Cardiac Cases

NURS 380

Med Review Bingo

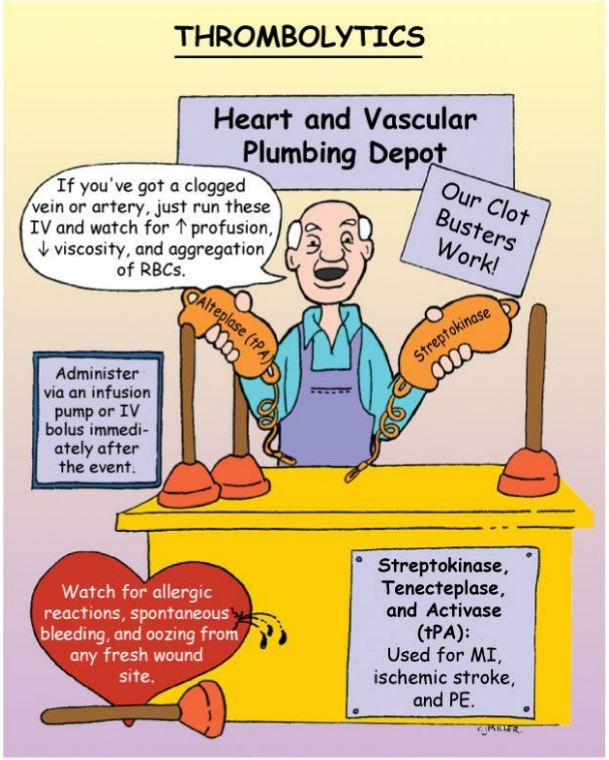
Fibrinolytic
Warfarin
Aspirin
Antiarrhythmics
Adenosine
Amiodarone
Digoxin
Dopamine
Norepinephrine

Nitroprusside
Clevidipine
Atorvastatin
ACE inhibitor
Beta blocker
Nitrates
Spironolactone
Loop diuretics

Cardiac Medication Review

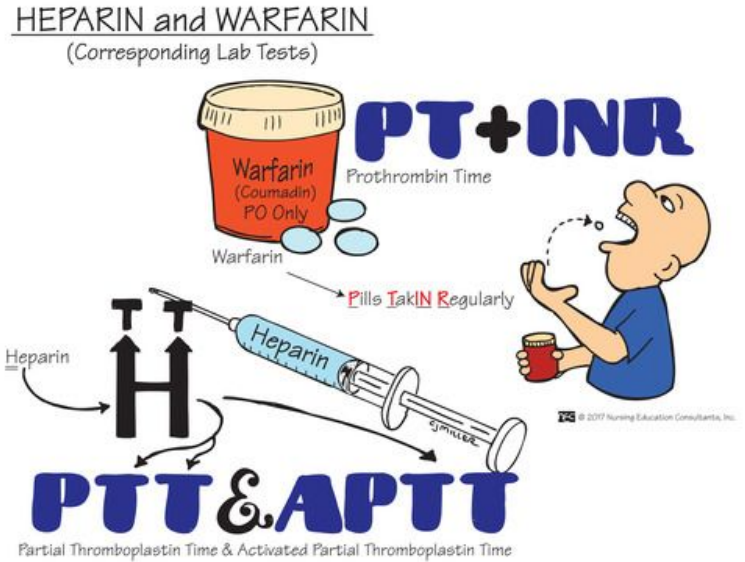
Fibrinolytics

- Alteplase, tenecteplase, reteplase, streptokinase
- Dissolve intravascular clots to prevent ischemic damage and restore blood flow
- Uses: STEMI/AMI, DVT, PE, AIS, occlusion of indwelling catheters, intracardiac thrombus formation, frostbite (off-label)
- Contraindications?
- Nursing management?



