pads at the paddle placement positions.
4. **Monitoring and after care**
  - a. Turn on the defibrillator. if performing manual external defibrillation, set the energy level at 200 joules or 360 joules.
  - b. Charge the paddles by pressing the “CHARGE” buttons, which are located on either the machine or the paddles.
5. **Ready:-**
  - a. Place the paddles over the conductive pads and press firmly against the patients chest using 25lb pressure.
  - b. Reassess the patient’s cardiac rhythm in two leads.
6. **Set:-** If the patient remains in ventricular fibrillation, State "ALL CLEAR" to all



personnel stand clear of the patient and the bed. Also, make a visual check to make sure everyone is clear of the patient and the bed.

7. **Go:** - a. Discharge the current by pressing both the paddles “DISCHARGE” buttons simultaneously.
- b. Leave the paddles in position on the patient’s chest while you reassess his cardiac rhythm; have someone else assess his pulse.
- c. If necessary, continue CPR and prepare to defibrillate a second time. Instruct someone to reset the energy level on defibrillator to 200 or more joules.
- d. Announce that you are preparing to defibrillate, and follow the procedure again.

8. **One more time:** - a. Reassess the patient. If defibrillation is again necessary, follow the same procedure as before.
- b. Perform the counter shocks in rapid



succession, reassess the patient’s rhythm before each attempt.

- c. If the patient has no

pulse after three initial defibrillations, resume C P R , g i v e supplemental Oxygen, a p p r o p r i a t e medications.

- d. Also consider possible causes for failure of the patients rhythm to convert, such as acidosis and hypoxia.

9. **It worked:** - If defibrillation restores a normal rhythm, assess the patient. Obtain baseline ABG levels and a 12 lead ECG. Provide supplemental Oxygen, ventilation and medications as prescribed. Assess the patient’s skin – does he need treatment for skin burns? Prepare the defibrillator for immediate use.

10. Document the procedure, including the patients

- ECG rhythms before and after defibrillation;
- The number of times defibrillation performed;
- The voltage used; whether a pulse returned;
- Dosage and time of any drugs gives;
- Whether CPR was used;
- How the airway maintained and
- Patient’s outcome.

Causes of failure of defibrillation

1. Poor patients outcaome  
Valvular diseases  
Massive MI  
Cadiomegaly

Myocardial rupture  
Pulmonary embolism or infarction  
Respiratory disease or trauma

2. Prolonged cardiac arrest
3. Inadequate CPR Measures
4. Electrolyte imbalances
5. Drug toxicity
6. Inadequate Sympathetic tone
7. Inadequate electrical current delivered to the heart
8. Inexperienced operator.

### COMPLICATIONS

1. Dysrhythmias & Pulmonary edema
2. Cardiac arrest Pulmonary or systemic emboli
3. Respiratory arrest Equipment malfunction
4. Neurologic impairment Death
5. Altered skin integrity

### BAD THINGS TO WATCH FOR DURING DEFIBRILLATION

- Don't shock a patient who's awake!
- Don't forget to synchronize when cardioverting – a-fib can be turned into v-fib this way.
- Don't forget the conduction gel.
- Don't forget to clear the bed.
- Try to keep the process orderly. This means keeping yourself calm and deliberate when you're not really sure you can. Set up systematically. Set up communication with the appropriate team member for orders – don't take orders

from two doctors at once! Do your best.

- Remember that no matter what situation you're in, you may shortly be in a full-fledged code – make sure that backup help is on the way.

### WHAT'S THIS ONE?

This is the foxglove plant, The one that digitalis comes from



### REFERENCES

1. Smeltzer SC, Bare BG.(2004). Text book of medical surgical nursing”. 10th edition, Philadelphia: lippincott Williams& Wilkinson.
2. Lewis et al. (2004). Medical-surgical nursing. Assessment and management of clinical problems. 6th edition , Missouri: Mosby publishers.
3. Black.M.joyce & Jacobs E.M.(2000). Medical –surgical nursing clinical management for continuity of care. 5th edition, Philadelphia: WBSaunders publishers.
4. Sister NancyM.S(2003). A reference manual for nurses on Coronary care nursing. Delhi: Kumar publishing house.
5. Kluwer LWW (2009). Cardiovascular care- Incredibly easy. New Delhi: Wolters kluwer Private Ltd.