Pacemaker

- General Devices
  - ICD/PPM (larger) or PPM only (smaller)
  - Thick lead end on CXR means ICD lead
  - If multiple shocks consider: PAF, lead fracture, device failure, true multiple VF/VTs aka "storm"
  - Battery lasts ~6yrs
- Indications
  - Other: prolonged pauses (>3sec in symp pts vs >5sec in asymp pts), prolonged QT, alternating RBBB/LBBB
  - Bradycardia: any symptomatic bradycardia, ≥ Mobitz II AV Block
  - Tachycardia: drug resistant tachycardias
- symptomatic bradycardia accounts for 1/2 of pacemaker placement
- pacing only relieves symptoms not decrease mortality
- meds alone often fail hence PPM b/c they can adequately control tachy but not brady or vice versa therefore usually you need PPM for brady and meds for tachy
- temporary transcutaneous/venous pacing
- Permanent PaceMaker (PPM)
  - How are they coded? Three Letter Code (some have a fourth and fifth letter for more advanced features)
    - First Letter: Pacing Chamber (A (Atrial), V (Ventricle), D (Dual) O (Neither))
    - Second Letter: Sensing Chamber (A (Atrial), V (Ventricle), D (Dual) O (Neither))
    - Third Letter: Response to Sensed Event (I (Inhibited), T (Triggered), D (Dual) O (No Response))
    - Fourth Letter: ? (P (Programmable Rate), C (Communication Stored), R (Rate Response))
    - Fifth Letter: ? (P (Pacing), S (Shock), D (Dual), O (Neither)) if AICD
    - Most Common Type: DDD as most physiologic
  - Magnet is used to change settings and turn on (magnet off chest) and off (magnet on chest)
  - SEs: pocket hematoma, pocket infection w/ bacteremia, device failure (below)
    - Failure To Pace
      - Manifests as bradycardia
      - Cause: low battery, lead dislodgement, local tissue injury around pacing lead
    - Failure to Sense
      - Manifest as inappropriate pacing
      - Cause: lead dislodgement
    - PM Mediated Tachycardia
      - Manifests as tachycardia
      - Seen in DDD
    - PM Syndrome
      - Manifests as palpitations and HF
      - Seen in VVV

Antiarrhythmics

- When you start an anti-arrhythmic always follow QT
- AP of SA/AV Nodes are initiated by autonomic stimuli (hence Class II – BBs work, but you can also use digoxin) and generated by calcium influx (hence Class IV – non-dihydropyridine CCBs work, but you can also use adenosine)

- AP of pathways (between nodes and His-Purkinje System) are propagated by Na influx and K outflux (hence Class I – Na Channel Blockers and Class III – K Channel Blockers work)
- Types (Vaughn-Williams Classification) SEs: pro-arrhythmic potential
  - Class I Na Channel Blockers
    - Ia (rarely used) SEs: prolong QRS and QT
      - disopyramide (Norpace) SEs: anticholinergic effects
      - procainamide (Procanbid) SEs: drug-induced lupus, heme issues (agranulocytosis, neutropenia, thrombocytopeni)
      - quinidine (?) SEs: GI, TTP, "cinchonism" (hearing loss, tinnitus, psychosis)
    - Ib (rarely used)
      - lidocaine (Xylocaine) SEs: seizures
      - mexiletine (Mexitil) SEs: ?
    - Ic (used)
      - propafenone (Rythmol) some BB effect, good for PVCs and Afib, SEs: dysguesia
      - flecainide (Tambacor) pure Ic, good for PVCs and Afib, SEs: CNS
  - Class II Beta Blockers (refer above/below)
  - Class III K Channel Blockers
    - ibutilide (Covert) SEs: pro-arrhythmic, renal failure
    - sotalol (Betapace) actually more K blocker then BB, SEs: pro-arrhythmic only if QTc>500msec
    - bretylium (?) SEs: transient HTN then postural hypotension
  - Class IV Ca Channel Blockers (refer to Non-Dihydropyridine CCB: diltiazem/verapamil)
- Important to remember is amiodarone (Pacerone, Cordarone) because it is falls in all classes even though it is primarily a Class III and it is used most often

- Toxicity ("PFTs, TFTs, LFTs")
  - Acute: pneumonitis/ARDS, hypo/hyperthyroidism, acute liver dz (refer)
    - Other: infusion phlebitis, **hypoTN** (most common adverse effect in IV admin)
  - Chronic: pulmonary fibrosis, hypo/hyperthyroidism, chronic liver dz (refer)
    - Other: optic neuropathy, corneal deposits, blue skin, photosensitivity, muscle weakness, drug interactions esp coumadin/digoxin, **neurotoxicity** (most common adverse effect in PO admin)
  - it is a love hate/relationship, it works well but it has SEs and Toxicity, therefore mainly used short-term or long-term in old pts who likely will not live long enough to experience the chronic SEs