Anticoagulants

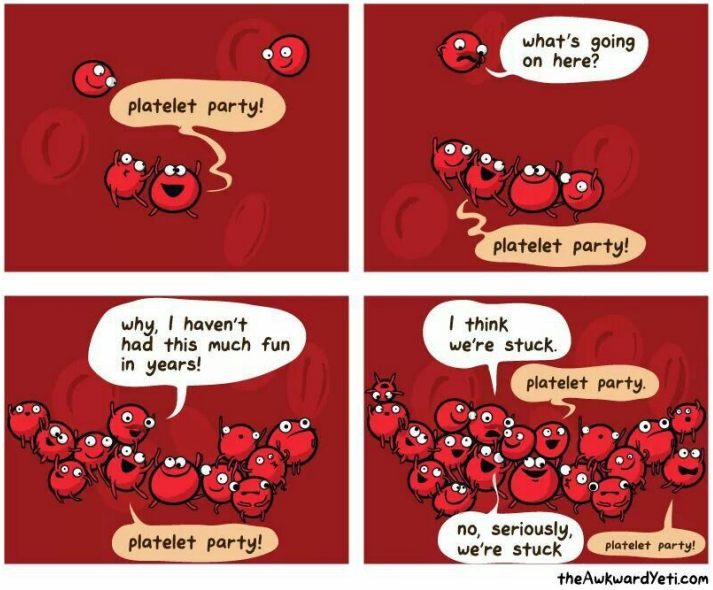
- Unfractionated heparin (UFH)
  - Indicated for ACS, venous thromboembolism, PCIs, and patients who have received fibrinolytic therapy
  - Prevents clot formation
  - Narrow therapeutic range, increased bleeding risk, HIT, monitoring
- Low molecular weight heparins (LMWH)
  - enoxaparin (Lovenox)
  - Derived from UFH; indicated for unstable angina, NSTEMI, DVT
  - Longer half-life, predictable effects, administered subQ
  - Adverse: bleeding, thrombocytopenia, elevated liver enzymes, injection site complications



Anticoagulants

- Direct thrombin inhibitors
  - bivalirudin (Angiomax), argatroban
  - Used in patients who have a history of HIT and are undergoing PCI
  - Dosage based on aPTT results or ACT
- Warfarin
  - Oral chronic anticoagulation therapy
  - Interferes with vitamin K synthesis
  - Indications: AF, HF, prosthetic valves, post AMI anticoagulation, VTE, cardiomyopathy
  - Contraindications: uncontrolled hypertension, severe hepatic or renal impairment
  - Starting dose? Titration parameter?
- Others
  - Direct oral anticoagulants (DOACs)
  - Only approved for Afib
  - Rivaroxaban (Xarelto) and apixaban (Eliquis)
  - Andexanet alfa (Andexxa) is reversal agent

Platelet Inhibitors



- Aka antiplatelet agents
- Indications: ACS, post PCI with stenting, mechanical heart valves in combo with warfarin, acute ischemic stroke, stable angina, Kawasaki disease, afib with high risk of stroke, primary prevention of VTE
- Classified based on mechanism of action
- Aspirin most commonly used
- Clopidogrel (Plavix), ticagrelor (Brilinta), prasugrel (Effient), cangrelor

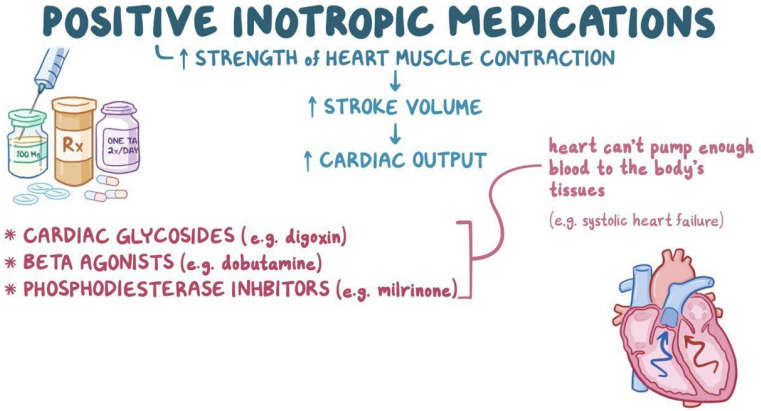
Antiarrhythmics

ANTIARRHYTHMICS

DRUG CLASS	NAME	SIDE EFFECTS
CLASS I	• A: Quinidine, Procainamide, Disopyrimide	• Thrombocytopenia, Wide QT, Cinchonism (Quin.), Drug-induced Lupus (Pro.), Heart failure (Dis.)
	• B: Lidocaine, Mexiletine	• CNS & Cardiovascular depression
	• C: Flecainide, Propafenone	• Arrhythmias post-MI
CLASS II	• Selective: Metropolol, Esmolol, Atenolol	• Hypoglycemia unawareness, Bradycardia, Dizzyness, Sleep alterations • Met.: Dyslipidemia
	• Non-selective: Propranolol, Timolol, Carvedilol	• Non-sel.: Bronchospasm, vasospasm
CLASS III	• Sotalol	• Excessive beta blockade
	• Amiodarone	• Pulmonary fibrosis, Hepatotoxicity, Thyroid alterations, Corneal & skin deposits, Neurologic alterations, Constipation
	• -tilide	• Torsade de pointes
CLASS IV	• Verapamil, Diltiazim	• Flushing, Bradycardia, Peripheral edema, Constipation

Inotropes

- Increase cardiac contractility
- **Dobutamine**, dopamine, isoproterenol, **milrinone**
- **Dobutamine**
  - Indications: decreased contractility due to HF or cardiac decompensation
  - 0.5 mcg/kg/min to 40 mcg/kg min
  - Increases risk of afib with RVR and HTN
  - Contraindications: AMI, unstable angina, arrhythmias, hypokalemia



Vasodilators

- Indications: HTN, MI, angina, HF, stroke, CKD, preeclampsia, HTN emergency
- Most commonly affect arteries but some are venous vasodilators
- Nitroprusside
  - Acute HTN, acute decompensated HF, induction of perioperative hypotension
  - IV infusion in D5W
  - 0.5-4 mcg/kg/minute with max 10mcg/kg/min for less than 10 minutes
  - Half life 2 minutes

ACE Inhibitors

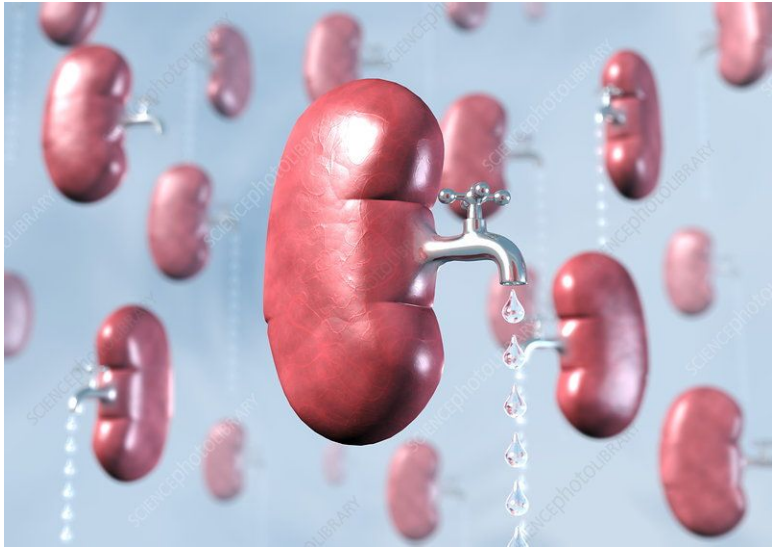
- Indications: HTN, HF, STEMI, diabetic neuropathy and IBD (off-label)
- Oral only (enalapril is the only IV ACEI)
- Adverse: **dry cough**, dizziness, hypotension, increased BUN and creatinine, syncope, hyperkalemia, **angioedema**
- Contraindicated in pregnancy

Beta Blockers

- Negative inotropes
- Long-term use best for HTN and HF
  - Also used for CHF, tachycardia, HTN, hyperthyroidism, essential tremor, aortic dissection, glaucoma, migraine prophylaxis, long QT syndrome
- Small dose for patients who are BB naive
- Adverse: bronchospasm, fatigue, dizziness, nausea, constipation, ED, weight gain, heart blocks
- Antidote? - **glucagon** (if it doesn't work, then temporary pacing)

Diuretics

- Mainstay of heart failure management
- Categorized by MOA and area of function
  - Loop diuretic?
    - Furosemide (maximum dose 240mg as a push)
    - Push slowly (over 2 min)
  - Thiazide?
    - hydrochlorothiazide
  - Aldosterone antagonist? Potassium sparing diuretic
    - spironolactone



