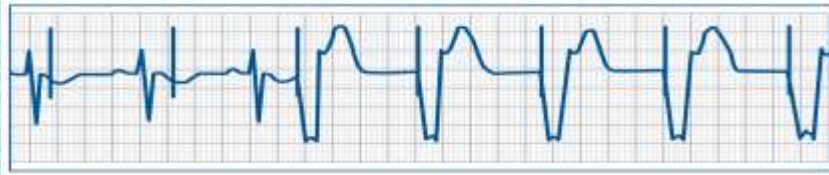


# CARDIAC PACING DEVICES(PACE MAKER)



**Presented by:**

**Ahmed Mohamed Abdel Hamid KABSHA**

## OUTLINES:

1. What is pacemaker
2. Types of pacemaker
3. Indication of pacemaker
4. How it works
5. Nursing care to patient with pace maker

## What is a pacemaker?

- A device which delivers an electrical current to the myocardium
- Designed to:
  - Restore or maintain a rhythm and rate sufficient to meet metabolic needs
- First used 1959



## Types of pacemaker:

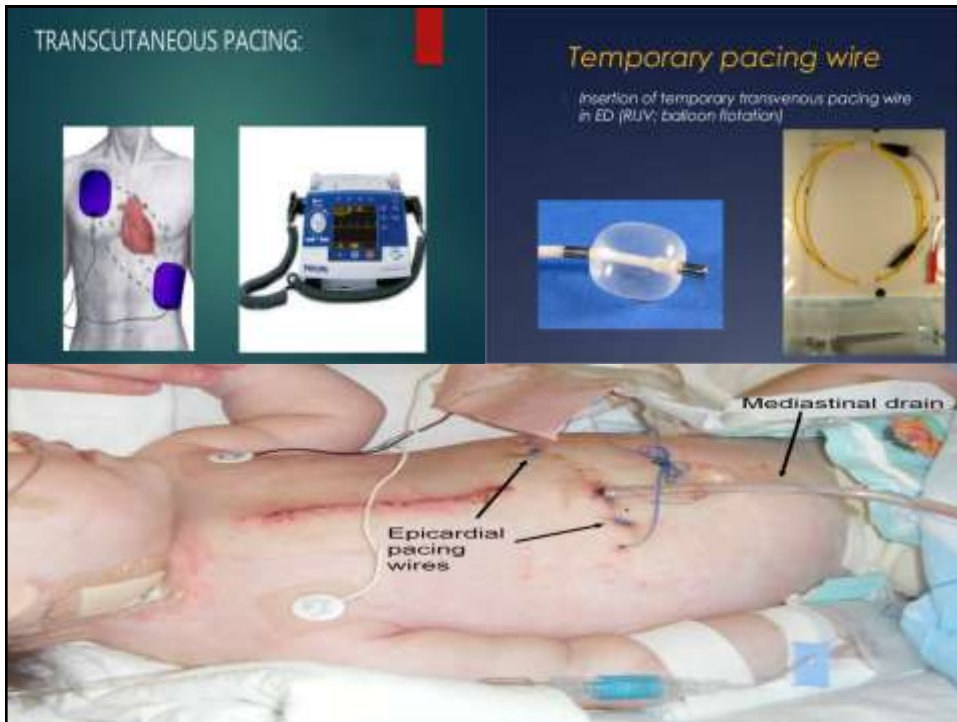
### A) Temporary pacemaker: (transcutaneous, transvenous, epicardial)

- Provide a temporary rate to support metabolic needs

Due to:

- Reversible problem
- Awaiting for a permanent pacemaker





## **B) Permanent pacemaker:**

### 1) **Implantable Pulse Generators (IPG):**

- Provide a rate to support metabolic needs
- Provide various diagnostics
- Single chamber (AAI,VVI)
- dual chamber (DDD)
- About 8-10 years longevity



## 2) Cardiac Resynchronization Therapy-Pacing (CRT-P):

- Restore ventricular synchrony
  - Uses a specially designed lead placed usually on the posterior-lateral wall of the LV via the Coronary Sinus circulation
  - Provides RV and LV synchronous pacing
- Provides a rate to support metabolic needs
  - CRT pacing only (Low-Power CRT)
- Provides various diagnostics

