ALLERGIC RHINITIS

sneezing, itchy nose, eyes or throat, watery eyes, rhinorrhea (runny nose), nasal congestion, post-nasal drip.

NON-PHARM Tx:	DRUG Tx:
1. AVOID exposure to allergens. 2. IgE – mediated or Blood test. 3. Nasal irrigation – saline, propylene/polyethylene glycol 4. Neti Pot 5. **Boiled/Distilled H_2O –** NEVER use faucet water.	1. Chronic, Mod-Severe rhinitis a. **1st LINE** = Intranasal Corticosteroid 2. MILD sx = Oral Antihistamine a. Decongestants can be used or other agents for itchy eyes.

Intranasal Corticosteroids
***1st LINE = for mod-severe** | **most effective class of med to decrease inflammation** | **Have different names for allergy relief & asthma.**

GENERIC	BRAND	ADRs	BBW	COUNSELING	NOTES
Beclomethasone	**Beconase, Qnasl**	HA, dry nose, bad taste, epistaxis (nose bleed), and local infection.	- Adrenal suppression w/ long-term use. - Delayed wound healing - Avoid if nasal ulcers or trauma. - Stunt growth in children - IOP↑ , open-angle glaucoma, cataracts.	FLONASE & NASACORT Counseling: 1. Shake bottle 2. Flonase = Prime 7-days no use 3. Nasacort = Prime 14-days no use 4. Point away when priming 5. Tilt head forward & inhale while spraying in nose.	1. May take 1 week to get relief. 2. Pregnancy - Use Budesonide 3. Get nasal exams for long use. 4. AVOID contagious people 5. Shake well before use
Budesonide	**Rhinort Aqua**				
Fluticasone	**Flonase**				
Mometasone	**Nasonex**				
Triamcinolone	**Nasacort**				
Ciclesonide	Omnaris, Zetonna				
Flusinolide					

Oral Antihistamines 1st generation (more drowsiness)
1st LINE = Mild-Mod Sx. | **Effective relief of itching, sneezing, rhinorrhea, other immediate hypersensitivity rxns.** | **Has little effect on nasal congestion.**

GENERIC	BRAND	ADRs	BBW	CONTRAINDICATIONS	NOTES
Diphenhydramine HCL	**Benadryl** *Do NOT use <6 YO ADULTS = 25-50mg PO Q4-6H	Somnolence, cognitive impairment, strong anticholinergic effects	- AVOID use in elderly - Caution in CVD, - Prostate enlargement - Glaucoma - Asthma - Excessive sedation. - AVOID use in <2 YO	Infants, lactating women, narrow-angle glaucoma, asthma, AVOID MAOi, symptomatic BPH, peptic ulcer	Lactating women should use 2nd gen ALL should be D/C before allergy skin testing. 1st gen cause photosensitivity
Clemastine	Tavist, Dayhist				
Chlorpheniramine	Chlor-Trimeton, Chlorphen				
Carbinoxamine	Arbinoxa, Karbinal				
Oral Antihistamines 2nd generation (preferred due to less sedation & more cognitive function)					
Cetirizine	**Zyrtec**	Somnolence occasionally	- CNS depression - Sedation w/ other sedating meds	Levocetirizine w/ ESRD	1. Fexofenadine: Take w/ H_2O 2. AVOID Al^+/Mg^+ products 3. PREGO - Loratadine/Cetirizine best
Levocetirzine	**Xyzal**				
Fexofenadine	**Allegra**				
Loratadine	**Claritin**				
Desloratadine	**Clarinex**				
Intranasal Antihistamines					
Azelastine	**Astelin, Astepro**	Somnolence, bitter taste, HA, nosebleed			Helps w/ Nasal congestion
Olopatadine	**Patanase**				

Oral Decongestants
α-Adrenergic-Agonist | **Products containing "D" contain Phenylephrine or Pseudoephedrine** | **Vasoconstriction of sinus vessels**