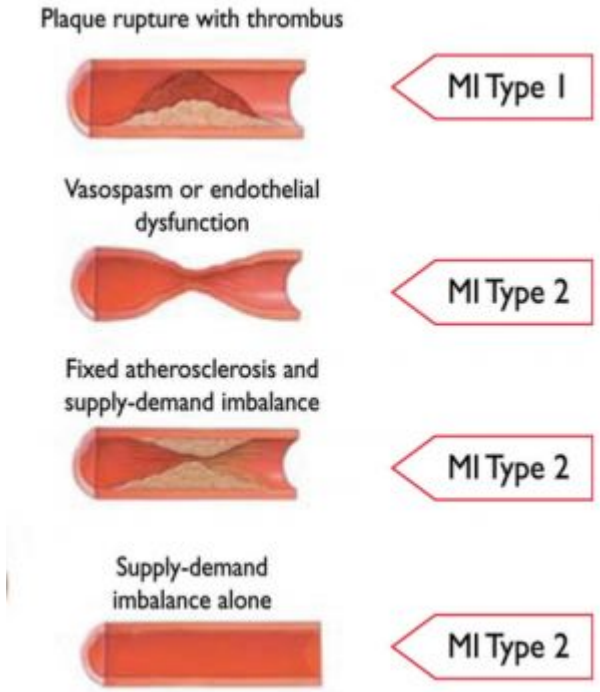
Topics from Adult ACS Case

Angina

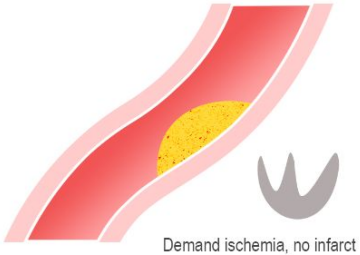
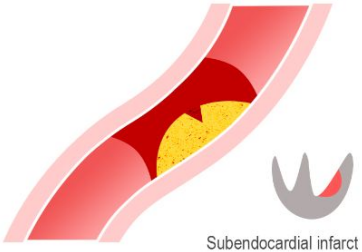
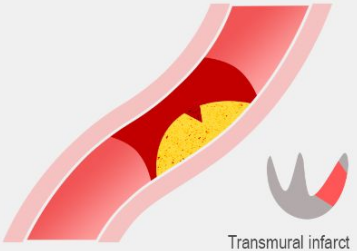
- Chest pain or discomfort caused by myocardial ischemia
- Angina =/= cell death
- 3 types:
  - Stable angina - occurs with exertion, relieved by rest
  - Unstable angina - occurs at rest, requires more frequent nitrate therapy
  - Variant/Prinzmetal's - caused by coronary artery spasm
- Assessment data?
- Interventions
  - Nursing
  - Medical

Acute Coronary Syndrome

- Umbrella term for stable/unstable angina and MI
- Causes - decreased coronary artery perfusion
- Types of MI
  - NSTEMI vs STEMI
  - Type I - spontaneous MI due to plaque rupture
  - Type II - coronary vasospasm, embolism, arrhythmia, anemia, respiratory failure, hypotension, shock
- Signs/Symptoms
  - Differences in presentation for men vs women