## 3) Implantable Cardioverter Defibrillator (ICD):

- Restore sinus rhythm in the presence of tachycardia
  - Defibrillate
  - Cardiovert
- Provide a rate to support metabolic needs
  - Includes single or dual chamber pacing
- Provide various diagnostics
- About 6-8 years longevity



## 4) Cardiac Resynchronization Therapy-Defibrillator(CRT-D):

- restore rhythms in presence of lethal tachycardia
  - CRT pacing +ICD (High-Power CRT)

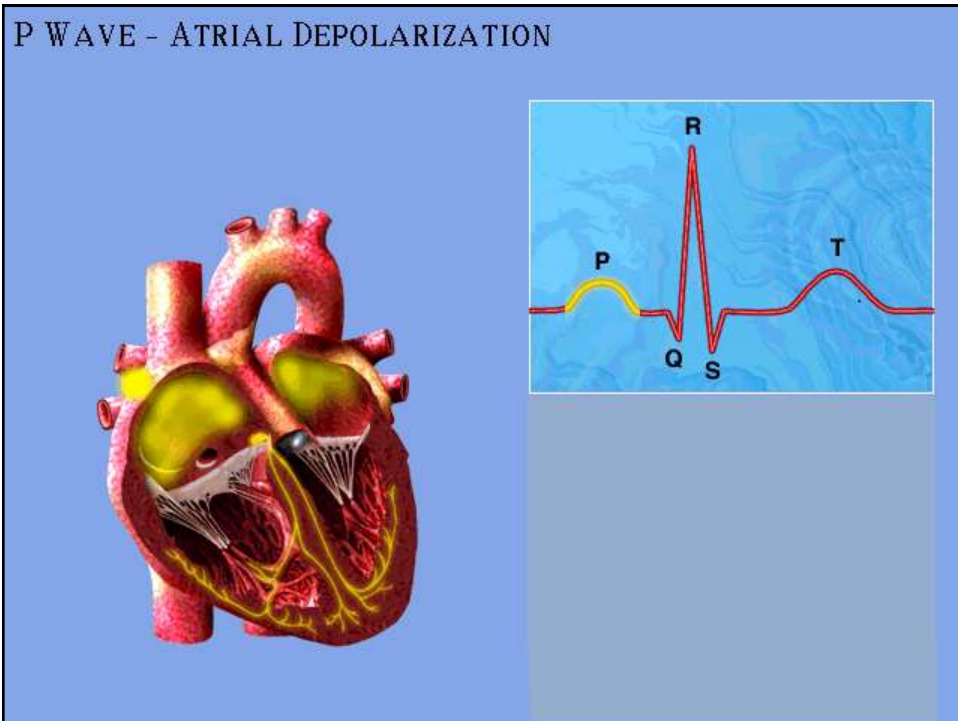
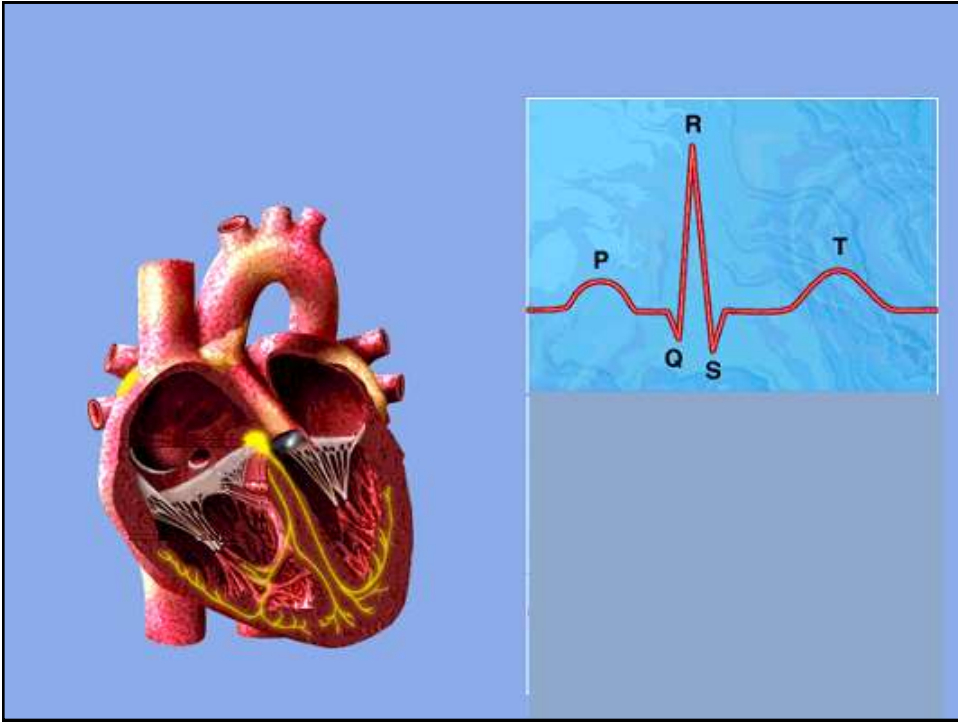
## Indications for Pacemakers

