Objectives

- Participants will identify indications for pacemakers, defibrillators, and cardiac resynchronization devices.
- Participants will identify complications in newly implanted and chronic devices.
- Participants will identify current remote monitoring capabilities in device follow up.
- Participants will identify special considerations and end of life considerations of device patients.
- Participants will identify indications for the wearable defibrillator.

Devices

Pacemakers

- Between 1993 and 2009, 2.9 million patients received permanent pacemakers in the United States. Overall use increased by 55.6%.
- Dual chamber pacemaker use increased from 62% to 82%.
- Single-chamber ventricular pacemaker use fell from 36% to 14%.

Pacemakers

- The purpose of permanent pacing is to electrically stimulate myocardial contraction, and to restore and maintain an appropriate heart rate or ventricular synchrony when a chronic conduction or impulse formation disturbance exists in the cardiac conduction system (Offutt, 2011).

Pacemakers

- Class I indications for pacemaker implantation in sinus node dysfunction:
  - Sinus node dysfunction with symptomatic bradycardia
  - Symptomatic chronotropic incompetence with sinus node dysfunction.
Class I indications for pacemaker implantation:
- 3rd AVB
- 2nd AVB
- Atrial fibrillation with a slow ventricular response
- Hypersensitive carotid syndrome
- Drug induced conduction abnormalities

Does my patient need a pacemaker?
- Patient history: Primary reason for visit.
- Medication history: specifically cardiovascular medications, also tricyclic antidepressants, lithium, and phenothiazines (antipsychotics).
- Medical history: specifically cardiovascular disease.

Diagnostic testing:
- 12-lead EKG
- Holter Monitor
- Event Monitor
- Loop recorder

Achieving Cardiac Resynchronization
Mechanical heart failure: Synchronized biventricular pacing
- Transvenous Approach
  - Standard pacing lead in RV
  - Standard pacing lead in the left ventricle via an isolated in a left ventricular catheter over the coronary sinus
The purpose of the implantable cardioverter-defibrillator (ICD) is a device that is used to prevent sudden cardiac death from malignant ventricular dysrhythmias. The ICD continuously monitors a patient’s rhythm and attempts to convert ventricular tachycardia or ventricular fibrillation via antitachycardia pacing, cardioversion, defibrillation, or some combination of these. The ICD has the capability for backup bradycardia pacing (Offutt & Josephson-Keeven, 2011).

ICDs

- Class I Indications for ICD’s:
  - Survivors of cardiac arrest as a result of VF or VT.
  - Patients with structural heart disease and sustained VT.
  - Patients with syncope of undetermined origin with hemodynamically significant VT or VF at EP study.
  - Patients with non-ischemic dilated cardiomyopathy with the left ventricular ejection fraction < or equal to 35% and are NYHA functional class II or III.

Other Considerations (class IIa and IIb):
- Patients awaiting heart transplantation outside the hospital.
- Hypertrophic cardiomyopathy with one or more major risk factors for sudden cardiac death.
- Long QT syndrome.
- Nonischemic heart disease with an LVEF <35% and NYHA class I.

ICDs

- Class I Indications for ICD’s:
  - Patients with LVEF <35% and the presence of prior MI.
  - Patients with LV dysfunction with a prior MI with LVEF <30% and are NYHA class I.
  - Patients with Nonsustained VT due to prior MI who have LVEF <40% and inducible VF or VT during an EP study.

- Other Considerations (class IIa and IIb):
  - Patients with structural heart disease and sustained VT.
  - Patients with syncope of undetermined origin with hemodynamically significant VT or VF at EP study.
  - Patients with non-ischemic dilated cardiomyopathy with the left ventricular ejection fraction < or equal to 35% and are NYHA functional class II or III.
ICDs

Cardiac Resynchronization

- **Class I Indications:**
  - LVEF<35%, in sinus rhythm, has a LBBB with a QRS duration of greater than 150ms, and NYHA class II, III or a ambulatory IV.
- **Class Ila Indications:**
  - CRT can be useful in pts with LVEF<35%, in sinus rhythm, has a LBBB with a QRS duration of 120-149ms and NYHA class II, III or a ambulatory IV.
  - In patients with atrial fib with LVEF<35%, pt. requires Ventricular pacing and meets other CRT criteria and has AV nodal ablation or pharmacological rate control that will allow near 100% ventricular pacing with CRT.