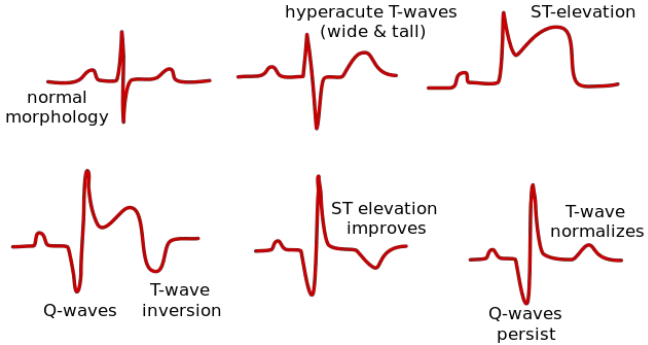
ACUTE CORONARY SYNDROME

	1 STABLE ANGINA	2 UNSTABLE ANGINA	3 NSTEMI	4 STEMI
	Angina pain develops when there is increased demand in the setting of a stable atherosclerotic plaque. The vessel is unable to dilate enough to allow adequate blood flow to meet the myocardial demand.	The plaque ruptures and a thrombus forms around the ruptured plaque, causing partial occlusion of the vessel. Angina pain occurs at rest or progresses rapidly over a short period of time.	During an NSTEMI, the plaque rupture and thrombus formation causes partial occlusion to the vessel that results in injury and infarct to the subendocardial myocardium.	A STEMI is characterized by complete occlusion of the blood vessel lumen, resulting in transmural injury and infarct to the myocardium, which is reflected by ECG changes and a rise in troponins.
	 Demand ischemia, no infarct	 Supply ischemia, no infarct	 Subendocardial infarct	 Transmural infarct
ECG	 Normal	 Normal, Inverted T waves, or ST depression	 Normal, Inverted T waves, or ST depression	 Hyperacute T waves or ST elevation
TROPONINS	Normal	Normal	Elevated	Elevated

This infographic was created by Paula Sneath and Leah Zhao for the Sirens to Scrubs series of CanadiEM.org.

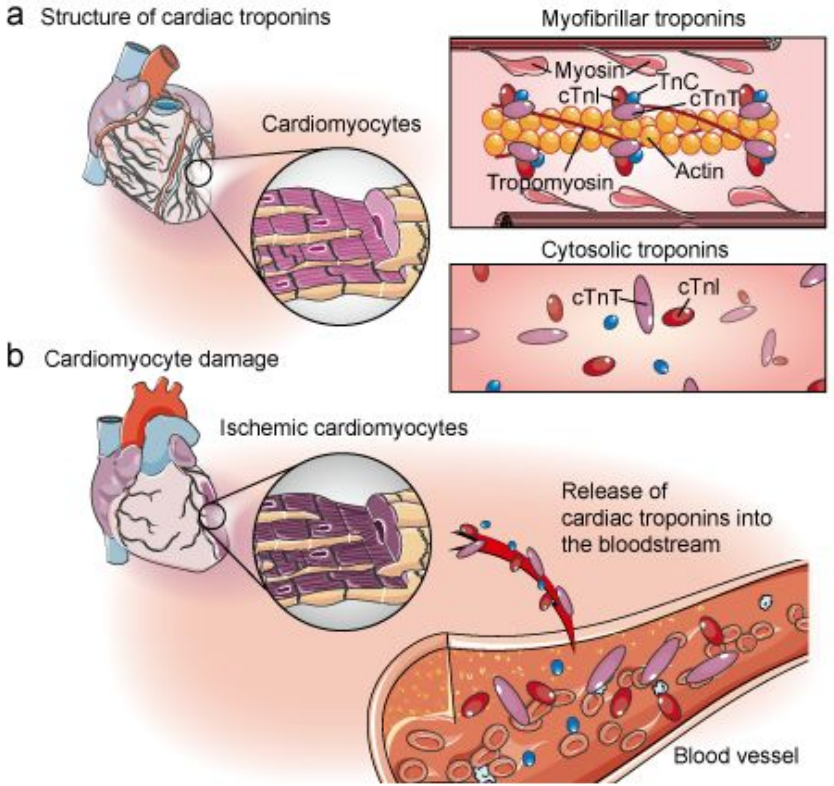
ACS - Diagnosis

GOOD TO KNOW



Cardiac Biomarkers

- **CK** - creatine kinase
  - Found in heart and skeletal muscle, brain
  - Released when (any of the three above are) damaged - aka. nonspecific
- **CK-MB** - heart specific
  - Heart-specific CK enzyme
  - Detected in serum **4 hours after injury**
  - Peaks by 24 hours
  - Normalizes 48 - 72 hours
  - **Normal: 3 - 5% of total CK or 5 - 25 IU/L**
- **Troponin** (most specific and sensitive)
  - Found in heart muscles
  - First line test for MI
  - Three subunits: troponin C, troponin I, troponin T
  - T and I detected in serum 4 hours after injury, peaks in 24 - 48 hours, remains elevated for days
  - **Normal: 0 - 0.04 nanograms/mL**
  - Drawn every 6 hours until it plateaus (once it starts going down)
  - Value has nothing to do with severity