- Dysrhythmias
  - Symptomatic bradycardia
  - Heart blocks
    - 2<sup>nd</sup> and 3<sup>rd</sup> degree
  - Tachydysrhythmias ex: VT
  - SA node dysfunction ex.: sick sinus syndrome
- Heart failure and Cardiomyopathy
- Prophylaxis (Temporary)
  - Cardiac Surgery
  - ACS with conduction disturbance
  - Drug toxicity

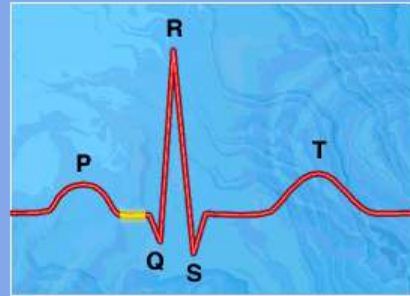
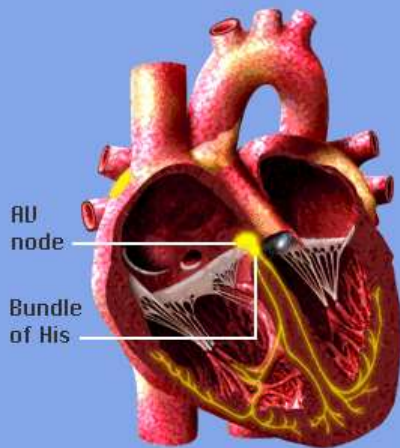


# HOW DOES PACEMAKER WORK?

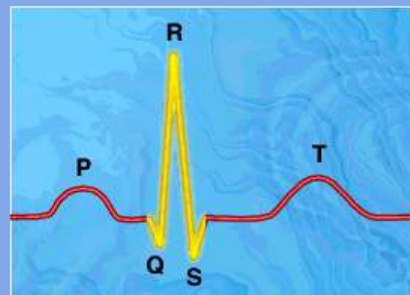
**Conduction  
system**



## DEPOLARIZATION OF AV NODE AND BUNDLE OF HIS

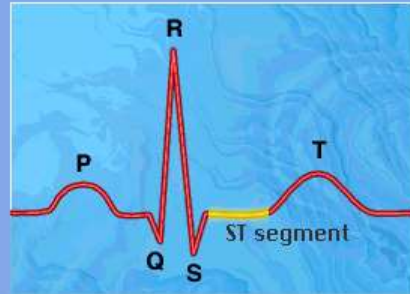
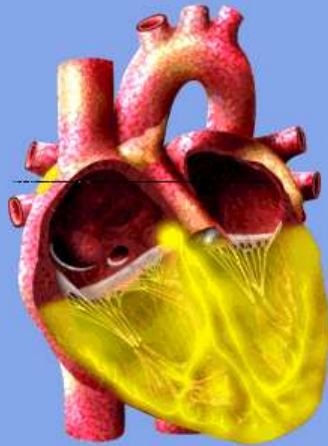


## QRS COMPLEX - VENTRICULAR DEPOLARIZATION

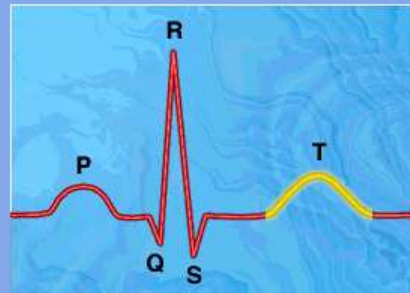
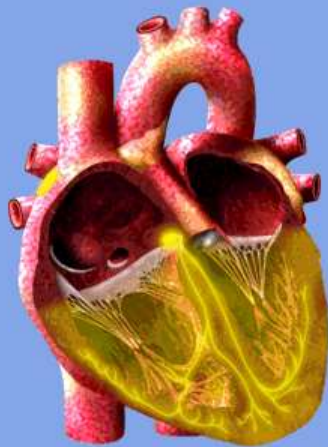




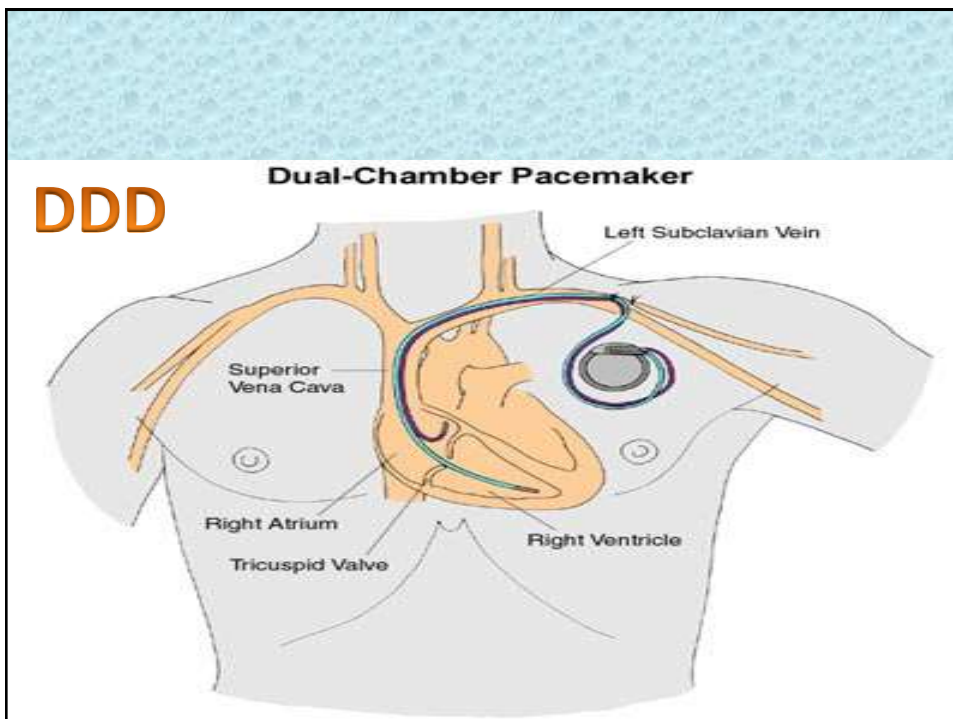
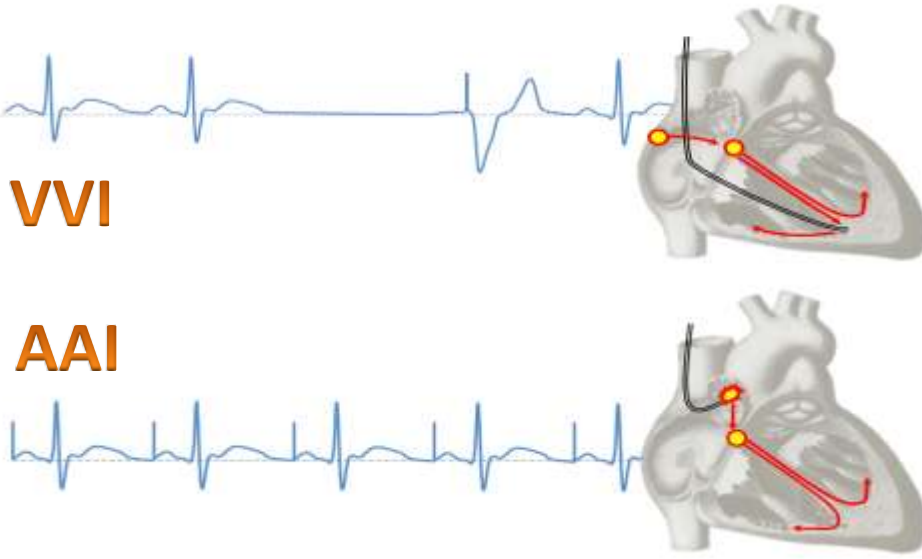
## ST SEGMENT - COMPLETE VENTRICULAR DEPOLARIZATION



