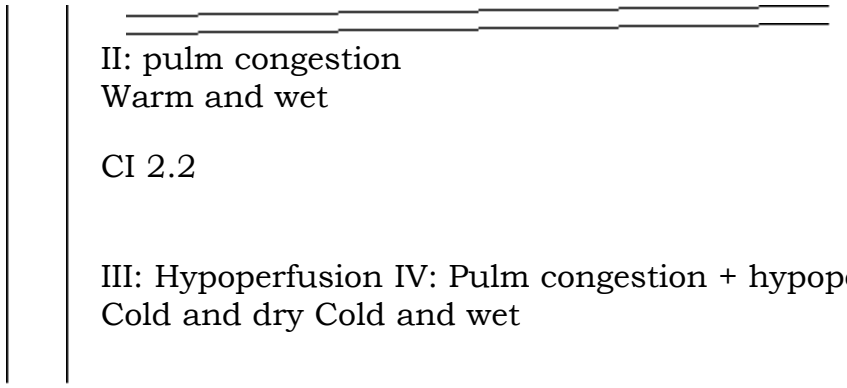
Acute Care Cardiology

Key things to remember

Parameter	Normal value	What is in decompensated HF
HR	60-80	70-90
Cardiac output (CO)	4-7 L/Min	2-4 L/min
Cardiac index (CI)	2.8-3.6 L/min/m^2	1.3- 2
PCWP	8-12 mmHg	18-30
Systemic vascular resistance	800-1200 dynes/sec/cm2	1500-3000
MAP	80-100	60-80
Central venous pressure	2-6 mmHg	6-15
Stroke volume	60-70 ml	25-50 ml

PCWP CO/CI SVR
CV shock
Septic shock



Medications for decompensated failure

1. Inotropes: Short term use only, long-term use associated with mortality because of proarrhythmic effects (for category 3/4)
    1. dobutamine
        i. Beta- 1 agonist
        ii. Half-life 2 minutes

iii. ADR: > 10% PVC, tachycardia, angina

2. Milrinone
   i. PDE inhibitor: + inotrope and potent vasodilator (do not bolus when starting the medication)
   ii. 90% eliminated renally, started with lower infusion rate if used in pt with renal disease (CrCl < 50 ml/min)
   iii. Normal dose: 0.375-0.75 mcg/kg/min
   iv. Would use when you don't want to stop the Beta blocker
   v. ADR: > 10% ventricular arrythymia, hypotension <1% plt

2. Nitroprusside
   1. Arterial and venodilator
   2. Great in HTN emergency
   3. 0.3 to 0.5 mcg/kg/min up to 3 mcg/kg/min
   4. Half-life: nipride < 10 minutes, thiocynate 2.5 to 7 days
   5. Good for patients who are in category II with SVR
   6. ADR: prolonged use especially in pts with renal or hepatic disease can cause cyanide toxicity
3. NTG
   1. Venous > arterial dilator
   2. Good in Category II
4. Neseritide
   1. Endogenous BNP which stimulates cGMP production to vasodilate arteries and veins (PCWP and SVR)
   2. No adjustment needed in renal/hepatic disease
   3. Half-life:20 minutes
   4. Dose-limiting hypotension can occur, if it does stop when BP stable restart at lower dose with no bolus.
   5. Maybe in category 2 if renal/hepatic impairment

Vasopressors

Agent	1 vasoconstriction	1 HR and contraction	2 vasodilation	DA Dose-dependent (vasodilates renals)
Dopamine				
1-3 mcg/kg/min		1+		4+

3-10mcg/kg/min	0-1+	4+	2+	4+
10-20mcg/kg/min	3+	4+	1+	
Norepinephrine	3+	3+	1-2+	
Phenylephrine	3+			
Epinephrine				
0.01-0.05mcg/kg/min	2+	4+	3+	
>0.05mcg/kg/min	4+	3+	1+	

Vasopressin:
antidiuretic hormone: good in sepsis/septic shock with other agents (no more then 0.04 Units/minute)
DO NOT titrate for BP control
urine output, SVR and MAP
Avoid in acute cardiogenic and hemorrhagic shock
ADR: plt aggregation, organ ischemia

DYSRHYTHMIAS

1. Superventricular tachycardia
    1. Atrial fib
        i. Rate vs. rhythm
        ii. Amiodarone, BB, dofetilide and digoxin ok if EF < 40%
        iii. Digoxin only works at rest
        iv. Pharmacological rhythm control:
            1. Can initiate if duration < 48hr otherwise check TEE or anticoagulate for 3-4 weeks.
            2. sotalol, dofetilide (DIAMOND-HF), amiodarone with CAD or structural heart disease
            3. EF > 40% and no CAD: propafenone, flecanide, sotalol (maintenance only),

disopyramide

v. DCC: 80 to 90% efficacy, 1st line if Afib < 48 hrs

Class	Agents	ECG effect	Other information	Primary effect
I a	Procainamide, quinidine, disopyramide	QRS and QT	Good in a and v tach death in MI survivors	Slow depolarization
IB	Lidocaine, phenytoin	QT QRS	Good in v tach, doesn't slow atrial tissue conduction May ICD firin	Slows depolarization
Ic	Flecainide, ecanide, morcizine, propafenone	QRS	mortality post-MI and in structuaral heart disease(CAST trial) Works in a and v tach	Slows depolarization
II	Beta-blockers	PR		Slows AV nodal conduction
III	Amiodarone, dofetilide, sotalol		Amiodarone and sotalol can prevent ICD firing and ok in post-MI and HF patients SWORD: d-sotalol, n/a in the US mortality in post-MI	Slows AV nodal conduction

1. Atrial flutter
2. Atrial tachycardia
3. Paroxysmal supraventricular tachycardia
    i. AV nodal rentry tachycardia
    ii. Wolff-Parkinson White

1. Ventricular tachycardia
    1. At least 3 consecutive PVCs at rate > 100 BPM
    2. Premature ventricular contractions
        i. Can control if sx w/ BB
        ii. CAST trial: class IC increased mortality
    3. Polymorphic
        i. Torsades (when Qtc > 500 msec)
            1. Class I a/c and III antiarrhythmics, FQ, antipsychotics, azole antifungals, erythromycin, pentamidine, ziprasidone
            2. Low Mg/K
            3. Treatment: d/c offending agent, Mg, isoproterenol, lidocaine, transvenous

pacer

4. Non-sustained VT: spontaneously terminates in less then 30 seconds
    i. If no symptoms and no structural heart disease: no tx
    ii. Sx w/o structural heart disease: BB
    iii. Asymptomatic w/ structural heart disease
        1. EF > 40%: no treatment, BB may mortality
        2. < 40%: evaluate for ICD, if not eligible, BB or amiodarone
5. Sustained VT: > 30 or requires cardioversion due to hemodynamic instability
    i. EF > 40 %: procainamide, lidocaine, amiodarone
    ii. EF < 40%: amiodarone, lidocaine
6. ICD
    i. MADIT II: MI w/n one month and EF < 30%, ICD vs. conventional therapy reduced death by 31% after 20 months
    ii. SCD-Hft: EF 35% or left with sx ICM or NICM (NYHA II or III) to amiodarone, ICD or placebo: 7.2% absolute reduction with ICD over 5 years (mortality rates 29% placebo, 28% amio, 22% ICD)
    iii. AVID: secondary prevention 39% reduction over amiodarone/sotalol, best bet in EF < 35%

2. Sudden cardiac death: pulseless VT or VF
    1. Shock x1 then drug then shock etc.
    2. Epinephrine 1 mg every 3 to 5 minutes or 40 units vasopressin
    3. Amiodarone 300 mg or lidocaine 1 to 1.5 mg/kg x 1
    4. Shock
3. Pulseless electrical activity or asystole
    1. Epinephrine 1 mg q 3-5 minutes
    2. Alternate with atropine 1 mg q 3 to 5 minutes (max 0.04 mg/kg)
4. Structural heart disease: HF (EF < 40%), s/p AMI, valvular heart disease, LVH

Acute Coronary Syndrome

Give:

1. NTG: symptomatic benefit
2. BB:
    1. CP, infarct size and LV wall stress.
    2. recurrent MI in USA/NSTEMI (no mortality benefit)
3. ACE inhibitors:
    1. NSTEMI/USA: give to folks who are hypertensive despite BB esp in DM or HF
    2. STEMI: give to all of them unless hypotension, prevents remodeling and mortality
4. Aldosterone antagonists: give in patients with SCr < 2.5 men and < 2 in female post-STEMI with EF < 40% with HF symptoms of DM, decreases mortality
5. CCB: only when BB are contraindicated
6. Clopidogrel:
    1. NSTEMI/USA: at 9 -12 months death, MI or revascularization
    2. Must give at least 1 mo bare metal, 3 mo cypher (sirolimus) and 6 mo taxus (paxiltaxel) for caths that are not ACS
7. ASA, morphine, UFH/enoxaparin, oxygen +/- clopidogrel
8. Glycoprotein IIb/IIIa inhibitor
    1. Tirofiban: not used, shown to be inferior to abciximab
    2. Eptifibatide: CI in patients on HD, decrease rate to 1mcg/kg/min if CrCl < 50 ml/min, give in NSTEMI/USA
    3. Abciximab: the one with data in STEMI, no dose reductions are necessary. Only give if

planned cath (no benefit over placebo may worsen mortality)

Thrombolytics

1. Absolute CI
    1. Hx of hemorrhagic stroke
    2. Other type of stroke in past 1 year
    3. Intracranial neoplasm
    4. Active internal bleeding (not menstruation)
    5. Aortic dissection
    6. Ischemic stroke in past 3 months
    7. Significant facial or closed head trauma in pat 3 months
2. Give within 12 hr, if sx longer then 12 hrs not benefit over bleeding
    1. Only work 50% of the time, PCI works 95-99% of the time
3. tenecteplase: weight based
4. Reteplase: 10 units x 2, 30 minutes apart]
5. tPA: 15 mg then 0.75 mg/kg over 30 min (max 50 mg) then 0.5 mg/kg (max 35 mg)
6. Streptokinase 1.5 million units over 60 minutes (don't need to give with UFH unlike other lytics because this one binds to thrombin and fibrin)

Pulmonary Arterial Hypertension

1. Definition: mean pulmonary arterial pressure > 25 mmHg with PCWP < 15 mmHg or LAP < 15 mmHg
2. Classified according to NYHA
3. Treatment
    1. AC with warfarin (INR 1.5 to 2.5) if idiopathic PAH
    2. Loops for sx
    3. CCB
        i. 1st line: vasodilator test first
        ii. Amlodipine, nifedipine or diltiazem can be used
    4. Epoprostenol
        i. Prostacyclin analogue
        ii. Improves 3 to 5 year survival, walk distance, QOL, CI and sx
        iii. 1st line: if NYHA IV or fail or cant take CCB
        iv. 2nd line: if fail or cant take CCB/bosentan for NYHA II/III
        v. Must be kept in refridgerator, ice packs, $$$$$,
        vi. Half-life < 6 minutes
    5. Treprostinil
        i. Effective in III/IV
        ii. Safer if abruptly stopped then epoprostenol
    6. Bosentan
        i. Endothelin receptor antagonist
        ii. Monitor LFT's , Hgb and Hct
        iii. Big DI with glyburide and cyclosporine
        iv. Give in class III failing CCB
    7. Inhaled iloprost
        i. NYHA III
    8. Sildenafil
        i. Last line