

HYPERTENSION

AHA Regulations:

Elevated BP: 120-129 / <80 → Nonpharmacologic Therapy → Reassess in 3-6 mo.

Stage 1 HTN BP: 130-139 / 80-89 → Assess ASCVD or 10y CVD risk $\geq 10\%$ → NO → Nonpharm therapy and reassess in 3-6 mo.
YES → Nonpharm therapy and BP lowering meds and reassess in 1 mo.

First line meds:

- Thiazides (diuretics)
- ACE
- ARBs
- CCBs

⊘ Avoid ACEs/ARBs in African Americans and pregnancy.

✓ CCBs ok for African Americans and pregnancy

Second Line:

- Diuretics
- β blockers
- Direct renin inhibitor
- α -1 blocker
- α -2 agonist
- Direct vasodilator

*ACEs & ARBs can help with diabetes.

FIRST LINES

*THIAZIDE DIURETICS:

- hydrochlorothiazide (Esidrex) *MC*
 - metolazone (Zaroxolyn) - usually in combo. w/ loop diuretic
 - chlorthalidone (Hygroton)
- These work in the distal tubule of the nephron!

Hydrochlorothiazide *go-to thiazide diuretic*

- Do NOT use in
 - kidney issues
 - Dehydration / electrolyte imbalance
- Risk for gout.

♀+1 = pregnancy

AA = African Americans

⊘ ♀+1

⊘ AAs

Very teratogenic!

*ACE INHIBITORS:

- lisinopril (Prinivil, Zestril) *MC*
- ramipril (Altace)
- enalapril

} all dosed x1 daily - very ideal

* - captopril* - sucks - no one uses it anymore & only has 2hour $\frac{1}{2}$ life.

Use caution when using ACEs & ARBs w/ renal insufficiency - can still use but make sure they're well hydrated!

- Adverse effects: $\uparrow K^+$, dry cough, renal failure, angioedema
renal insufficiency + ACE/ARB = hyperkalemia - no bueno

* ARBs: "-artan"

- ibesartan (Avapro) *MC*
- candesartan (Atacand)
- Valsartan (Diovan)

* Losartan* (Lozar) - sucks - dosed every 2 hours but its reversible and can be better in combo. w/ diuretics.

⊖ AAs! ⊖ ♀+1

Avoid grapefruit juice w/ ACEs/ARBs!

* Calcium Channel Blockers: "-pine"

- Dihydropyridine CCBs
- Amlodipine *MC*

↳ These cause vasodilation, ∴ adverse effect = peripheral edema

- Non-dihydropyridine CCBs → not really used for HTN, but only one to know is...
- Diltiazem *MC* - slows AV conduction

SECOND LINE *use when first line doesn't work

* Diuretics: "-mide"

- Loop diuretics → Not used for HTN primarily, but if you're already giving it to them for another reason (ie. CHF), you'll see ↓ BP
"loop" refers to loop of henle
- Furosemide (Lasix) *MC*
- Bumetanide

Furosemide (Lasix)

- Used for CHF, but can be for HTN, and hepatic cirrhosis/ascites, ∴ renal failure
- Adverse effects: dehydration, electrolyte imbalance, ototoxicity / tinnitus
- Do NOT use w/ digoxin
- Potassium sparing diuretics
- Spironolactone → not great for HTN / good for CHF, ascites
- Osmotic diuretics
- Mannitol (Osmitol) → more for renal failure than HTN

* Beta Blockers: "-olol"

⊖ asthma

- Metoprolol (Lopressor) *MC*
- Atenolol
- Esmolol * - IV only b/c short onset; used in ICU or OR
- Labetolol - for pregnancy

* Centrally Acting Agents

- Clonidine → kind of helpful in opioid withdrawal but can cause rebound HTN!

* Vasodilators

→ usually sublingual or in patch-form

Nitroglycerin → great for short term (sudden) only; ~8 hours

- ↳ chronic nitro can deplete sulfhydryl groups & cause tachyphalaxis!
- Adverse effects: headache, orthostatic hypotension, reflex tachycardia if they're not also on a β-blocker, local tingling sensation
 - Do NOT use w/ Viagra, aspirin, or CCBs!

Hydralazine * used in obstetrics

- $t_{1/2}$ life of 3-7 hours
- Eliminated via hepatic metabolism
- Adverse effects: reflex tachy if used w/o β -blocker, headache, tingling

use Vit. B6

→ to alleviate

If having a hypertensive Emergency (BP = $\frac{\geq 180}{\geq 120}$ $\frac{1}{3}$ organ damage)
→ reduce BP by max 25% over first hour, then to 160/110 in the next 2-6h, then to normal over next 24-48h.