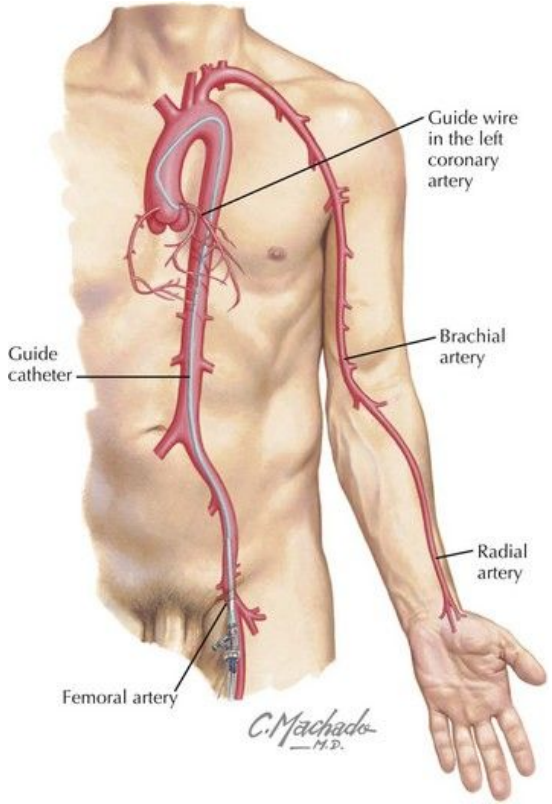
ACS - Treatment

- Treatment (establish reperfusion, reduce infarct size, treat complications, emotional support)
  - Pain relief
  - Oxygen
  - Antidysrhythmics
  - Prevention of platelet aggregation
  - PCI/PTCA
  - Fibrinolytic therapy
  - Surgical revascularization

diltiazem (Cardizem)	Antiarrhythmic/CCB used primarily for afib/flutter, SVT	IV: 0.25 mg/kg Cont IV: 5-15 mg/h	Hypotension, edema, dizziness, bradycardia
amiodarone (Cordarone)	Antiarrhythmic used for afib/flutter, SVT, vfib/tach	IV: 150mg or 300 mg Cont IV: 150 mg over 10 minutes, 360 mg at 1mg/min for 6 hours, then 0.5 mg/min for 18 hours (540 mg)	Bradycardia, AV blocks, hypotension, pulmonary fibrosis, long half-life
alteplase (t-PA)	thrombolytic	IV: 0.9 mg/kg with 10% of total dose bolused over 1 minute and remainder as gtt over 1 hour	Bleeding, reperfusion arrhythmias, reocclusion/reinfarct
clopidogrel (Plavix)	Inhibits clotting mechanisms and prevents platelet aggregation in MI, UA, AMI and post PCI	PO: 300 mg loading dose then 75mg/day in combo with aspirin	Bleeding, epigastric discomfort, bruising

PCI Care

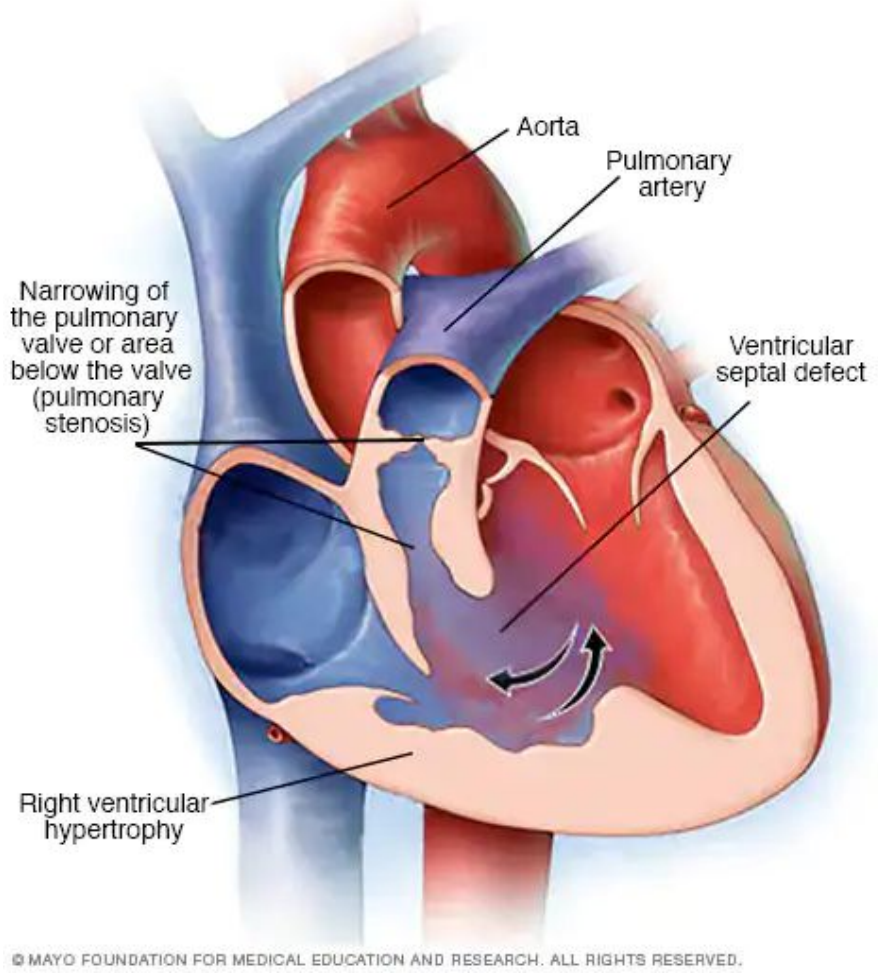
- Site care
  - Femoral vs radial
- Activity
- Monitoring for complications
  - EKG changes
  - Reperfusion injury
  - Bleeding
- Medications
  - Antiplatelets/anticoagulation
  - Beta blockers
  - Pain management
- Education
  - Diet
  - Exercise
  - Discharge/follow-up care



Pediatric Cardiac Case Study

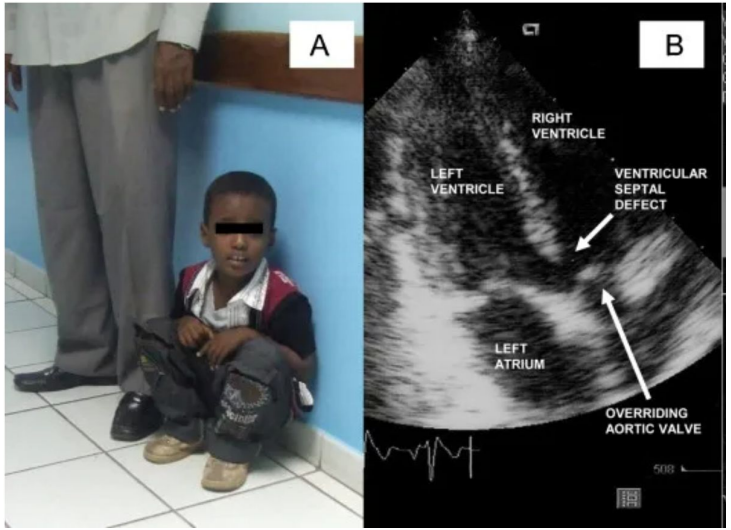
Tetralogy of Fallot (TOF)

- Combination of four congenital heart defects:
  - VSD
  - Pulmonary stenosis
  - Misplaced aorta
  - RV hypertrophy
- Causes/Risk Factors
  - Untreated maternal diabetes
  - PKU
  - Viral illness
  - Chromosomal abnormalities (trisomy 18, 21, 13)



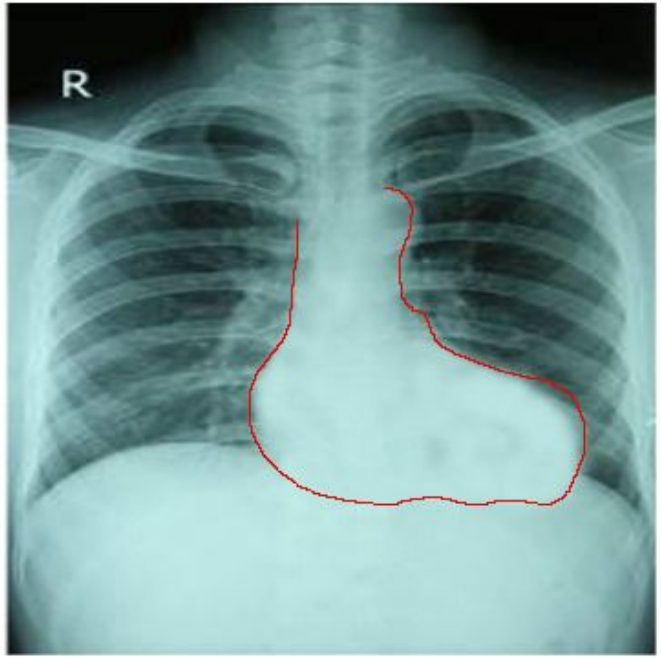
TOF History & Physical

- Dependent on severity
- Cyanosis
- Dyspnea and tachypnea during feeding or exercise
- Poor weight gain
- Fatigue
- Prolonged crying
- Murmur/abnormal heart sounds
- Prominent ventricular impulse & palpable thrill
- “Tet spells”
- Squatting