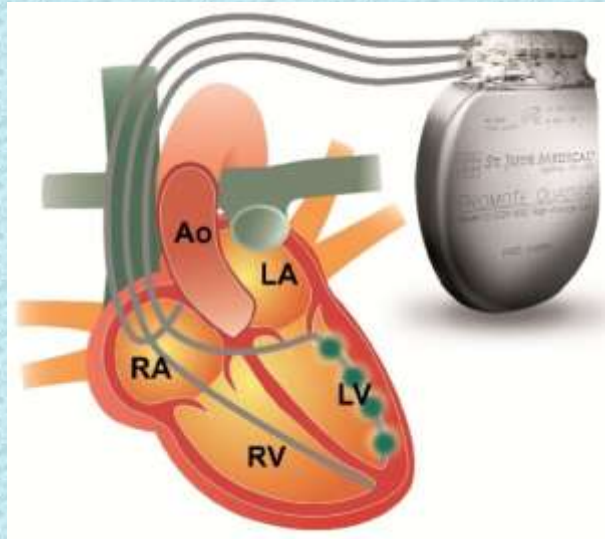
## T WAVE - VENTRICULAR REPOLARIZATION



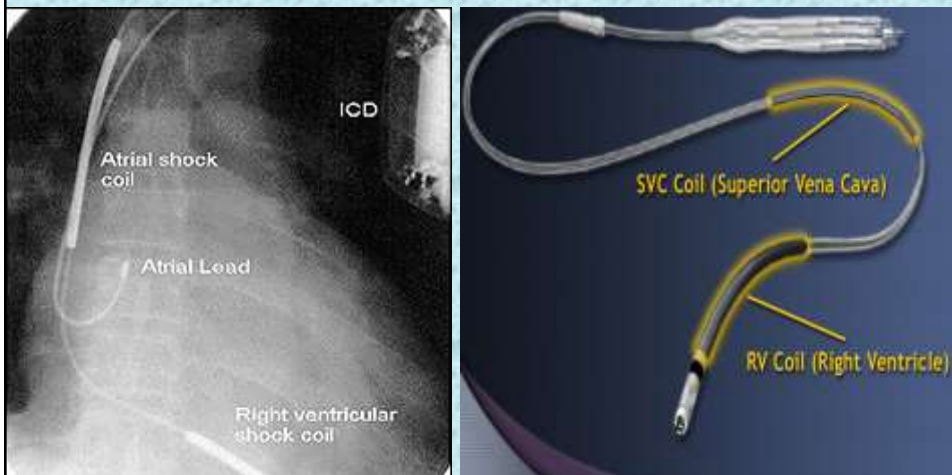
## 1) Implantable Pulse Generators (IPG):



