Cardiovascular Study Guide

Heart is failing to do his work!, In the WITH TIME he e gets BIG

Heart Failure (CHF)

Pathophysiology

- **Heart Failure**: The heart cannot pump enough blood to meet the body's demands.
- **Preload**: The volume of blood stretching the ventricle at the end of diastole (filling). Think VOLUME. Increased in fluid overload.
- **Afterload**: The pressure the heart must work against to eject blood during systole. Think RESISTANCE. Increased in hypertension.

Left-Sided vs. Right-Sided Heart Failure

Type	Blood Backs Up Into...	Key Symptoms
Left-Sided	Lungs	Lung symptoms: Dyspnea, Crackles, Cough, Orthopnea
Right-Sided	Rest of the Body	Rest of body symptoms: Peripheral Edema, Jugular Vein Distention (JVD), Ascites, Weight gain

Nonpharmacologic Treatment

- **Lifestyle modifications** → Gym, Diet
- **Limit salt intake**
- Limit or avoid alcohol
- Stop smoking
- Decrease saturated fat intake
- **Daily weights** to monitor fluid status → Changes in daily weight in big numb could indicate Fluid Retention
- **Key Labs**
  - **Atrial Natriuretic Peptide (ANP)**: Normal Range: 20–77 pg/mL. **Elevated ANP indicates that the atria are under stress from fluid overload or high pressure → common in HF.**
  - **BNP (Brain Natriuretic Peptide)**: Normal is <100 pg/mL. **Elevated BNP is a key indicator of heart failure.**

Michelle: Edema means to much Liquid in the tissues.

Cardiac Glycosides

Digoxin (Lanoxin)

- **Class**: Cardiac Glycoside
- **Mechanism**:
  - Inhibits the Na+/K+ pump, increasing intracellular sodium.
  - This leads to increased intracellular calcium.
  - More calcium = stronger heart muscle contraction.
- **Effects**:
  - **Positive Inotropic**: ↑ Force of contraction
  - **Negative Chronotropic**: ↓ Heart rate
  - **Negative Dromotropic**: ↓ Conduction velocity through AV node

- **Uses**: Heart Failure, Atrial Fibrillation (to control rate).
- **Digoxin Toxicity**:
  - **Therapeutic Range**: **0.5 - 2.0 ng/mL**
  - **Early Signs**: **Anorexia, nausea, vomiting, diarrhea**
  - **Late Signs**: **Bradycardia**, dysrhythmias, **visual disturbances (yellow/green halos)**
  - **Increased Risk with**: **Hypokalemia (low potassium)**.
    - *This is critical for patients also on loop or thiazide diuretics.*
- **Nursing Considerations**:
  - **Check apical pulse for 1 full minute before giving.**
  - **HOLD if pulse is < 60 bpm** for an adult.
  - Monitor potassium levels.
  - Encourage potassium-rich foods (bananas, spinach, potatoes).
- **Antidote**: **Digoxin Immune Fab (Digibind)**

Antianginal Drugs

Used to treat angina pectoris (chest pain) by improving the balance between myocardial oxygen supply and demand.

Types of Angina

Type	Trigger	Relief	Key Feature
Stable	Exertion or stress	Rest or Nitroglycerin	Predictable pattern
Unstable	Minimal exertion or at rest	Not easily relieved	Emergency! High risk of MI.
Variant (Prinzmetal's)	Coronary artery spasm	Nitroglycerin, CCBs	Occurs at rest

Nitrates

- **Drug**: **Nitroglycerin (NTG)**
- **Mechanism of Action**: **Vasodilation** of veins and arteries.
  - Decreases preload and afterload, reducing cardiac workload.
- **Routes**:
  - **Sublingual (SL)**: For acute attacks.
  - Topical/Patch: For long-term prevention.
  - IV: For unstable angina.
- **Sublingual Administration for Acute Attack**:
  - Sit down before taking to prevent hypotension.
  - Place one tablet sublingually.
    - Educate patient not to swallow the medication.
  - If pain is not relieved in 5 minutes, call 911, then take a second tablet.
  - May take a third tablet 5 minutes later if needed.
    - **(Max 3 doses in 15 minutes)**.