TOF Management

- Diagnosis
  - Clinical signs/symptoms
  - Tests/labs
- Treatment
  - Tet spells
  - Shunt placement
  - Intracardiac repair
- Avoiding complications
  - Heart failure
  - Arrhythmias
- Education
  - Preventing infection
  - Preventing tet spells
  - Feeding
  - Exercise limitations
  - Pregnancy (later)
  - Medications



Peripartum Cardiomyopathy

Peripartum Cardiomyopathy Pathophysiology

- Type of systolic heart failure or dilated cardiomyopathy
- Four criteria
  - Development of cardiac failure in the last month of pregnancy or within five months of delivery
  - Absence of other cause of cardiac failure
  - Absence of recognizable heart disease before last month of pregnancy
  - LV dysfunction (EF <45%) **normal 54-74%**
- Etiology unclear
- Misdiagnosed or delayed diagnosis
- High mortality rate (20-50%)

PPCM Risk Factors

- Multiparity
- Black race (Nigerian or Haitian ancestry or ethnicity)
- AMA (>30)
- Pre-eclampsia
- Gestational HTN
- Autoimmune disease
- Substance use disorder
- Genetic predisposition

PPCM Signs & Symptoms

Table 1.

Signs and symptoms in peripartum cardiomyopathy vs normal pregnancy, pulmonary embolism, and upper respiratory infection

Pregnancy	PPCM	PE	URI
Fatigue	Fatigue	Fatigue	Fatigue
Tachycardia	Tachycardia	Tachycardia	
Dyspnea	Dyspnea	Dyspnea	
Edema	Edema	Edema	
Chest pain	Chest pain		
DOE	DOE		
PND/orthopnea	PND/orthopnea		
Rales	Rales		
S3 heart sound	S3 heart sound		
Cough		Cough	
Hepatosplenomegaly			

Labs/Diagnosis

- B-type natriuretic peptide (BNP)
  - Hormone secreted by cardiomyocytes in response to stretching
- D-dimer
  - Fibrin degradation product
  - Elevated in any process that causes fibrin to break down (surgery, trauma, infection, liver disease)
  - Normally undetectable
- Extra heart sounds (S3 gallop)
- Cardiac enzymes
- Preeclampsia workup
- EKG
- Chest CT/CXR
- Echocardiogram

Age Range	BNP Level	What It Means
All ages	Under 100 pg/mL	Normal
Ages 50 and older	450 pg/mL and up	Acute heart failure
Ages 50 to 75	900 pg/mL and up	Acute heart failure
Ages 75 and older	1,800 pg/mL and up	Acute heart failure

Treatment

- Fluid restriction
- Sodium restriction
- Beta Blockers
- Diuretics (cautious if pregnant)
- Digoxin
  - Cardiac glycoside
  - Antiarrhythmic and BP support, inotropic support
  - Side effects: N, V, D, dizziness, HA, weakness, anxiety, depression
  - Adverse: digoxin toxicity (atrial tachycardia, v tach, afib with slow response) Therapeutic level: 0.8 - 2.0 ng/mL. Toxic: >2.5 ng/mL
  - Antidote: digibind/ digoxin immune fab
  - Oral, IV (usually a loading dose followed by maintenance dose)

Treatment

- ACEIs and ARBs contraindicated
- Hydralazine to reduce afterload
- Anticoagulation to prevent thrombus formation
- Prolactin inhibition (bromocriptine)
- Complications: ECMO, heart transplantation, ventricular tachyarrhythmias leading to defibrillator placement

- Treatment, especially medications, should last for 1 year
- EF typically normalizes within 6 months
- Subsequent pregnancy not recommended (30% chance of recurrence)