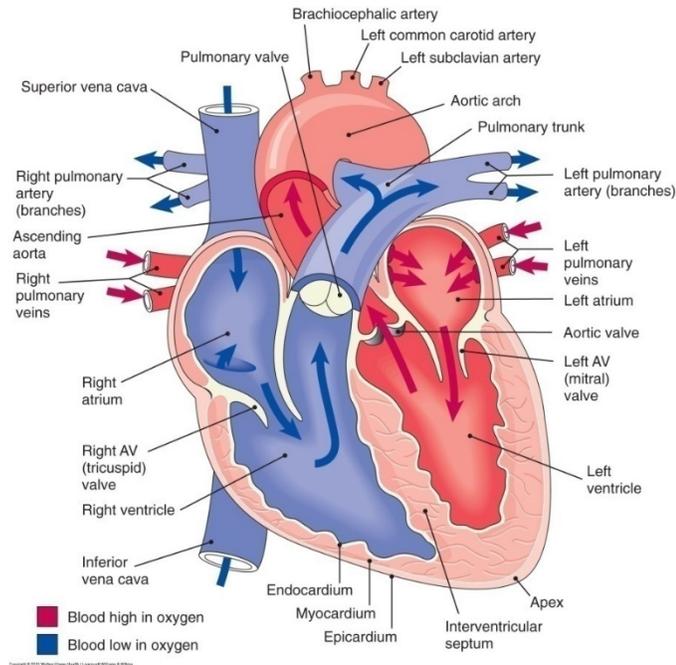


CARDIOVASCULAR DISEASE

Leading cause of death for males & females, regardless of race



-Cardiac cycle: Systole & Diastole

- Systole is Ventricular Contraction
- Diastole is Ventricular Relaxation

-CO: How much blood is ejected every minute ($CO = SV \times HR$)

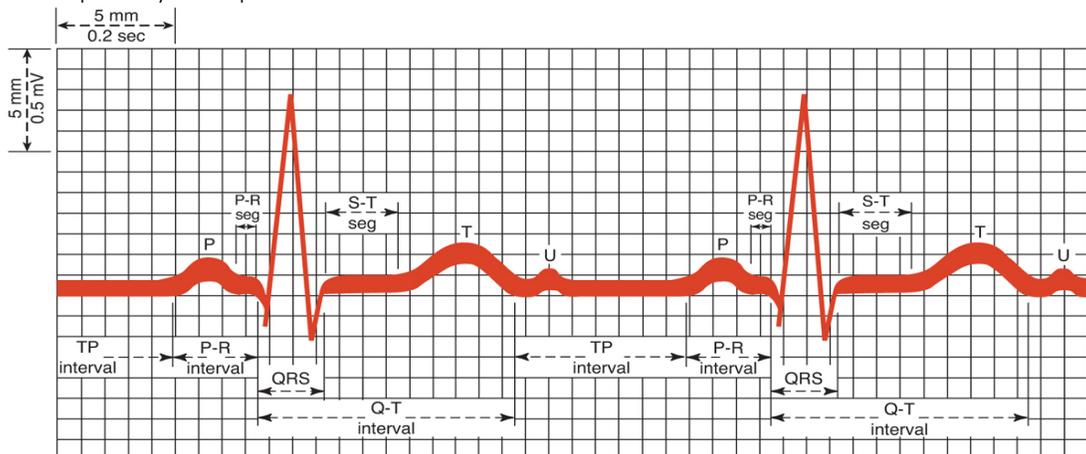
-SV: How much blood is pumped w/ each contraction

-Preload: How much muscle is stretched after Diastole

-Afterload: The resistance the Ventricle is ejecting against

EKG

- During procedure, lie still for 5-10 seconds
- Nurses & Respiratory Therapists can do EKGs