- **Side Effects**: **Headache, hypotension, dizziness, reflex tachycardia.**
- **Contraindication: Do NOT take with PDE5 inhibitors like sildenafil (Viagra)** - can cause life-threatening hypotension.

Beta Blockers

- **Suffix**: ***-lol*** (e.g. *Metoprolol, Atenolol, Propranolol*)
- **Mechanism of Action**: Block beta-receptors to decrease HR, contractility, and BP, reducing myocardial oxygen demand.
- **Types**:
  - **Cardioselective (β1)**: Metoprolol, Atenolol (Safer for lung patients)
  - **Nonselective (β1 & β2)**: Propranolol
    - **(Contraindicated in asthma/COPD due to bronchoconstriction)**
- **Side Effects**: Bradycardia, hypotension, fatigue, impotence.
- **Nursing Considerations**:
  - Check HR and BP before giving.
  - **Hold if HR < 60 or SBP < 90.**
  - **Do not stop abruptly (rebound hypertension)**.

Calcium Channel Blockers (CCBs)

- **Drugs**: Verapamil, Diltiazem, Amlodipine, Nifedipine
- **Mechanism of Action**: Block calcium channels in cardiac and smooth muscle, causing vasodilation and decreased heart contractility/rate.
- **Types**:
  - **Non-Dihydropyridines**: Verapamil, Diltiazem (Work on heart and vessels - slow HR)
  - **Dihydropyridines**: Amlodipine, Nifedipine (Mainly work on vessels - potent vasodilators)

Is like selective / non Selective

- **Side Effects**: Hypotension, bradycardia (with non-DHPs), peripheral edema, headache, flushing.
- **Nursing Considerations**: Monitor HR and BP. **Avoid grapefruit juice** (increases toxicity risk).

Diuretics

Diuretics increase Urine Production, they don't increase urination.
They act on the Kidenys, not on the bladder or the urethra.

Type	Examples	Primary Use	Major Side Effects	Nursing Considerations
Loop Diuretics	Furosemide (Lasix), Bumetanide	Heart failure, pulmonary edema, hypertension	Hypokalemia, hyponatremia, dehydration, hypotension, ototoxicity	Monitor electrolytes, BP, daily weight, I&O; give in morning; assess for dehydration
Thiazide Diuretics	Hydrochlorothiazide, Metolazone	Hypertension, mild edema	Hypokalemia, hyponatremia, hyperglycemia, hyperuricemia	Monitor electrolytes, BP, glucose in diabetics; give in morning; encourage potassium-rich foods
Potassium-Sparing Diuretics	Spironolactone, Triamterene	Heart failure, hypertension, prevent hypokalemia	Hyperkalemia, gynecomastia (spironolactone), menstrual irregularities	Monitor potassium, BP, I&O; avoid potassium supplements or salt substitutes; teach signs of hyperkalemia
Osmotic Diuretics	Mannitol	Cerebral edema, increased ICP, acute kidney injury	Dehydration, electrolyte imbalance, pulmonary edema	Monitor I&O, daily weight, electrolytes, mental status; use IV infusion filter; assess lung sounds

- **General Nursing Considerations**: Administer in the morning, monitor I&O and daily weights, monitor electrolytes, assess for dehydration and orthostatic hypotension.

Antihypertensives

ACE Inhibitors

- **Suffix**: ***-pril*** (e.g., Lisinopril, Enalapril)
- **Mechanism of Action**: Block the conversion of Angiotensin I to Angiotensin II, causing vasodilation and decreased aldosterone.
- **Side Effects**: **Dry, persistent cough**, **angioedema (life-threatening)**, hyperkalemia, hypotension.

Angiotensin II Receptor Blockers (ARBs)

- **Suffix**: ***-sartan*** (e.g., Losartan, Valsartan)
- **Mechanism of Action**: Block Angiotensin II receptors, causing vasodilation.
- **Side Effects**: Dizziness, hypotension. Lower risk of cough and angioedema than ACE inhibitors.