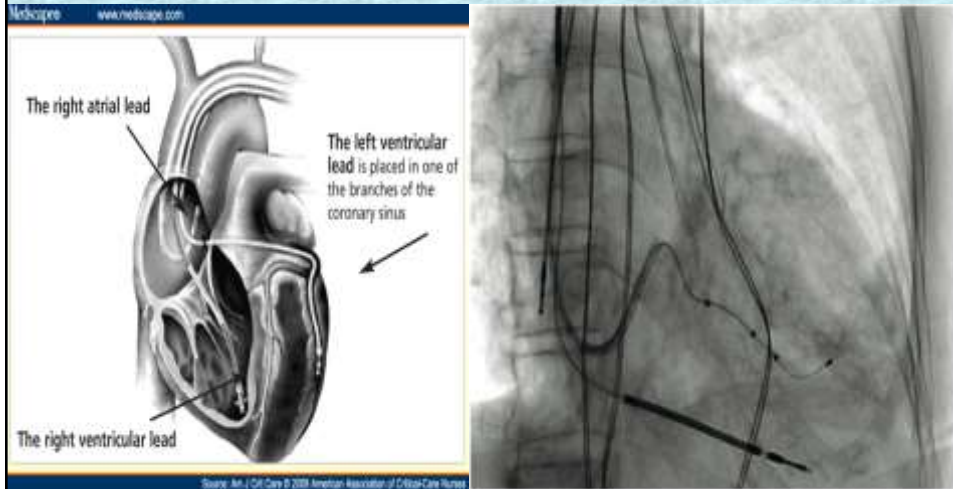
## 2) Cardiac Resynchronization Therapy-Pacing (CRT-P):



## 3) Implantable Cardioverter Defibrillators (ICDs):



## 4) Cardiac Resynchronization Therapy-Defibrillator(CRT-D):



## Which mode is appropriate?

### Indication

- DDD(R)
  - complete AV block
  - sinus nodal dysfunction
  - paroxysmal atrial fibrillation
- AAI(R)
  - sinus nodal dysfunction
- VVI(R)
  - permanent atrial fibrillation

AAI/AAIR

DDD/DDDR

VVI/VVIR

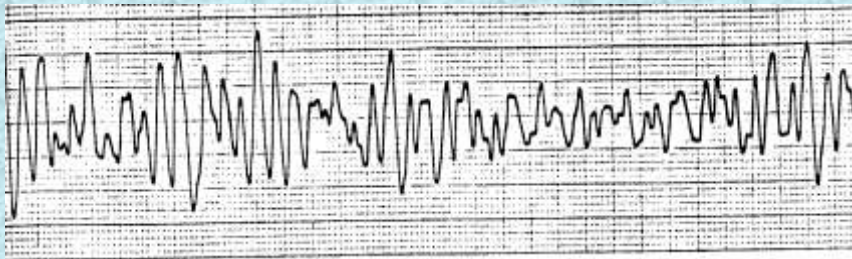
## Indications for CRT

- LV Ejection Fraction  $\leq$  35%
- New York Heart Association Heart Failure Classification - Class III or IV
- Left bundle branch block
- QRS  $>$  0.12s
- On optimal medical treatment, established regime including ACE inhibitor, B-Blocker, Digoxin, diuretic.

## Indications for ICD:

- Patients with recurrent ventricular dysrhythmias at risk for sudden death

### VT & VF



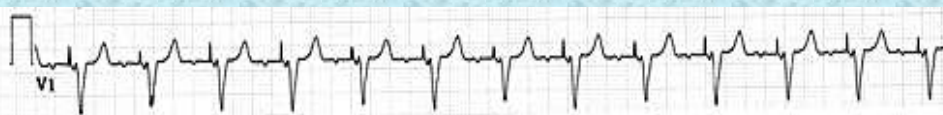


## Pacemaker terminology

- **Rate**: the rate at which the pacemaker will discharge (beats per minute)
- **Output**: The amount of electrical energy sent to the heart via the leads measured in milliamps (MA)
- **Sensitivity**: The ability to sense intrinsic cardiac activity to allow appropriate pacing (millivolts)

## Pacemaker terminology

- **Spike**: sharp vertical line which represents electrical energy delivered by the pulse generator
- **Capture**: successful depolarization of the chamber that is being paced
  - Atrial spike should be followed by a “P” wave
  - Ventricular spike should be followed by a “QRS” complex