* First choice drugs for hypertensive emergencies:

- Nicardipine (CCB)

OR

- Labetalol (CB)

HYPERLIPIDEMIA

* Antihyperlipidemic Agents

• Cholesterol lowering:

- Hmg-CoA Reductase Inhibitors ("Statin"s) *mc* 1st line
- Ezetimibe - 2nd line
- PCSK9 Inhibitors (monoclonal antibodies - \$\$\$)
- Bile Acid Sequestrants (not used)

• Triglyceride lowering:

- Fish Oil / Omega 3 Fatty Acids 1st line
- Fibric Acid Derivatives
- Niacin (not used)

Statins

→ *weigh risk vs. benefit in >80 years old
ASCVD >7.5% → give a statin

• First pass effect - only 35% absorbed

• Increased adverse effects w/ warfarin, CCBs, and grapefruit

→ risk of myopathy! → check CPK levels for rhabdomyolysis

- Atorvastatin (Lipitor) *mc* 40-80mg = high dose!
- Rosuvastatin (Crestor) *mc* adjust for renal probs 20-40mg = high dose!

* Lovastatin* no one uses anymore

Ezetimibe

- Add-on after a statin when you need a boost. (2nd line to statin)

Fibric Acid Derivatives

Gemfibrozil not as great as Omega-3

1st line

- Drug Interactions: oral anticoagulants, may ↑ myopathy from Statins!
Can cause hepatic & renal problems.

ANTITHROMBOTICS

Three kinds: Antiplatelet agents, anticoagulants, fibrinolytics

* Antiplatelets

- Usually for those who have had MI or CVA or stents/shunts
- Irreversible cyclooxygenase inhibitor
- ADP receptor inhibitor *mc*
- Phosphodiesterase inhibitor
- Glycoprotein inhibitor
- Adenosine
- Trinitroxy reuptake inhibitor

Irreversible Cyclooxygenase inhibitor

- Aspirin (anti-inflammatory) $\rightarrow$ no longer recommending low-dose for low-risk pts. ϕ ♀+1 ϕ kids (Reye's)
- Use for acute MI, CVA, new onset chest pain
- Contraindic.: hypersens. (asthma, nasal polyps), any bleed

ADP Receptor Inhibitor

- $\rightarrow$ Plavix > bleeding risk than aspirin
- Clopidogrel (Plavix) $\rightarrow$ "prodrug": needs cytochrome 2C19
- Prasugrel (Effient)
- Ticagrelor (Brillinta)

* Anticoagulant agents

- Heparins $\rightarrow$ no need to adjust for renal dysfunction!
- Vitamin K Antagonists
- Direct Thrombin Inhib.
- Direct Factor Xa Inhib.

Unfractionated Heparin

- $\rightarrow$ made from cows & pigs
- Measured w/ aPTT or antiXa, not PT/INR
- Unfractionated = really large molecule
- Narrow Therapeutic Index
- Side effect: thrombocytopenia
- Give as IV for immediate relief, subcutaneous for DVT prophylaxis

Low Molecular Weight Heparin

- ("parin") more 1st line
- Enoxaparin (Lovenox) $\rightarrow$ used for DVT prophylaxis or Active DVT/PE.
- Dalteparin (Fragmin)
- Tinzaparin (Innohep)

* Fondaparinux (Arixtra)
is a heparin-like drug w/
lower risk for thrombocytopenia

Direct Thrombin Inhibitors

- Dabigatran (Pradaxa) - only oral drug
 - Hirudin - Bivalirudin
 - Lepirudin - Argatroban $\rightarrow$ more for pts. w/ HITS
- heparin-induced
 $\rightarrow$ thrombocytopenia

- Vitamin K Antagonists** * formerly rat poison!
- Warfarin (Coumadin) **LOTS of Drug Interactions!**
 - Test levels w/ PT/INR
 - Good for prevention of venous thromboembolism
 - You'll start seeing effects ~45 hr after first dose
 - **Therapeutic range is ~2.5 (2-3) INR range.**
 - OK to be a little higher in prosthetic mitral valves
- ↓
Amiodarone
metronidazole
Sulfameth.

Reminder: Heparin = PTT and anti-Xa
Warfarin = PT

Avoid leafy greens! (Vit. K)

Estimate bleeding risk using "**HAS BLED SCORE**"
↳ use anticoag if ≥ 2 !

NOACS & DOACS

- Rivaroxaban *MC*
- Apixaban *MC*
- Edoxaban

"-xaban" alternatives to Warfarin

Risk for upper GI bleed!

* DOACs are better than Warfarin in A-fib.

* NOAC > warfarin in A-fib

Reversing Anticoag:

Heparin → use protamine

Warfarin → use Vit. K and Fresh Frozen Plasma or KCentra (\$\$\$)

Fibrinolytics = "clot busting drug"

- Great for thrombotic CVAs, NOT hemorrhagic CVAs

Tissue Plasminogen Activator (t-PA) ♂ ♀+1

- Use for acute evolving MI or clotted catheters
- Contraindic.: recent surgery, active bleed, recent CVA
 - hemorrhagic CVA → ♂ use!
 - past CVA → talk to neuro
 - current thrombotic CVA → ✓ OK to use

ANTI-ARRHYTHMIAS

CHAD-VAS SCORE =
1 (men) or 2 (women)

Consider DOAC (preferred)
or warfarin therapy

CHAD-VAS Score $\geq$
2 (men) or 3 (women)

Use DOAC (preferred)
or Warfarin

* Drugs that Slow AV Nodal Conduction

- CCBs Diltiazem and Verapamil only. * other "-pine"s are ok!
- Beta blockers
- Digoxin

* Drugs that Increase HR

- Theophylline
- Amphetamines/Stimulants
- β Agonists
- Hypotensives leading to reflex tachycardia

Before dishing out drugs:
Check electrolytes, thyroid function, if bradycardia or AV block, review for QTc prolongation 2/2 current drugs

* Antidysrhythmic Agents

- Amiodarone *MC*
- Propranolol
- Diltiazem
- Adenosine

Amiodarone

- Very long $1/2$ life: ~ 58 days: steady state isn't for MONTHS, so must front load the dosing; make sure pt. hasn't had it in the last 6mo.
- Not renally eliminated - ok to give in kidney probs.
- Used for V-tach & V-fib
- Contraindication: iodine sensitivity (shellfish allergy?)
 - Use in a different IV site
 - lots of drug interactions

Other drugs:

- Dofetilide - sucks - so many drug interactions.
- Adenosine - $1/2$ life is 60 sec.
- Digoxin - 2nd line; slows AV node
- Epinephrine - during ACLS protocol; we don't use in IV form unless V-fib or asystole
- Vasopressin - ACLS protocol - no longer recommended
- Magnesium sulfate - Torsades or prolonged QTc
 - MUST BE DILUTED!

Adenosine

- Slows HR majorly!
- $1/2$ life is 6 seconds - must be flushed w/ saline
- They flat-line for ~ 20 seconds then come back

* Atrial Fibrillation Drugs *

- Diltiazem 1st line
 - Metoprolol 1st line
 - Digoxin (used when nothing else works)
- } can use interchangeably
- Avoid digoxin & diltiazem in WPW syndrome

rate control drugs

Goal ventricular rate = < 110

Rhythm control drugs:

- Amiodarone *MC*
- many drug interactions!

***MUST confirm Φ thrombus first!**

usually rhythm probs. in young pts.

Thromboembolic Prevention in Afib

CHAD-VAS Score = 1 ♂ or 2 ♀ Antithrombotic may be considered w/a DOAC* or warfarin	CHAD-VAS Score $\geq$ 2 ♂ or 3 ♀ Antithrombotic w/ DOAC* or warfarin
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* Rate control is emergent; rhythm control can wait (~ 3 weeks for DOAC) in case of clot $\rightarrow$ not emergent

HEART FAILURE

↓ Stroke Volume is the main pharm. goal

STAGES :

- A - high risk but no structural change or symptoms
- B - Structural change, but no symptoms
- C - structural & symptoms
- D - Requires specialized intervention

CLASSES :

- I - No symptoms ; no physical limitations
- II - Slight limitation with physical activity ; OK at rest
- III - Marked limitation w/ physical activity ; OK at rest
- IV - Symptoms at rest ; unable to do physical activity

Use a combination of :

* ACEs and ARBs are 1st line with a diuretic or a CCB or a β -blocker or a inotrope (limited use 2 days)

Inotropes not listed - dopamine

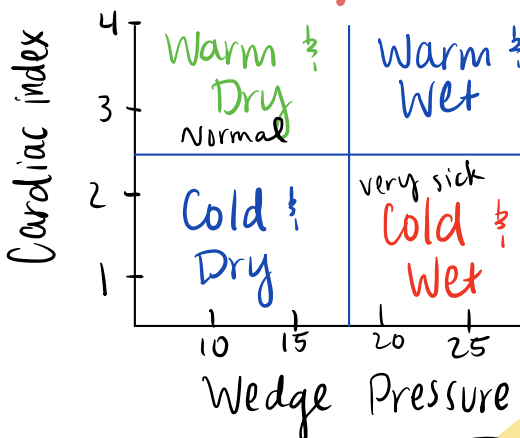
Digoxin

- 2nd line to everything
- Narrow therapeutic index
- Slows AV node $\rightarrow$ $\therefore$ good for A-flutter & A-fib
- Adverse Rxn: headache, weakness, yellow & green vision, ^{fatal!} dig toxicity
- Drug rxn w/ amiodarone & diuretics
- Renally eliminated
- Check electrolytes & thyroid function first
- $\rightarrow$ Reversal agent = digoxin immune FAB (aka "Digibind")

Amrinone / Milrinone

- Only used in ICU ; short-term management only
- Adverse effect: thrombocytopenia
- Drug interaction: diuretics

Acute Decompensated Heart Failure



* Warm & Dry = normal ; optimize meds

* Warm & Wet = IV diuretics & IV vasodilators

* Cold & Dry = IV inotrope & IV vasodilator

* Cold & Wet = IV diuretics & IV vasodilator & IV inotrope & IV vasopressor

When using diuretics, add a second to ↓ resistance

1st line - diuretics

2nd line - inotropes

3rd line - vasodilators (Nitro) *mc*

1st - loop
2nd - thiazide

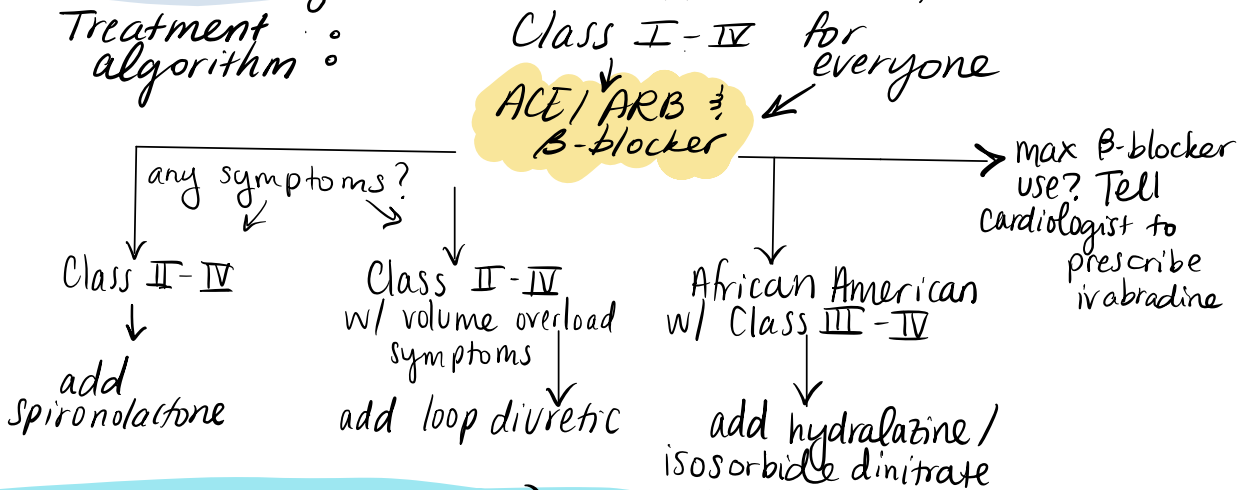
* Dobutamine & Milrinone reserved for very sick pts.
(ie. Cold & Wet)

MED / SURG CHRONIC HF

* Reduced EF (systolic) HF (aka HFrEF)

- Loop diuretics
 - Furosemide *mc*
- Thiazide diuretics
 - Hydrochlorothiazide
- ACE inhibitors 1st line
 - Lisinopril } *mc*
 - Ramipril }
- ARBs (when unable to take ACE) 1st-ish line
 - Losartan
 - Valsartan
 - Candesartan
- β -Blockers (only add when pt. is stable $\rightarrow$ not good for short term, just long term)
 - Carvedilol *mc*
 - Metoprolol succinate
- Aldosterone Antagonists
 - Spironolactone *mc*
- Device therapy in unstable/pulseless pts.

Treatment algorithm:



* Preserved EF (Diastolic) HF (aka HFpEF)

- *ACEs*/ARBs
- Digoxin (maybe - not really)
- β -blockers
- Diltiazem or Verapamil For diastolic dysfunction - NOT systolic!

ENDOCARDITIS

- Use Amoxicillin prophylactically (after dental procedures)
 - If allergic to penicillin, use clindamycin or azithromycin
- If active endocarditis, use vancomycin