Coagulation Modifiers

They Hate the Gs

Anticoagulants vs. Antiplatelets vs. Thrombolytics

	Anticoagulants	Antiplatelets	Thrombolytics
Purpose	Prevent formation or extension of venous clots	Prevent arterial clots (platelet-rich)	Dissolve existing clots (arterial or venous)
Mechanism of Action	Inhibit clotting factors in coagulation cascade	Inhibit platelet aggregation ("stick")	Convert plasminogen → plasmin→ breaks down fibrin in clots
Examples	Heparin, LMWH, Warfarin	Aspirin, Clopidogrel, Ticagrelor, Abciximab	Alteplase (tPA), Streptokinase, Urokinase, Reteplase, Tenecteplase
Route	IV, SC (Heparin/LMWH); Oral (Warfarin)	Oral (Aspirin, Clopidogrel, Ticagrelor); IV (Abciximab)	IV (bolus or infusion)
Monitoring	**aPTT (Heparin), Anti-Xa (LMWH), PT/INR (Warfarin)**	Usually none; monitor for bleeding	Frequent VS, bleeding signs, labs (CBC, coagulation)
Major Side Effects	Bleeding, bruising, HIT (heparin), elevated INR (warfarin)	Bleeding, bruising, GI upset	High risk of severe bleeding, bruising, hypotension
Antidote / Reversal	**Protamine sulfate (Heparin/LMWH), Vitamin K or FFP (Warfarin)**	None; stop drug if severe bleeding	No direct antidote; supportive care, stop drug, transfusions if needed
Common Uses	DVT, PE, atrial fibrillation, post-surgery	MI/stroke prevention, stent placement, high-risk cardiac patients	Acute MI, ischemic stroke, PE, arterial thrombosis

IV

LIPID-LOWERING AGENTS

Lipid Lowering agents must be avoided in pt with liver desea

Statins

- **Suffix**: ***-statin*** (e.g., Atorvastatin, Simvastatin)
- **Mechanism of Action**: Inhibit HMG-CoA reductase, the primary enzyme for cholesterol synthesis in the liver.
- **Primary Use**: Lower LDL ("bad") cholesterol.
- **Side Effects**:
  - **Hepatotoxicity**: Monitor liver function tests.
  - **Rhabdomyolysis**: **Report any unexplained muscle pain or weakness immediately.**
- **Nursing Considerations**: Administer in the evening, as cholesterol synthesis is highest at night. Educate patient to avoid grapefruit juice (increases statin levels which can lead to toxicity). Emphasize the importance of taking medication as prescribed along with lifestyle modifications.

Bile-Acid Resins

- **Cholestyramine (Questran)**
- **Mechanism of Action**: Bind to bile acids in the intestine → prevent reabsorption
  Liver uses cholesterol to make more bile acids → lowers cholesterol in blood.
- **Primary Use**: Lower serum lipid levels (especially LDL cholesterol). Often used in hyperlipidemia or as adjunct therapy with statins.
- **Side Effects**: GI symptoms: Bloating, gas, constipation are common
- **Drug interactions**: Can bind to other medications in the gut; may reduce their absorption. Timing of other meds may need adjustment
- Nursing Considerations
  - Mix thoroughly in juice or water before administration
  - Encourage fluids and fiber to reduce constipation
  - **Monitor for drug interactions**: separate other oral medications by at least 1 hour before or 4–6 hours after bile-acid resins

Fibric-Acid Agents (Fibrates)

- **Examples: Gemfibrozil (Lopid), Fenofibrate (Tricor)**
- **Mechanism of Action**: Inhibits peripheral lipolysis, reduces breakdown of fats in the blood. Decreases fatty acid uptake by the liver, lowers triglyceride synthesis
- **Primary Use**: Treats severe hypertriglyceridemia. May also increase HDL ("good" cholesterol).
- **Side Effects**:
  - GI distress: nausea, abdominal pain, diarrhea
  - **Potentiates anticoagulants, increased bleeding risk**
- **Nursing Considerations**:
  - Monitor GI distress
  - Assess lipid levels: Triglycerides, Total cholesterol, LDL, HDL
  - Patient should fast before lipid panel for accurate results
  - Monitor liver function: Check AST/ALT before and during therapy
  - Avoid use in patients with liver disease
  - Monitor patient's overall condition
  - Watch for bleeding risk if patient is on anticoagulants
  - Patient education: Importance of compliance with medication and diet. Report GI discomfort or unusual bleeding.

Good luck on your exam! Happy studying!