GENERIC	BRAND	ADRs	BBW	CONTRAINDICATIONS	NOTES
Phenylephrine HCL	**Sudafed PE**	CV + CNS stimulation	- AVOID in <2 YO	14 Days w/ MAOi Phenylephrine: HTN, tachycardia	Phenylephrine low BA PSE more effective ONSET 15-60 mins
Pseudophedrine	**Sudafed, Nexafed, Zephrex-D**				
Topical (Intranasal) Decongestants					
Oxymetazoline	**Afrin**	Stingy, burning, sneezing, dryness, rebound congestion after 3 days	- AVOID in <2 YO - MAOi use		Effective in 5-10 mins *Limit use to <3 days to potential rebound congestion.
Naphazoline	Privine				
Tetrahydrozolline	Tyzine				

Other

GENERIC	BRAND	MOA	ADRs	BBW	CONTRAINDICATIONS	NOTES
Intranasal Cromolyn	Nasalcrom	MAST-cell Stabilizer				Can be used as Tx + Px
Ipratroprium Bromide	Atrovent	Anticholinergic				GOOD for Rhinitis by drying nose out
Montelukast	Singulair	leukotriene antagonist				10 mg PO QD, can be used as adjunctive tx
Sublingual Immunotherapy					Allergy Shots - 1st dose MUST be given in doctor's office w/ PT monitored 1st 30 mins	*PT should get RX for Epinephrine Pen

COLD

★Viral infxn of URT caused by Rhinovirus/Coronavirus. ⇨Transmit through hands or by air. ⇨Practice correct hand-washing technique. ⇨Self-limiting

NON-PHARM Tx:	DRUG Tx:
1. Zinc 2. Vitamin C (Absorbic acid) 3. Echinacea	1. Expectorants 2. Cough suppressants 3. Decongestants (refer to allergic rhinitis for drug chart) 4. Analgesics/Antipyretics

Expectorant – removes phlegm					
GENERIC	**BRAND**	**ADRs**	**BBW**	**CONTRAINDICATION**	**NOTES**
Guaifenesin	**Mucinex, Robitussin**	N/V/D, dizzy, HA, rash, upset stomach		Child < 2 yo	MAX = 2000 mg/day (Adult)

Cough Suppressants DM = 5-HT + NMDA blocker Benzonatate = Topical anesthetic					
GENERIC	**BRAND**	**ADRs**	**BBW**	**CONTRAINDICATION**	**NOTES**
Dextromethorphan	**Delysm, DayQuil**	N/V, drowsiness, Serotonin Syndrome		MAOi use 14 days	DM = Dextromethorphan Must be > 18 yo to buy
Codeine		N/V, sedation, constipation, hypotension	BBW: Respiratory depression	Child < 12 yo	Additive CNS effect w/ other CNS depressants
Benzonatate	**Tessalon. Zonatuss**	Somnolence, confusion, hallucination			*AVOID in child < 10 yo
Diphenhydramine	**Benadryl**				

Combination Products	
GENERIC	**BRAND**
Dextromethorphan/Promethazine	
Brompheniramine/PSE/DM	**BromFed DM**
Promethazine/Phenylephrine/Codeine	Promethazine VC/Codeine
GuaiFENesin/Codeine	Robafen AC, Virtussin AC
GuaiFENesin/Codeine/PSE	Cheratussin, Mytussin DAC
Chlorpheniramine/Hydrocodone	**TussiCaps, Tussionex, Vituz**

Pediatric Concerns/Dosing for Cold medications		
Cough/Cold Products	**Acetaminophen in Infants**	**Ibuprofen in Infants**
Per FDA, don't use • OTC meds in < 2 yo • Codeine in child < 12 yo Per manufacturer (relabeled) • NO child < 4 yo Per AAP - NO child < 6 yo Do NOT use Promethazine in < 2 yo Use 1. Hydration, nasal bulbs, saline drop/spray 2. Ibuprofen or Acetaminophen a. Do NOT use ASA (Reyes Sx)	**{160mg/5mL}** Dose: 10-15 mg/kg/dose Q4-6H PRN Max: 5 doses/24hr	Drops: 50mg/1.25 mL Suspension: 100 mg/5 mL Dose: 5-10 mg/kg/dose Q4-6H PRN Max = 40 mg/kg/day

ASTHMA

Inflammation & bronchoconstriction ⇨ Airway obstruction and low expiratory exhalation.