Complications from implant:
- Infection
- Bleeding
- Pneumothorax
- Lead dislodgement
- Lead perforation
- Venous Thrombosis and Superior Vena Cava Syndrome (SVCS)

Long term complications
- Chronic device:
  - Generator failure (rare)
  - Lead failure
  - Extra cardiac stimulation (can occur in acute or chronic phase)
  - Twiddler's Syndrome
  - Skin erosion
  - Late infection

ICDs

Pacemakers and ICDs

Pacemakers and ICDs
Pacemakers and ICDs

Symptoms patient may experience with a pacemaker malfunction:
- Dizziness or lightheaded episodes
- Syncope
- Weakness
- Easy fatigability

Patient should be aware of the return of any symptoms they had prior to pacemaker implant.

Pacemakers and ICDs

- Patients with pacemakers and ICDs need regular follow up on their device.
- Ask patient who has a device about their follow up:
- Should be checked once/90 days either in person or by phone

When should I call the pacemaker clinic:
- Decreased Heart rate.
- Excessive pain, drainage, redness, or swelling.
- Fever.
- Lightheadedness or feeling faint.
- Shortness of breath or fatigue.
- Palpitations or continuous fast heart rate.
- Hiccups.

Pacemakers and ICDs

Do’s and don’ts:
- Household appliances including microwaves are ok to use.
- Cell phones are ok.
- Anti-theft systems.
- Metal detector.
Pacemakers and ICDs

Do’s and Don’ts:
- Welding equipment.
- For most patients MRI is contraindicated.
- TENS unit.
- Radiation.
- Surgery with electrocautery.

Pacemakers

- Reason for visit:
- Pacemaker:
  - Mode:
  - Implant date:
  - Implant site:
  - Condition:
  - Pacemaker indication:
  - Placement:
  - PPM dependent:
  - Telemetry:
  - Current rhythm:
  - Intrinsic rhythm:
  - Programmed settings:
    - Low rate:
    - Upper rate:
    - A-delay (S) (P):
    - Sensitivity rate (A) (V):
    - Response:
    - Mode:
    - Pulse width (A) (V):
    - Amplitude (A) (V):
    - Refractory (A) (V):
    - Magnet rate:
    - Capacitor maintenance charge:
  - Lead impedance:
  - Atrial:
  - Ventricular:
  - Heart rate:
  - ECG:
  - Assoicated symptoms:

ICDs

- What do the findings mean:
  - ER - Elective replacement indicator
  - EOL - End of Life
  - Mode Switch Episodes - usually indicate atrial fib.
  - Ventricular High Rate Episodes - can indicate NSVT.
- What should patients do when they receive a shock:
  - If patient receives one shock and does not pass out he should call the device clinic.
  - If patient receives two or more shocks in the same day he should go the nearest ER for evaluation.
ICDs

- What does the magnet do over the ICD?
  - Will Not Detect
  - Can Not Deliver Therapy
  - No effect on pacemaker function

ICDs

- Special Considerations:
  - Emotional response to having an ICD.
  - Anxiety and fear increase after patient experiences a shock.
  - Feel sense of loss of control.

ICDs

- End of Life Considerations:
  - Deactivation of the ICD.
  - Discussion should be had with patient/POA prior to deactivation.
  - Must have a DNR order and a separate order to deactivate ICD.
  - Encourage patients to express their wishes for device management and deactivation as part of their advanced directive.

Wearable ICD

Pacemakers and ICDs
Helpful Websites:

- www.medicaca.com
- www.bostonscientific.com
- www.sjm.com

References: