

PHARM 504: Pharmacy Practice  
Winter 2009  
***MCP DRUGS #3:***  
***CARDIOVASCULAR PRODUCTS***  
January 22<sup>th</sup>, 2010  
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*General Tips and Information:*

1. Types of **Cardiovascular Disorders**:

- Myocardial infarction

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Heart disease is the **#1** cause of death or disability in the United States and most European countries!

2. **“9 for 90”**: 9 controllable risk factors for over 90% for heart attacks (MIs)

HTN, Hyperlipidemia, Diabetes, \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_, EtOH use, Smoking, Psychosocial life events

3. Good non-pharmacological tips for prevention of MIs:

Lifestyle changes: \_\_\_\_\_; smoking cessation; stop EtOH

4. Why are **CV disorders** so hard to control?

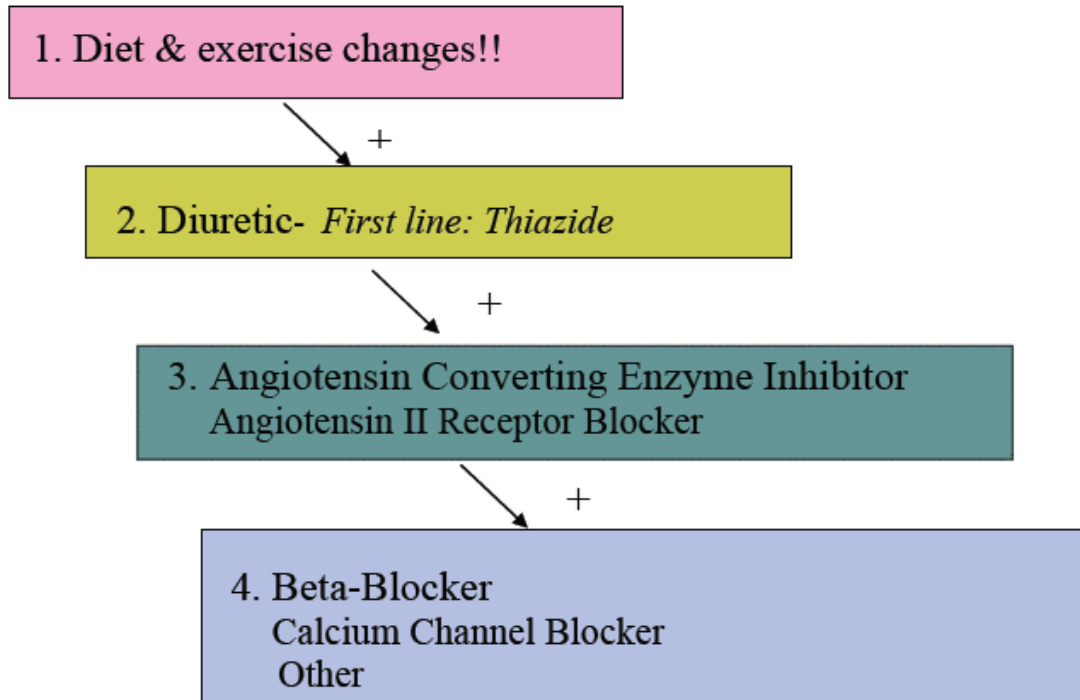
- Current lifestyle of patients:
  - stressful career, sedentary lifestyle
- Chronic diseases
  - May require both long-term lifestyle and drug therapy changes
- Medication adherence:
  - \_\_\_\_\_
  - CV diseases are often: \_\_\_\_\_

- Adherence Patterns- CV medication studies find low levels of adherence, as low as 10%.

- Specific study examples are just FYI.
- Consequence: Declining CV health, rehospitalization, mortality

## 6. Medication Step-wise Approach to Treating HTN:

- For a healthy pt with only HTN (no comorbid conditions/ diseases)



When do we add a new drug to HTN therapy?

- Drugs are added one at a time
- Patients are usually monitored monthly by PCP
- Second drug added to therapy more quickly in patients with higher BP
- Takes time to reach BP goal

7. Common side effects of **Antihypertensive drugs**:

- Lightheadedness (\_\_\_\_\_)
- Dizziness, drowsiness
- *Counseling tips*: To avoid falls: Stand up slowly. Hold onto railings for support when using stairs. Do not make abrupt movements.

8. **Hypertension**—BP Monitoring advice:

- Where? Home BP machines, machines in clinics, retail pharmacies
- Acute elevated BP can occur with exercise, \_\_\_\_\_, \_\_\_\_\_

Tell pt to sit for ~\_\_\_\_\_ before taking BP

- HTN can't be diagnosed with one BP reading. Pts need to have a pattern of high BP readings over time that aren't related to short-term factors
- White coat syndrome

10. **Definitions**:

- Angioedema: A sudden swelling of the face, mouth, throat or intestines, usually due to an allergic reaction.
- Arrhythmia: Irregular heart beat.
- Bradycardia: Abnormally slow heart rate (\_\_\_\_\_)
- Diabetic nephropathy: Progressive kidney disease/ failure due to diabetes
- Hyperkalemia: Abnormally high serum potassium levels.
- Photosensitivity (cutaneous): Skin sensitivity to light.
- Tachycardia: Abnormally rapid heart rate (\_\_\_\_\_)
- Thrombosis: Formation or presence of a clot in a blood vessel

## 1. Diuretics

### **Example:**

Hydrochlorothiazide: 12.5, 25, 50, 100 mg tab (*Microzide*); 50/5mL ← \_\_\_\_\_ type diuretic

Furosemide: 20, 40, 80 mg tab (*Lasix*); 10/mL; 40/5 mL; IM; IV ← \_\_\_\_\_ diuretic

Bumetanide: 0.5, 1, 2 mg tab (*Bumex*)

Torsemide: 5, 10, 20, 100 mg tab (*Demadex*)

Triamterene/HCTZ: 25/37.5 mg tab (*Dyazide*); 75/50 mg tab (*Maxide*) ← \_\_\_\_\_ diuretic

Spironolactone: 25, 50, 100 mg tab (*Aldactone*)

### **Indications**

HTN, CHF

Edema

### **MOA**

Diuretics act at different sites in the Loop of Henle and collecting duct based on specific diuretic class  
→ block Na<sup>+</sup> reabsorption and increase renal excretion of Na<sup>+</sup>, K<sup>+</sup>, Mg<sup>++</sup> ions → decrease fluid retention AND

\_\_\_\_\_ → lowered cardiac output → lowered BP

### **Pt. Info:**

#### **Administration:**

Take in the morning. If it is to be taken twice a day, take in the early morning and late afternoon.

**Time to effect:** Varies. Onset may be in 2 hours, full effect in 2+ weeks.

#### **Common side effects:**

- Dizziness, drowsiness
- \_\_\_\_\_
- Muscle cramps, fatigue
- Photosensitivity
- N/V- may take with food

#### **Also:**

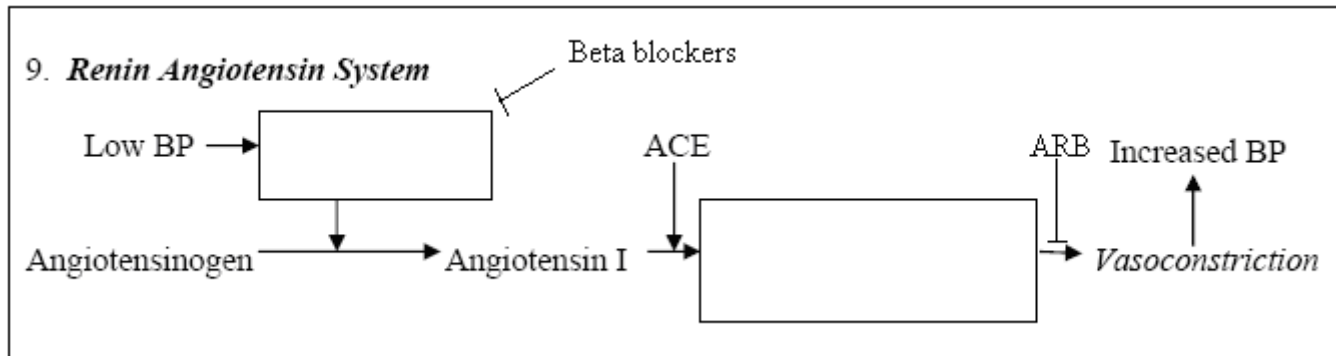
- Loop and thiazide diuretics are not K<sup>+</sup> sparing, therefore pts may also be prescribed a

- 
- Instead of K<sup>+</sup> supplement, pts may be asked to consume more **bananas or orange juice**.
  - Potassium supplement should not be taken with potassium sparing diuretic- may cause hyperkalemia. Sx of hyperkalemia are: nausea, weakness, numbness, heart arrhythmias
  - *Urine output:* Loop > \_\_\_\_\_ > \_\_\_\_\_

**Cautions/Contraindications:**

**Contraindicated in:** patients with renal dysfunction

**Caution:** Pregnancy Category B



## 2. Angiotensin Converting Enzyme Inhibitors (ACEIs)

**Medications:**

Lisinopril: 2.5, 5, 10, 20, 30, 40 mg tab (*Prinivil, Zestril*)

Ramipril: 1.25, 2.5, 5, 10 mg tab (*Altace*)

Captopril: 12.5, 25, 50, 100 mg tab (*Capoten*)

Benazepril: 5, 10, 20, 40 mg tab (*Lotensin*)

Enalapril: 2.5, 5, 10, 20 mg tab (*Vasotec*)

**Indications**

HTN

CHF

Acute MI

MI prevention

Diabetic nephropathy

**MOA**

Inhibits \_\_\_\_\_ → inhibition of Angiotensin II formation and vasoconstriction

**Pt. Info:**

**Administration:**

- May be taken with or without food; Avoid alcohol
- Do not take with antacids: Space out \_\_\_\_\_
- Captopril: Take on an \_\_\_\_\_ (1 hour before meals)  
→ First ACEI developed

**Time to effect:** 2-4 weeks

**Common side effects:**

ACE cough (15-20%): \_\_\_\_\_

- Worse at night
- Onset: Days-years
- Outcome: patients may need to stop ACEI and switch meds
- Cough symptoms are sometimes relieved but not cured by use of antitussives, lozenges, hard candies.

Angioedema, anaphylaxis (rare, less than \_\_\_\_\_% of pts)

- Onset: days to years
- Swelling of mouth, lips, neck
- Medical emergency

**Also:**

Avoid potassium supplements (ACEI have potassium-sparing effects)

**Caution/Contraindications:**

**Black Box Warning:** Avoid in: \_\_\_\_\_

because it may lead to an increase in: \_\_\_\_\_

Discontinue ACEI if pregnancy detected.

Pregnancy Category \_\_\_\_\_

Contraindicated in patients with history of angioedema

Caution in: breastfeeding patients, patients also on a potassium sparing diuretic (increases hyperkalemia risk)

### **3. Angiotensin II Receptor Blockers (ARBs)**

#### ***Medications:***

Valsartan: 40, 80, 160, 320 mg tab (*Diovan*)

Losartan: 25, 50, 100 mg tab (*Cozaar*)

Irbesartan: 75, 150, 300 mg tab (*Avapro*)

Candesartan: 4 mg, 8 mg, 16 mg, 32 mg (*Atacand*)

#### ***Indications***

HTN

CHF

Left ventricular dysfunction, post-MI

Diabetic nephropathy

#### ***MOA***

Inhibits \_\_\_\_\_ from binding to receptors → inhibition of vasoconstriction

#### ***Pt. Info: Administration:***

May be taken with or without food; Avoid alcohol

- Moderate to excess alcohol intake may \_\_\_\_\_

**Time to effect:** 2-6 weeks

#### **Common side effects:**

- Dizziness, drowsiness
- 
- Rarely: anaphylaxis

#### **Also:**

Avoid potassium supplements (may result in \_\_\_\_\_)

#### ***Cautions/Contraindications:***

Black Box Warning: CAUTION in pregnant women.

1<sup>st</sup> trimester: Pregnancy Category \_\_\_\_\_; 2<sup>nd</sup> and 3<sup>rd</sup> trimesters: Category D

→ May cause increased fetal mortality

→ D/c immediately if pregnancy is detected and consult with PCP about fetal risk vs. maternal benefit.

## **4. Beta-Blockers**

### ***Medications:***

Atenolol: 25, 50, 100 mg tab (*Tenormin*)

Labetalol: 100 mg, 200 mg, 300 mg (*Normodyne, Trandate*)

Metoprolol Succinate: 25, 50, 100, 200 mg tab (*Toprol XL*)

Metoprolol Tartrate: 50, 100 mg tab (*Lopressor*)

Propranolol: 10, 20, 40, 60 80 mg tab (*Inderal*); 60, 80, 120, 160 mg cap (*Inderal LA*)

### ***Indications***

HTN, CHF, MI

Cardiac arrhythmia

Prevention of angina

### ***MOA***

Selectively blocks beta-1 adrenergic receptor → \_\_\_\_\_ → lowered cardiac output → lowered BP

Minor MOA: Inhibits kidney excretion of rennin → inhibits angiotensin II production → lowered BP

### ***Pt. Info: Administration:***

May be taken with or without food. Avoid alcohol.

Inderal LA: Do not crush or chew. Swallow whole

**Time to effect:** 2 or more weeks

### ***Common side effects:***

- Dizziness, drowsiness, lightheadedness
- 
- Bradycardia

### ***Cautions/Contraindications:***

Black Box Warning: Do NOT \_\_\_\_\_ as this may cause angina exacerbation, MI or arrhythmias. Taper slowly to discontinue.

May affect beta receptors (beta-2) in the lungs and cause bronchospasms or decrease efficacy of asthma medications. **Caution** in pts with chronic asthma.

**Caution:** May mask hypoglycemic symptoms in diabetic pts.

Majority: \_\_\_\_\_

→ Atenolol: Category D

→ **Caution** especially in pregnancy 2<sup>nd</sup> and 3<sup>rd</sup> trimesters



## 5. Calcium Channel Blockers

### **Examples:**

Nifedipine: 10, 20 mg tab (*Procardia*); 30, 60, 90 ER mg tab (*Adalat CC*; *Procardia XL*)

Amlodipine: 2.5, 5, 10 mg tab (*Norvasc*)

Diltiazem: 120, 180, 240 mg cap (*Cardizem*)

Verapamil: 120, 180, 240 mg tab (*Calan SR*, *Covera HS*)

### **Indications**

HTN

Cardiac arrhythmia

Prevention of angina

### **MOA**

Blocks calcium channels and prevents influx of calcium ions into vascular smooth muscle and

Myocardium → \_\_\_\_\_ → decreased cardiac workload → lowered BP

### ***Pt. Info:* Administration:**

Take on an empty stomach, 1 hour before or 2 hours after a meal.

Do not crush or chew tablets

All but Diltiazem: Avoid grapefruit juice. May cause inhibition of drug metabolism due to inhibition of CYP450 3A4 liver enzymes.

### **Time to effect:**

2 or more weeks

### **Common side effects:**

- Dizziness, drowsiness
- 
- Constipation
- Flushing

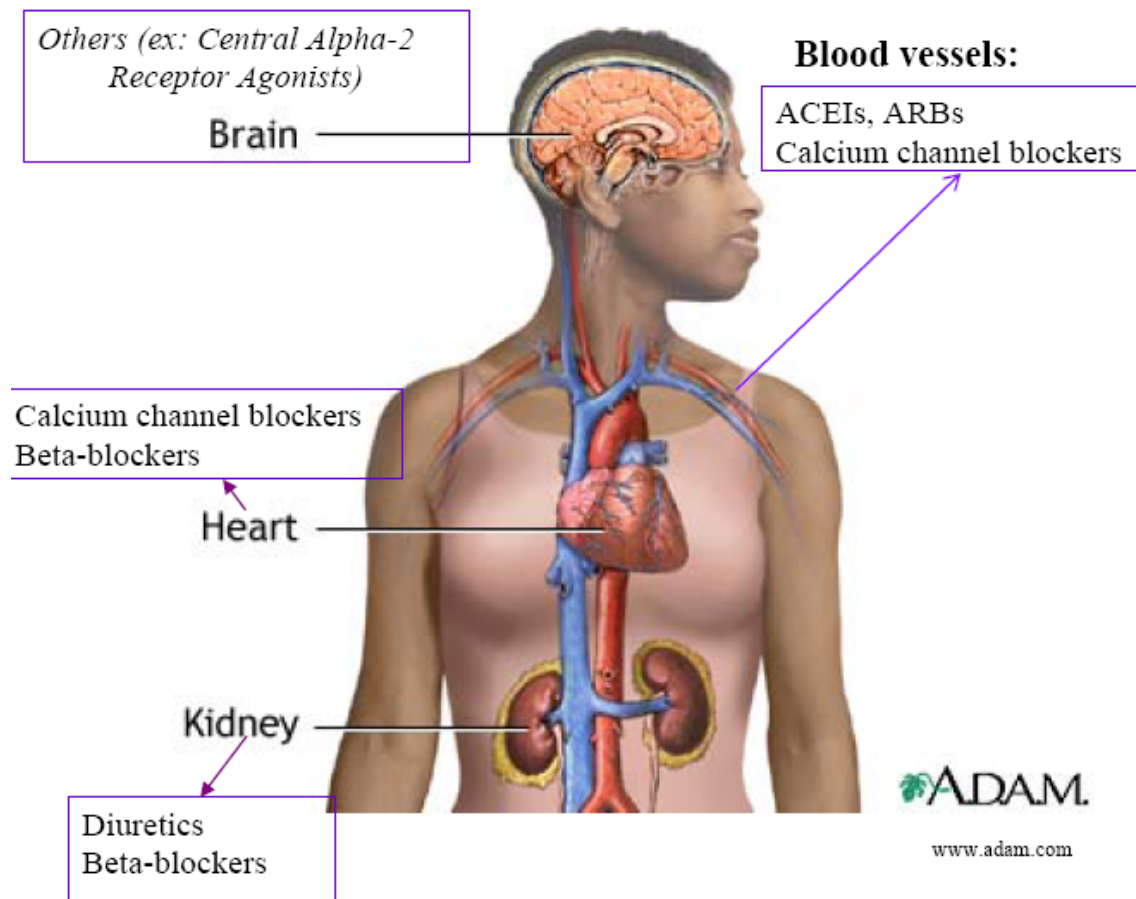
### **Contraindications:**

Pregnancy \_\_\_\_\_

→ Animal studies have shown an adverse effect on animal fetus, but no adequate and well-controlled human studies. Use **caution**; weigh potential benefits vs risks.

**Caution:** May interact with many drugs including statins, digoxin, beta-blockers.

## \*Antihypertensive Drugs Recap\*



## **6. Nitrates**

### ***Medications:***

Nitroglycerin: 0.3, 0.4, 0.6 mg SL tab (*Nitrostat, NitroQuick*); 0.1, 0.2, 0.3, 0.4, 0.6, 0.8mg/h transdermal patch (*NitroDur*); Nitro-Bid 2% ointment

Isosorbide mononitrate: 10, 20 mg tab (*ISMO, Monoket*); 30, 60, 120 ER mg tab (*Imdur*)

Isosorbide dinitrate: 2.5, 5, 10, 20, 30 mg tabs (*Isordil*); 2.5, 5 mg SL tab (*Isordil*); 40 mg CR tab (*Isochron*)

### ***Indications***

Angina: Prevention and treatment

### ***MOA***

Stimulates cGMP production → vascular smooth muscle relaxation and vasodilation

### ***Pt. Info: Administration:***

Directions for acute angina (Nitroglycerin SL):

→ 1 tab SL at onset of chest pain. If pain persists after 5 min, \_\_\_\_\_. May repeat up to 3 times total.

→ **OLD directions:** Take tab SL and call 911 if pain persists

→ Find a place to stop and sit down before taking med

### ***Time to effect:***

- Nitroglycerin SL: 1-3 minutes
- Isosorbide mononitrate/dinitrate: 30-60 minutes

### ***Side effects:***

- Dizziness, N/V, Rapid Pulse
- 
- Headache

### ***Also:***

Store SL tablets in: \_\_\_\_\_, away from light, heat; moisture. Do not use past expiration. SL tablets are relatively unstable.

Patches (For chronic angina): Counsel pt to remove and discard old patch before applying a new patch as per Dr's directions. Pts must also usually leave off patches at night (~10-12 hrs). This helps prevent tolerance.

### ***Cautions/Contraindications:***

**Contraindicated** with: Cialis, Levitra, Viagra (PDE inhibitors)

→ May exacerbate \_\_\_\_\_

**Caution** in pregnant women: Pregnancy Category B/C

## 7. Antiarrhythmics

### **Medications:**

Digoxin: 0.125, 0.25; 0.05/mL (*Lanoxin*)

→ caps (Lanoxicaps) discontinued in U.S.

### **Indications**

CHF

Atrial fibrillation, paroxysmal atrial tachycardia

### **MOA**

Inhibits  $\text{Na}^+/\text{K}^+$  ATPase pumps → membrane depolarization → increased calcium ions increase systolic contraction force and velocity → slows (normalizes) HR and decreases conduction of electrical impulses via AV node

### **Pt. Info: Administration:**

Take with a full glass of water and at the same time each day

Do not stop abruptly

**Time to effect:** 1-2 hours

### **Side effects:**

- Bradycardia, dizziness
- N/V
- 

### **Also:**

Many many drugs interact with digoxin due to CYP450 enzyme interactions, including Rx, OTC and herbal drugs. Do not take any non-Rx or herbal meds while on digoxin without consulting with your PCP.

### **Cautions/Contraindications:**

Digoxin is a *narrow therapeutic index* drug: Blood levels should be monitored very closely to avoid toxicities.

→ Possible toxicities: N/V/D, blurred vision, visual disturbances

( ), \_\_\_\_\_, confusion, lethargy

**Contraindicated** in pts with: AV block, ventricular arrhythmias, renal dysfunction

Use **caution** in pregnant women, elderly pts

→ Pregnancy Category C

## 8. Antithrombotics

### ***Medications:***

Warfarin: 1, 2, 2.5, 3, 4, 5, 6, 7.5, 10 mg tab (*Coumadin, Jantoven*)

→

Clopidogrel: 75, 300 mg tab (*Plavix*)

→

Aspirin: 81 mg, 325 mg

→

### ***Indications***

Pulmonary embolism

Venous thrombosis, DVT

Post-MI prevention

Post-stroke prevention

### ***MOA***

Warfarin: Inhibits formation of vitamin K-dependent clotting factors → inhibits coagulation

Clopidogrel: \_\_\_\_\_ binds to adenosine diphosphate (ADP) receptors on platelet

→ membranes → prevents ADP from binding = inhibits platelet aggregation

Aspirin: Covalently binds and irreversibly inhibits COX enzymes → inhibition of prostaglandin and thromboxane A<sub>2</sub> synthesis → inhibits platelet aggregation

### Cell Membrane Phospholipids



#### Arachidonic Acid



prostaglandins  
(stomach  
mucosa, platelet  
activation,  
kidneys)



prostaglandins  
(Inflammatory  
response)

### ***Pt. Info: Administration:***

Warfarin: Take exactly as directed by PCP; avoid alcohol.

- Avoid sudden changes of vita K in diet: liver, broccoli, spinach, \_\_\_\_\_
- Avoid cranberry juice or cranberry herbals
- Avoid NSAIDS: may affect clotting and \_\_\_\_\_
- For pts age 18 or over

Clopidogrel:

- Take with or without food; avoid alcohol.
- Do NOT take with omeprazole; may decrease clopidogrel effect ~50%!
- Avoid NSAIDS

### **Time to effect:**

Warfarin: ~1 day

Clopidogrel: 3-7 days

Aspirin: ~30 min

### **Side effects:**

Warfarin: Bleeding, bruising, blood in urine or stool

Clopidogrel: Nosebleeds, bruising, blood in stool, chest pain, malaise

Aspirin: GI discomfort, N/V, dizziness, drowsiness

### **Also:**

Warfarin: Do not stop abruptly as this may lead to: \_\_\_\_\_

- Many many drugs interact with warfarin due to CYP450 enzyme interactions.
- Do not take any non-prescription or herbal meds while on warfarin without consulting your doctor or pharmacist.

Warfarin: is a *narrow therapeutic index* drug. Pts need to have their measured blood clotting time or INR (International Normalized Ratio) monitored regularly.

### ***Cautions/Contraindications:***

Warfarin:

- **Black Box Warning:** May cause major or fatal bleeding, especially during the starting period and with a higher dose and higher INR.
- Dispensed with FDA patient medication guide
- **Contraindicated** in: pregnant pts: \_\_\_\_\_, pts with bleeding risks (hemophilia), recent surgery
- **Caution** in: elderly, hepatic dysfunction, renal dysfunction, diabetic pts

Clopidogrel:

- **Contraindicated** in: pts with bleeding risks, trauma or active bleeding
- **Caution** in: pregnant pts, hepatic dysfunction, renal dysfunction, GI ulcer pts
- Pregnancy Category B

Aspirin:

**Contraindicated in children**

Caution in: Asthma, GI ulcer hx, diabetes, chronic alcohol use

**Pregnancy Category D in third trimester**