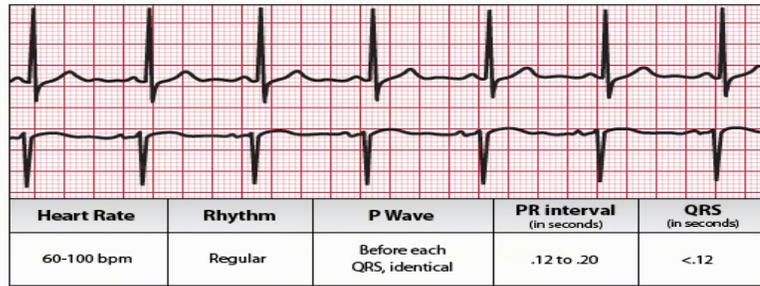
• Parts of an EKG-

- Horizontal Axis: The time that goes by (each box is 0.04 sec)
- Vertical Axis: Amplitude/voltage
- P wave: Atrial Depolarization, not atrial contraction bc this is the electrical activity telling the atria to contract
- QRS: Ventricular Depolarization/Atrial Repolarization (hidden)
- T: Ventricular Repolarization
- U Wave: Purkinje Fibers Repolarization (could be pathological)

Reading a Normal EKG

- Normal HR is 60-100 (normal sinus rhythm)
- Rhythm: R to R distance should match up along strips (regular rhythm)
- P should be in front of every QRS
- QRS & T should be pointing same direction

Normal Sinus Rhythm

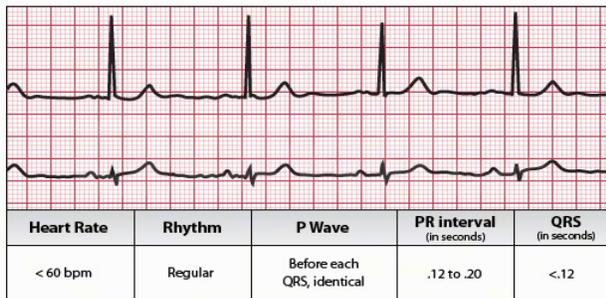


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SINUS RHYTHMS

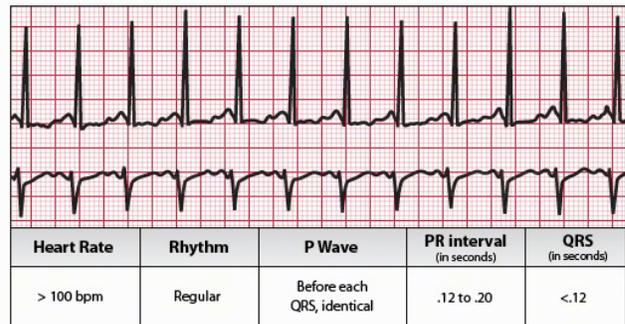
Sinus Rhythm means the SA node is generating your impulse (the pacemaker)

Sinus Bradycardia



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Sinus Tachycardia



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ATRIAL FIBRILATION



-Uncoordinated Atrial Activity

- Atria are just twitching
- Not pushing blood into the ventricle like they are supposed to
- No Pattern- **R to R distance doesn't match so rhythm is IRREGULAR**
- You can't identify the P**
- Beta Blockers are given to control HR
- Anti-Coagulant (Coumadin) bc they are at a high risk for clots

ATRIAL FLUTTER



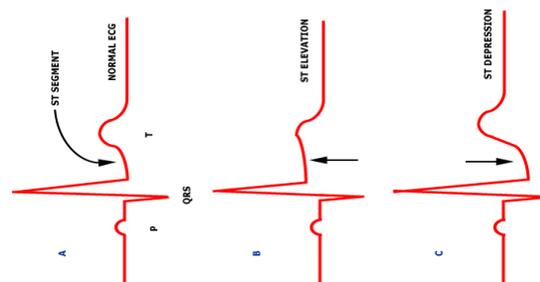
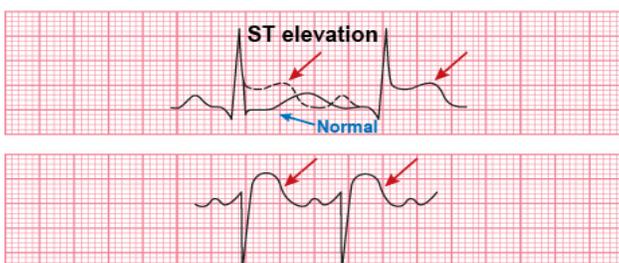
- “Saw Tooth Wave” between R-R
- No distinguishable P wave

A Fib is faster & more chaotic than A Flutter



STEMI: “ST elevation MI”

- Probably means they are having a heart attack
- Could be from high K levels



ST DEPRESSION: with low K or if they are on Digoxin

Coronary Atherosclerosis

- Formation of focal deposits of Cholesterol & Lipids known as **plaque** that obstructs circulation in Coronary Arteries
 - Coronary Arteries provide blood supply to heart muscle (myocardium)
- CAD includes Atherosclerosis, Angina all the way to an MI – continuum

PATHOPHYSIOLOGY OF CAD

- Injury may be initiated by smoking, HTN, genetics, etc
- Begins as fatty streaks of lipids that deposit on vessel wall which develop at young age & some of the lesions advance due to other factors
 - Heredity, Smoking, Environmental Factors
- Inflammation process attracts Platelets & WBCs and fibrous cap covers inflammation filtrate so it is unstable
- Blood flow could dislodge clot--- this obstructs blood flow which would lead to a MI
- **The plaque is very unstable and can rupture anytime. When it does, a thrombosis will form and will occlude the vessel completely.**

Atheroma or Plaque: smooth muscle cell formed fibrous cap over core filled w/ lipid and inflammatory filtrate

SIGNS & SYMPTOMS

- Many people are **Asymptomatic**
 - Depends on where obstruction is & how big it is
- **Chest Pain** due to Ischemia can occur
- Women & Elderly usually have SOB, Nausea, and Weakness
- DM/HF may just report SOB

RISK FACTORS

NON-MODIFIABLE RISK FACTORS

- Genetics
- Family History
- Age
 - Men older than 45
 - Women older than 55
- Gender
 - Women: More deaths bc no sx
 - Men: More sx-- seek tx earlier
 - After 55, both have equal risk
- Race (AA has higher incidence)

MODIFIABLE RISK FACTORS

- Changing Lifestyle or Habits
- Take Medications
- Diet
- Exercise
- Smoking
- Stress
- Hyperlipidemia/HTN/DM(meds)
- Obesity

MEDICATIONS

HMG-CoA Reductase Inhibitors

(end in -statin)

- Don't take w/ Liver Disease
- Take at night w/ food (more cholesterol made at night)
- Restricts Lipoprotein Production

Bile Acid Sequestrants

Cholestyramine (Questran)
- ↑ Lipoprotein Removal

Niacin

Restricts Lipoprotein Production

Cholesterol Absorption Inhibitor

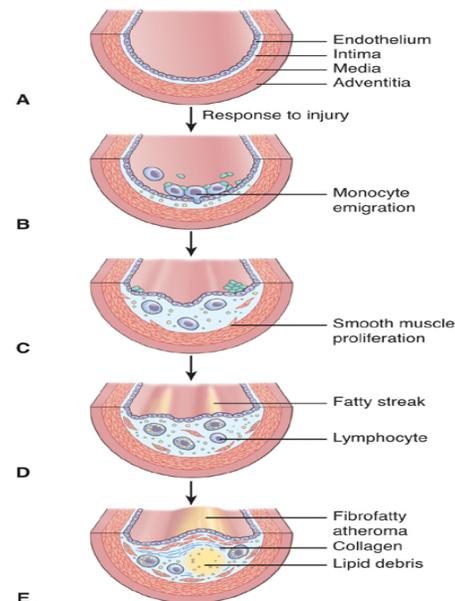
Ezetimibe (Zetia)

- ↓ cholesterol absorption

Fibric Acid Derivatives

Fenofibrate (TriCor), Gemfibrozil (Lopid)

-Restricts Lipoprotein Production



LABS

Fasting Lipid Panel (FLP)

- Need to fast for 12 hours
- Cholesterol, LDL, HDL, Triglycerides
- Older than 20--check every 5 yrs
 - Abnormal result check more often
 - If pt had a CABG
 - Check after discharge
 - Then every 6 weeks
 - Then every 4-6 months

Nutrient	Recommended Intake
Total calories	Balance intake & expenditure to maintain desirable weight
Total fat	25%–35%)
Saturated fat	< 7%
Polyunsaturated fat	Up to 10%
Monounsaturated fat	Up to 20%
Carbohydrate	50%–60%
Dietary fiber	20–30 g/day
Protein	About 15%
Cholesterol	<200 mg/day

PREVENTION

- Hyperlipidemia
 - Take Meds
 - Lose Weight (Low Fat, Low Cholesterol diet)
 - Moderate Exercise (able to talk, brisk walking)
 - 30 mins/most days of the week –↑ HDL and ↓TG
- Stop Smoking
 - Causes Vasoconstriction (↑BP and HR)
 - Higher risk for developing Clots due to
 - ↑ platelet aggregation
 - ↑ CO2 production (carbon monoxide)
 - which binds to HGB, instead of O2
 - leads to decreased O2
- HTN&DM: accelerates process of atherosclerosis; take meds

Angina Pectoris

- Stable Angina is relieved by Rest or Nitro
- Unstable Angina is not relieved by rest or nitro & considered MI w/ STEMI or non-STEMI

Assessment

- ECG: 12 lead
- Lab: Cardiac Enzyme- 3 sets, every 6 hrs to see trends
 - Troponin and CK-MB
- Chest X-ray: CP can come from Pulmonary origin so this is to rule out different things
 - No metal, Check for pregnancy

Signs & Symptoms

- Chest pain is a Heavy Sensation
 - "Elephant sitting on chest"
- Pain is usually behind Sternum
 - Can radiate to Neck, Jaw, Shoulder or Right Arm
- May tell you they have Indigestion & Choking Sensation
- DM-- may not feel Chest Pain due to Neuropathy
- Women & Elderly-- may just have SOB & Weakness or Silent
- May occur upon:
 - Physical Exertion
 - Eating Heavy Meal
 - Stress or Cold Environment bc Vasoconstriction

Medications for Angina

Nitroglycerin

Vasodilator / ↓ Preload & Afterload

- Side Effects: ↓BP, Headache
- Types:
 - Sublingual: every 5 min up to 3x
 - Patch
 - Write date/time/initial
 - Chart which arm or chest
 - Tell pts they can shower/swim
 - Put on in am, take off pm (tolerance)
 - Prevents CP but **does not** stop an attack
- Before Giving Nitro--
 - Assess BP
 - Ask if they are on Viagra (both vasodilate, so BP will drop quick)
 Used if they have had Angina in the past

Beta-blocker

(Metoprolol/Carvedilol)

↓ HR and BP

- DONT stop abruptly- Rebound HTN
- DM- masks Hypoglycemia symptoms
 - Monitor BG often
- Don't use w/ Severe Asthma or COPD
 - It can cause bronchoconstriction
 - Wheezing or SOB-- call provider and switch medications

Ca Channel Blocker

(Amlodipine/Diltiazem/Verapamil)

- ↓BP - check before giving
- Used for Heart Cath pts
 - at risk for vasospasms & this med helps that

Oxygen

(considered a medication)

- Give O2 for CP
- 2L Nasal Cannula & then Call Physician
- Oxygen Toxicity--
 - N/V
 - Coughing
 - Nasal Stuffiness
 - Sub-sternal Pain

Heparin

Anticoagulant
Prevent DVT or Clots

- SUBQ
 - Needle: 5/8 & 25-30G
- Monitor aPTT
 - Therapeutic is 45-75
 - Normal is 30
- Antidote: **Protamine Sulfat**
- Watch for bleeding
 - ↓BP/↓H&H/↑HR
- Heparin Induced Thrombocytopenia
 - Hold Pressure Longer
 - Avoid IM Injection
 - Avoid Continuous BP Cuff

ASA (Aspirin)

↓ Platelet Aggregation
↓ Risk for Clots

- Dose: 81 mg
- Side Effects:
 - GI Bleeding/GI Upset
- Ask if they have taken Aspirin that day so you don't give them too much

Enoxaparin (Lovenox)

Must give air bubble to pt bc it seals the medication inside tissue

Nursing Process: Angina

Assessment: COLDSIPA – what were they doing, activity level, risk factors, understanding of CP
Physical – vitals, heart, lung, abdomen, peripheral vascular (pulses and edema)

Diagnosis: Ineffective tissue perfusion r/t decreased coronary blood flow aeb pt reports chest pain; ABCs, deficient

Planning/Goals: reserve heart muscles & treat signs and symptoms

Interventions: Place pt in Semi-fowlers, rest; assess O2 & vitals, EKG and labs; teach stress reduction and prevent pain; stop smoking, watch activity level, carry nitro all the time, follow up appts

Cardiac Stress Testing

Goal is 80-90% of max HR-- Max HR = (220 – Age)

Exercise Stress Test: run on treadmill/pedal bicycle or arm crank; test takes 1-3 hrs
Pharm Test: Vasodilators (Dabutamine, adenosine)
○ Side Effects: Flushing/Nausea/HA/Dizziness

-Avoid tobacco, caffeine, and alcohol before

Nursing Interventions

- Instruct pt to fast 4hr before test
- Can take meds w sips of water
- Avoid intense exercise 3 hrs before
- Signed consent needed
- Dr may say not to take meds (beta blockers)
- IV Site just in case they have MI during test

Symptoms to Report

CP, dyspnea, dizziness, leg cramp, fatigue
change in EKG, BP or HR change, pallor, sweat
-All indicates (+) EKG—STOP THE TEST
-Pt needs treatment in cardiac cath
Post-Test: avoid hot bath/shower for 1-2 hrs

MIBI

Technetium-99m labeled methoxy-isobutyl-isonitrile
Test Perfusion in Heart
IV injection of Radioactive Isotope-- not a concern bc lose radioactivity after a few hrs

- NO caffeine 12hrs before
- Don't smoke 2 hrs before
- No food 2 hrs before
- Lie on back w/ arms extended over head
- Camera is taking pics
- Test will take 2-3 hrs
- Fatigue after is normal

Myocardial Infarction

- Acute Coronary Syndrome, includes Unstable Angina/nonSTEMI/and STEMI
- In an MI, areas of the Myocardium are permanently destroyed resulting in death of Myocardium
- Profound imbalance between O2 Supply & Demand

1. Assessment
 1. Chest Pain – continues w/ Rest & Nitro
 2. Dyspnea, Indigestion, Nausea, Anxiety
 2. Diagnostic: Cardiac Enzymes & Biomarkers (Troponin, CK-MB)
 1. ECG within 10 minutes
- Goals of Med therapy: Prevent tissue death and prevent complications

Drug Therapy (MONA – Morphine, Oxygen, Nitro, Aspirin)				
Aspirin Antiplatelet Agent	Nitroglycerin Vasodilator	Beta Blockers metoprolol & carvedilol	Morphine Analgesic (monitor RR)	Anticoagulants -heparin & enoxaparin (lovenox)
ACE Inhibitors --Lisinopril (Prinivil)-- ↓ workload of the heart, Helps ↓ mortality rate, Prevents remodeling of the heart muscle <u>Side Effects:</u> 1. Dry Cough 2. Retention of K+- (monitor for ↓ BP) 3. Angioedema- (EMERGENCY) (monitor airway & assess swelling)		Thrombolytics (TPA) Must be given within first 6 hrs to work Assess pt before <u>Contraindicated in Pts:</u> 1. Major Recent Surgery 2. Past Hemorrhagic Stroke Can also use to de-clot central line		
-if 3 Nitros don't work, call Physician & get an order for Morphine IV Push - <u>Cardiac rehab:</u> try to return to pre-illness lifestyle/work; teaching, counseling, interdisciplinary team				

Assessment Lungs, Heart, Abdomen, IV site, HR & Rhythm, Appearance, Chest pain, EKG, Respirations -Crackles & Edema –notify the physician Tempernarde- accumulation of fluid in Pericardial Cavity	Diagnosis -ineffective tissue perfusion - anxiety	Interventions Help prevent Pulmonary Edema Need IV Line to Push Meds Semi-fowlers/fowlers to get oxygen to heart Oxygen -HF-- Complication Vitals Q4H Active MI- pt needs to be resting until controlled
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Invasive Coronary Artery Procedure

--Heart Catheter can be Diagnostic or Interventional--
Gold standard for detecting Stenosis of Coronary Artery
 Go thru Femoral Artery & thread all the way to Coronary Artery

- Percutaneous Transluminal Coronary Angioplasty
- Coronary Artery Stent: stent can be coated in meds to help dissolve clot. After they'll be on Aspirin or Plavix (1 month to 1 year)
- Atherectomy: Cutting & Shaving off Plaque

<p>Pre Procedure--</p> <ul style="list-style-type: none"> -Assess allergies -Get signed consent -Renal Function bc of Dye -NPO for 8 hours -May sign Emergency CAGB (for if they have MI during Cath Lab & need emergency surgery) -Tell pt it can take 2hrs or more -May have back pain or feel flushed (dye) (give analgesics) 	<p>Post Procedure--</p> <ul style="list-style-type: none"> -Frequent VS every 15min x4 every 30min x2 every 1hour x4 Assess: <ul style="list-style-type: none"> -site for bleeding -site should be soft (hard & painful = hematoma) -peripheral pulses -remain <u>flat</u> in bed -keep affected leg straight -analgesics for pain
--	--

Coronary Artery Bypass Graft

--Find vein in Leg & Graft to Heart so Blood can Flow--

<p><u>Pre procedure:</u></p> <ul style="list-style-type: none"> -Provide Instruction -Informed Consent -Discontinue Meds (anticoagulants, digoxin, diuretics)
<p><u>Post Procedure--</u></p> <ul style="list-style-type: none"> -ICU for 1-2 days---then Med Surg -Pt will have a lot of lines <p>Assess: Vitals, Heart/Lung Sound, Heart rhythm LOC, O2 Sat -Assess incision sites: (big incision on chest & small incisions on legs) -Assess Pain and control it</p> <p>Ambulate : pt needs to be move to chair or ambulate 25-100 ft 48 hrs after to prevent DVT & Atelectasis (if sx while moving, need to stop & notify someone)</p> <ul style="list-style-type: none"> -Deep breathe, Cough and Turn -Incentive Spirometry – get baseline & use after surgery -Monitor CBC and BMP

Hypertension

the silent killer; sometimes it has no symptoms; if left untreated, can affect heart, brain, kidneys and eyes; can lead to heart attack, stroke and kidney failure; 1/3 of patients have HTN and don't even know

Primary HTN: (Essential) no known cause—most common

Secondary HTN: identified cause; ex: pregnancy or medications

Patho: BP = COxPR

S/S: HA, dizziness, fainting, vision problems; mostly symptomatic though

Assessment/Diagnostic: average of two or more readings in two or more visits to PCP; must be proper readings – sitting, arm at heart level, bare arms and legs uncrossed; kidney damage (urinalysis and BUN/creat), FLP, EKG can also tell you something

Hypertension Medications

Diuretics

- move out of positions slowly
- use side rails and ask for help
- assess for hypotension

Loop

- Furosemide (Lasix)--
- check K levels

Potassium Sparing

Miloride (midamor)

Thiazides

- HCTZ---
- can cause K loss (not as bad as loop)
- Take w/ food to ↓ stomach upset

Aldosterone Receptor Blocker

---Spironolactone---

Beta Blockers

Ca Channel Blocker

Amlodipine (Norvasc) & Diltiazem (Cardizem)

ACE Inhibitors

Lisinopril (Prinivil)

ARBs

- angiotensin II receptor blockers
- similar to ACE Inhibitor
- blocks binding

Central-Alpha Agonist

Clonidine (Catapres)

Discharge: encourage BP checks – provide cuff to pt, keep diary educate on postural hypotension & changing positions slowly

BP classification	SBP		DBP
Normal	< 120	and	< 80
Prehypertension	120-139	or	80-89
Stage 1 HTN	140-159	or	90-99
Stage 2 HTN	≥ 160	or	≥ 100

Prehypertension: modify weight, diet and exercise

Stage 1

1. BP meds – diuretics or beta blockers
2. physician visits every month
3. every 3-6 months after regulated
4. Goal is under 140/90 & for DM is 130/80

Stage 2: more frequent visits

HTN CRISES

Hypertensive Emergency

BP > 220/140

-there is target organ damage (kidneys, elevated BUN & creat)

You can't bring BP down too fast, bc vital organs won't get blood–

1. Reduce MAP by 25% within 1st hr
1. Over next 6 hrs slowly reduce BP to 160-100
2. Then slowly bring down over next few days

Treatment:

- IV Sodium Nitroprusside (Nitropress)
- Nicardipine Hydrochloride (Cardene)

Nursing Care

- Measure BP every 5 min ---- (leave BP cuff on & set automatically)
- Once stable, BP every 10-15 min (to monitor BP & prevent further organ damage)

Hypertensive Urgency

--HA, Nose Bleeds, Anxiety--

Use fast acting Oral meds
Try to normalize BP within 1-2 days
No organ damage yet
Not as bad as HTN Emergency

Treatment

- PO Fast Acting Anti-hypertensives
- Beta Blocker (Labetalol)
- ACE Inhibitor (Captopril)
- Alpha 2 Agonists (Clonidine)

Nursing Care

- Monitor BP
- Monitor the Heart
- Check Peripheral Vascular
- Check urine output for Kidney function

Abdominal Aortic Aneurysm

Damaged media layer of the vessel; weakened spot in artery wall; HTN causes bulge in arterial wall

- Risk factors
 - o Genetic
 - o Age & Gender (Caucasian elderly men 4x more than women)
 - o Tobacco
 - o HTN (more than half of people with AAA have HTN)
 - o Atherosclerosis (most common cause)
- Signs & Symptoms:
 - o Usually None
 - o Can feel their heart beating in their abdomen-- May be able to hear a bruit
- Assessment/diagnostic:
 - o Usually picked up with imaging for other things
 - If small, monitor every 6 months to make sure it's not growing too much
- Medical Management:
 - o Meds: control BP with oral medication
 - o Surgical intervention: if bigger than 2 in or 5 cm, needs surgical intervention (when it reaches 5.5 cm)
 - Open Surgical Repair: open incision & sew stent in place; incision in abdomen
 - Endovascular grafting: like heart cath, go in through groin area and place stent
- Nursing Management:

Pre-Op:

- Maintain Systolic BP 100-120 by giving Anti-hypertensives
 - Anticipate Rupture
- Impending Rupture Signs:
 - Severe Back & Constant Abdominal Pain (big clue)
 - Drop in BP, decreased HCT
- Get baseline vitals & detect peripheral pulses

Post-Op:

- Get baseline vitals
- Vitals Q15min x 4, Q30min x 4 and then every hour
- Assess incision site (no bleeding/hematoma)
- Ensure adequate nutrition
- Assess pain, color and temperature of legs, peripheral pulses, I/O and volume status

Heart Failure

-can result from HTN and CAD

LEFT SIDED HF	RIGHT SIDED HF
Backs up to the Lungs	Backs up to the Rest of Body (Peripheral & Visceral Organs)
<ul style="list-style-type: none"> • Dyspnea – (sit pt in HIGH Fowlers) • Low O2 sats – (may need O2) • S3 Heart Sound – (bc large volume of fluid entering ventricles) • Altered Mental Status-- (bc less blood flow to brain) • Pulmonary Crackle • Cough, frothy sputum • Altered mental status • Fatigue 	<ul style="list-style-type: none"> • JVD • Edema – (weight gain) • Ascites • Hepatomegaly • Anorexia • Nausea • Weakness

Diagnosics

ECG

Ejection Fraction- % of blood being pumped out

Normal: 55-65%

HF Patients: around 10%

Procedure:

- Takes about 1 hour
- Lie very still on Left side

BNP

Hormone that regulates Volume & BP
Key Diagnostic Indicator in HF

Normal: 0-100pg/mL

HF Pts: around 1000 pg/mL

Lifestyle Recommendations

Sodium Restriction: (2-3g/day)

Fluid Restriction: (1500ml-2L/day)

Daily Weight

- every day at the same time/same clothes
- empty bladder before
- keep diary

Should be Concerned:

- gain 2-3 lbs/ day
- 5 lbs in a week

Medications for Heart Failure

Digoxin

↓ HR -- by ↑ Contraction of Myocardium & ↓ Work Load
(Digoxin ↑ Ejection Fraction)

Therapeutic Range: 0.8 - 2.0

Antidote: Digibind

Nursing Care

- Assess HR & K before (Apical < 60--hold)
- (-K+ < 3.5---- hold)
- Tell Teleroom you're pushing Digoxin bc it will ↓ HR

Side Effects

- Anorexia, N&V, Diarrhea
- Drowsiness, Fatigue, Weakness
- Headache
- Depression
- Bradycardia, Dysrhythmias
- Visual Disturbances

Early Signs of Toxicity

GI Manifestations/ HR Abnormalities/Visual Disturbances
(diplopia, blurred vision, photophobia, yellow/green halos)

ACE Inhibitors

Lisinopril

ARBs

Valsarten

Beta Blockers

Metoprolol

Ca Channel Blocker

Amlodipine & Diltiazem

Diuretics

Furosemide

Hydralazine & Isosorbide Dinitrate

Vasodilator