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## Pacemaker Coding System

1 <sup>st</sup> letter: <b>Chamber paced</b>	2 <sup>nd</sup> letter: <b>Chamber sensed</b>	3 <sup>rd</sup> letter: <b>Pacemaker Response</b>
<b>A</b> (Atrium) <b>V</b> (Ventricle) <b>D</b> (dual A & V)	<b>A</b> <b>V</b> <b>D</b> <b>O</b> ( <i>Sensing function is off</i> )	<b>I</b> (Inhibited – if the pacemaker senses intrinsic activity it will not fire) <b>T</b> (triggered – if atrial activity sensed, ventricular pacing may be triggered) <b>D</b> (dual – inhibited & triggered) <b>O</b> (none – doesn't change in response to sensed intrinsic activity)

## Common Modes of Pacing

- **AAI**
  - Atrial pacing, atrial sensing, inhibited response to sensed P waves
- **VVI**
  - Ventricular pacing, ventricular sensing, inhibited by sensed QRS complexes
- **DDD**
  - Both chambers paced and sensed; inhibited response of pacing stimuli to sensed events; triggered response to sensed atrial activity to allow for rate-responsive ventricular pacing

# NURSING CARE FOR PATIENT WITH PACE MAKER & ICD

## Pre-Cath Preparation:

- **Routine pre-op management:**
  - 12 lead ECG
  - Skin preparation (shaving)
  - NPO - Fasting – put up a sign if you can!
  - Pre-operative checklist
  - Pre-operative labs(CBC , INR ,PT, PTT , Electrolytes , kidney function,.....etc.) as doctor order
- **Pre-op teaching: Discuss the procedure:**
  - Use written information material as available and appropriate
  - What can the patient expect during and after this procedure?
  - Encourage questions
- **Physician should obtain informed consent:**  
(remember patients must be consented before they receive a premed)

## Cath- lab nurse role:

- Explain the procedure step by step( he is conscious patient)
- Continuous ECG monitoring.
- Vital signs & Mental status.
- Scrub
- Circulating
- **Sterilization**(sterility is very important issue)
- *Pain Assessment*
- Administer analgesic or sedative.(if needed as doctor order)
- Evaluate patient response.
- Document the date of pacemaker insertion, the model and type, and settings. *This information is important for future reference*
- Provide a pacemaker identification card including the manufacturer's name, model number, mode of operation, rate parameters,

# Post-Cath Care

## A) Temporary pacemaker:

### 1- Assessment & Monitoring:-

#### A- For patient:-

- 12 lead ECG recording (on/off pacing)(in presence of doctor)
- Continuous ECG monitoring.
- Vital signs & Mental status.
- Skin color, warmth & integrity.
- Urine output.
- Level of comfort.

#### B-Pacemaker:-

- Setting, connections & function (recorded)

### 2- Pain management:-

- Administer analgesic or sedative.(if needed as doctor order)
- Evaluate patient response.
- Position patient comfortably/safe.
- Avoid accidental tension on wires & generator.

### 3- Providing site care:-

- Change electrodes /24 hours.(and if needed)
- Change dressing /48 hours

## B) Permanent pacemaker&ICD:

- 12 lead ECG soon post-operative
- Obtain a chest X-ray as ordered
- Minimize movement of the affected arm and shoulder
- Monitor pacemaker function with cardiac monitoring
- Assess & Report for dysrhythmias and treat as order.
- Document the date of pacemaker insertion, the model and type, and settings. *This information is important for future reference.*
- Immediately report signs of potential complications, including:tamponade,bleeding, infection, poor wound healing
- Provide a pacemaker identification card including the manufacturer's name, model number, mode of operation, parameters,



# Health Teaching for patient with permanent pace maker & ICD

- Once daily *dry dressing* changes to the incision site. Wash your hands, take off the old dressing, (If you have steri-strips, please do not remove them. These steri-strips will be removed at your post-device 1 week followup wound check appointment).
- You may be asked to keep the incision site dry for the week following implantation (you may shower, but need to keep the affected site dry).
- Typically driving is discouraged for at least 1 week or longer after the device is implanted
- Limit heavy lifting with the involved arm for at least 4 weeks

- Extreme motion with the involved arm (above the shoulder) should be avoided for 4-6 weeks You will need to return to the clinic in 1 week after device implantation to check the healing of the incision site.
- You can return to normal activities within several days
- Speak to your physician regarding your medications after device
- Expect 3-5 days of outpatient oral antibiotics after device implantation