Characteristics of Disease

1. Recurrent wheezing, breathlessness, chest tightness, & coughing. (Freq. at night & waking)
2. Reversible w/ meds.
3. Exacerbations can be mild-severe-fatal.
4. Triggered by environment & inflammatory mediators: Histamine, Leukotriene, Cytokines, Mast cells, Eosinophil, or genetics (IgE). Can be any of the following:
    a. Allergens, dust, smoke, chemicals, weather,
    b. Lifestyle (stress/exercise), respiratory infxns
    c. Meds: ASA, NSAIDs, BB's
5. Comorbidities: Allergy, GERD, Obesity, Sleep apnea, Anxiety, Depression.

Control Risk Factors

1. Avoid Smoking
2. Avoid Triggers
3. Keep exercising (even if EIB)
4. Annual Flu shot
5. PPSV23: Age 2-64 yo
6. PCV-13: Age 6-18 yo

Diagnosis

Assess Expiratory volume

1. Spirometry
    a. Test Forced Vital Capacity (FVC) in 1 second (FEV1)
2. Peak Expiratory Flow (PEF)
    a. use Peak Flow Meter measuring daily (see below)

Peak Flow Meter

1. Use every morning before any asthma meds.
2. Stand up straight → Exhale
3. Inhale deeply then blow out HARD & FAST into PEFR & record the highest of 3 tries.
4. Clean 1x/wk

GREEN Zone = 80-100%
YELLOW Zone = 50-80% (Need Action Plan)
RED Zone = < 50% of personal best (Go to Emergency Room)

Classification

Impairment Criteria	Intermittent	Mild-Persistent	Mod-Persistent	Severe-Persistent
Daytime Sx	≤ 2 days/wk	> 2 days/wk NOT daily	Daily	Throughout Day
Night time awakenings	≤ 2x/month	3-4x/month	> 1x/wk NOT nightly	Often 7x/wk
Rescue Inhaler use	≤ 2 days/wk	> 2 days/wk OR > 1x/day	Daily	Several times a day
Activity Limitations	none	Minor	Some	Extreme
Lung Fxn - FEV1%	> 80%	> 80%	60-80%	< 60%
FEV1/FVC	Normal	Normal	5% Reduction	5% Reduction

Risk Criteria	Intermittent	Mild-Persistent	Mod-Persistent	Severe-Persistent
Exacerbations req. PO steroid	0-1 per year	≥2 per year		

Steps for Initiation	STEP 1	STEP 2	STEP 3 – consider PO steroid	STEP 4/5 – consider PO steroid

Treatment Algorithm

STEP 1	SABA PRN **(ALL PTs must have SABA PRN)**	
STEP 2	Low Dose ICS	Alternate Tx: Cromolyn, LTRA, Theophylline
STEP 3	Low-dose ICS + LABA or Med-dose ICS	Alternate Tx: Zileuton, LTRA, Theophylline
STEP 4	Med-dose ICS + LABA	
STEP 5	High-dose ICS + LABA	Consider adding Tiotroprium for PTs > 6 yo if Hx of exacerbation.
STEP 6	High-dose ICS + LABA + PO steroid	

1. Follow up in 2-6 wks
2. Check Adherence to meds
3. Counsel technique/cleaning
4. Control risks, triggers, comorbidities
5. Review action plan
6. Determine step-up/down Tx
7. Follow up 1-6 months if controlled.

Effectiveness of Therapy

Well Controlled:

1. Sx/SABA use ≤ 2 days/wk
2. Nighttime awake ≤ 2x/month
3. No limits to activity

Maintain step/step down if controlled for 3 mons.

NOT Controlled:

1. Sx/SABA use > 2 days/wk
2. Nighttime awake 1-3x/wk
3. Some limits to activity

Step up 1 step

POORLY Controlled:

1. Sx/SABA use several times/day
2. Nighttime awake ≥ 4x/wk
3. Extreme limits to activity

Step up 1-2 steps

General Information

Spacers:

- Helps to coordinate inhalation w/ MDI into lungs & prevents thrush.
- Clean 1x/wk soap water

Nebulizer:

- Turns liquid meds into fine mist.

If prescribed >1 inhaler PT must wait 60 secs b/t each:

- 1st: SABA
- Any other Bronchodilator
- LAST: ICS

Exercise induced bronchospasms (EIB):

- SABA is preferred 5-15 mins before exercise but Salmeterol (LABA) can be used unless it is being used for maintenance. Montelukast must be taken 2 hrs prior to exercise.
- Rescue Inhalers: should last 12 months w/ good asthma control.

ASTHMA

Drug chart

GENERIC	BRAND	ADRs	BBW	CONTRAINDICATIONS/CAUTIONS	NOTES
β Agonists - Relax smooth muscle → Bronchodilation					
Albuterol (SABA)	ProAir HFA ProAir RespiClick Ventolin HFA Proventil HFA	Nervousness Tremor Tachycardia Palpitations Hyperglycemia K+ ↓		Caution w/ CVD, Glaucoma, Hyperthyroidism, Seizures, Diabetes	- MDI's (HFA): Shake well before use - Albuterol inhalers = 200 puffs/inhaler ○ Except Ventolin HFA = 60 inhales - EIB: 2 inhales 5 min. before exercise
Levabuterol (SABA)	Xopenex				
Salmeterol (LABA)	Serevent Diskus (DPI)		↑Risk of Asthma related death		- ONLY used for PTs on ICS but symptoms not controlled - ADD on therapy to Medium dose ICS before increasing to High dose ICS - NEVER use NON-Selective β agonists
Racepinepherine OTC (SABA)					
Inhaled Corticosteroids (ICS) – inhibits inflammation					
Beclomethasone	QVAR	Dysphonia (Hard to talk) Oral Thrush Cough URTI Hyperglycemia		- Not used for primary Tx of Asthma or acute episodes of asthma - Adrenal suppression, risk of fractures, stunt child growth	- 1st Line for ALL w/ Persistent Asthma - Rinse mouth w/ warm H_2O or use spacer to prevent thrush.
Budesonide	Pulmicort Flexhaler				
Fluticasone	Flovent HFA Arnuity Ellipta - DPI				
Mometasone	Asmanex HFA -MDI Asmanex Twisthaler - DPI				
Ciclesonide	Alvesco				
Flunisolide	Aerospan				
Leukotriene Receptor Antagonists – reduces airway inflammation					
Montelukast	**Singulair**	Headache Dizzy Ab pain URTI LFTs ↑		Neuropsychiatric events	- Mostly used in Children - **Montelukast:** 10 mg PO QHS ○ Granules: must be used w/in 15 mins. - **Zileuton:** taken with food - **Zafirlukast:** taken on empty stomach
Zileuton	**Zyflo**			Hepatic imp.	
Zafirlukast	Accolate				
Anticholinergic					
Tiotropium	**Spiriva Respimat**	Hyperthermia Dry skin/dry mouth Mydriasis Constipation Urinary retention			- Approved for > 6 YO for Asthma w/ Hx of exacerbations despite ICS/LABA Tx.
Xanthines - Blocks Phosphodiesterase → ↑cAMP → Bronchodilation					
Theophylline	**Theo-24** **Theo-Cron** **Elixophyllin**	N/V/HA HR increase Insomnia Tremor/Nervous		- CVD, Hyperthyroidism, PUD, Seizures - Small increase in dose → Large increase in concentration ○ Loading dose based on IBW	- MANY DRUG interactions due to IA2/3A4/2E1 inhibition - Monitor Serum Conc. → Tx Range = 5-15 mcg/mL ○ Measure PEAK - Active metabolites: Caffeine & 3-methylxanthine - Aminophylline → Theophylline: Multiply 0.8x
Monoclonal antibody - inhibits IgE					
Omalizumab	**Xolair**	Injection site rxn Arthralgias Dizzy/Fatigue	Anaphylaxis	Given SC Q2-4 wks only in Hospital under medical supervision.	Indication: Allergic asthma in PT > 6 YO & positive allergen skin test & ICS isn't enough.
Interleukin-5 (IL5) Antagonist – inhibits IgE					
Mepolizumab	Nucala	Injection site rxn Arthralgias Dizzy/Fatigue			Indication: >12 YO given SC route for Eosinophillic Asthma
Reslizumab	Cinqair		Anaphylaxis		IV only

