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## What is defibrillation?

Defibrillation involves providing an electric shock to the heart to restore a normal heart rhythm. It is used to correct dangerous, abnormal heartbeats, called arrhythmias. The devices that provide the shocks, called defibrillators, have recently become portable. These portable versions are called automated external defibrillators (AEDs).

## The problem with arrhythmias

Arrhythmias do not allow the ventricles, or lower chambers of the heart, to pump enough blood into the heart or out into the rest of the body. This is because the electric signal being sent from the brain to the heart is causing the heart to either pump too quickly or too slowly.

## The heart's electrical conduction system:

The heart is basically a pump made up of muscle tissue that is stimulated by electrical currents, which normally follow a specific circuit within the heart.

This normal electrical circuit begins in the sinus or SA node, which is a small mass of specialized tissue located in the right atrium (upper chamber) of the heart. The SA node generates an electrical stimulus at 60 to 100 times per minute under normal conditions; this electrical impulse from the SA node starts the heartbeat.

The electrical impulse travels from the SA node to the atrioventricular (AV) node in the bottom of the right atrium. From there the impulse continues down an electrical conduction pathway called the "His-Purkinje" system into the ventricles (lower chambers) of the heart.

When the electrical stimulus occurs it causes the muscle to contract and pump blood to the rest of the body. This process of electrical stimulation followed by muscle contraction is what makes the heart beat.

An implantable defibrillator may be needed when the electrical stimulation becomes chaotic and randomly starts in the ventricles instead of in the SA node in the right atrium. A variety of common cardiac conditions such as heart attacks and heart failure can lead to this type of electrical malfunction in the heart.

## Types of Defibrillators

There are three main types of devices used for defibrillation of the heart.

- **Automated External Defibrillators (AEDs):**  
These small devices are typically kept in public areas in the event that someone experiences cardiac arrest and needs an electric shock to regain consciousness. AEDs can be used by non-medical personnel in emergency situations. The devices provide instructions and prompts for the bystander to administer CPR and a shock to the victim. They can be found in schools, hospitals, airports, businesses, parks, etc.

There are many brands of AEDs but they all have the same functions and capabilities. Electrically-conductive pads are included in an AED kit. These are placed on the chest of the cardiac arrest victim. The device automatically analyzes the patient's heart rhythm and prepares to deliver a shock if needed.

- **Implantable Cardioverter - Defibrillator (ICDs):**  
An implantable cardioverter defibrillator (ICD) is a small, electronic device inserted in the upper chest that constantly monitors the electrical activity of the heart. About the size of a stopwatch, it consists of a pulse generator-essentially a battery and computer-and wires, called leads. These leads connect the pulse generator to the heart. ICDs are implanted to monitor heart rhythms and can determine what type of shock to deliver when needed.

Typically, the first type of treatment delivered is called Anti-tachycardia pacing (ATP). This delivers impulses to normalize a fast or irregular heart rhythm. Usually, a patient is unaware that this treatment occurs.

The next type of treatment would be cardioversion, or a light shock. These impulses can be mildly felt by the patient. The following step would be defibrillation, which is the strongest treatment that an ICD delivers. Many patients describe this feeling as a "kick in the chest." An ICD can also act as a basic pacemaker. Sometimes a heart may beat too slowly



# Your Guide To: Defibrillation



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after a shock, so an ICD can return the heart to a normal rhythm.

These treatments (ATP, cardioversion, defibrillation, and basic pacing) are programmed by your physician to meet your specific needs.

- **Manual defibrillator:** Commonly used in the emergency room or seen on television shows, these defibrillators have “paddles” that are used to deliver shocks.