ASTHMA

Counseling

Meter Dosed Inhalers (MDI)		
General	1. HFA, Respimat, or if there is Suffix (QVAR) 2. Aerosolized liquid med 3. HFA uses Propellant 4. Req. SLOW DEEP inhalation same time as pressing button. 5. SPACER can be used 6. SHAKE Well except for QVAR, Alvesco, Respimat	**DIRECTIONS FOR USE:** 1. Shake 5 secs before spray 2. Exhale fully 3. Inhale slowly/deeply while pressing button. 4. Hold breath 10 secs or long as possible.
Ventolin HFA **ProAir HFA**	**PRIME:** Spray 4x: into air while shaking between sprays. Prime if not used for 14 days or if dropped.	**CLEAN:** Remove metal canister (do not get wet) & rinse mouthpiece w/ warm H2O then AIR DRY (1x/wk).
Flovent HFA	**PRIME:** Spray 4x into air while shaking between sprays. Prime if not used for >7 days or >5 days for Dulera	**CLEAN:** Use clean cotton swab to wipe mouthpiece then AIR DRY.
Dulera		**CLEAN:** Wipe mouthpiece w/ clean dry cloth. NEVER put in H2O.
Symbicort **QVAR**	**PRIME:** Spray 2x into air while shaking between sprays. Prime if not used for 7 days or ≥10 days for QVAR	**CLEAN:** Wipe mouthpiece w/ clean dry cloth. NEVER put in H2O

Dry Powder Inhalers (DPI)	
General	1. Diskus, Ellipta, Pressair, Handihaler, Neohaler, RespiClick. 2. Fine powder inhalation 3. NO Propellant 4. Req. forceful quick inhalation w/o pressing button same time 5. NO SPACERS 6. Do NOT Shake
Advair Diskus	1. Pull Thumb-grip away til mouthpiece shows. 2. Slide lever until it clicks. 3. Exhale away from mouth. 4. Inhale quick/deep 5. HOLD long as possible or 10 sec 6. Rinse mouth w/ H2O & spit. **Do NOT wash just AIR DRY**
Pulmicort Flexhaler	1. Twist off white cover while twisting brown base far as it will go in other direction til you hear a click. (Loaded) 2. Do NOT shake the inhaler. 3. Turn head away & exhale fully. 4. Inhale deep/forcefully. 5. Rinse out mouth and spit. **Let AIR DRY no H_2O**
ProAir RespiClick **AirDuo RespiClick**	1. Open cap all the way til it clicks. a. Opening/Closing cap w/o inhaling wastes medication. 2. Exhale all the way away from inhaler. 3. Inhale deeply & HOLD long as possible or 10 secs **NO PRIMING needed. Only use dry cloth NO H_2O to clean.**

Soft Mist Inhaler/Inhalation Spray

Combivent, Spiriva, Striverdi, Stiolto

1. Propellant free and delivers drug in fine mist
2. Better lung deposition and requires less inhalation effort
3. To use for first time (keep cap closed until step 5)
   a. Press safety catch and pull off clear base
   b. Insert cartridge into inhaler and push against surface
   c. Replace clear base
   d. Turn base in direction of arrow until you hear a click
   e. Flip open cap until it clicks into open position
   f. Point inhaler toward ground and press dose release button until a cloud is visible then repeat 3 more times before use
4. Daily use (T.O.P)
   a. **T**urn base in direction of arrow until you hear a click (keep cap closed)
   b. **O**pen cap until it clicks into open position
   c. Close lips around inhaler and **P**ress button while taking in a slow deep breath

Combination Products

ICS/LABA Combos:
Budesonide/Formoterol (Symbicort)
Fluticasone/Salmeterol (Advair Diskus/HFA)
Mometasone/Formoterol (Dulera)

SMOKING CESSATION

GENERAL INFORMATION		The "5-A's" Model:
1. Providers must inquire about Tobacco use. 2. 1-800-QUIT-NOW 3. Counseling is just as important as medications. 4. Combination Tx can be used 1st LINE. 5. Meds are always recommended unless CI.	6. E-Cigs should not be recommended. 7. Counsel all pregnant women, children, & light smokers (<10 cigs/day). 8. Smokers 19-64 YO need Flu + Pneumovax 23 vaccines. 9. Smoke induces CYP450-A12 → Supratherapeutic levels of med. 10. Women > 35 YO should not take Oral Contraceptive (CVD risk)	1. ASK about tobacco use. 2. ADVISE to quit. 3. ASSESS willingness to quit. 4. ASSIST in quit attempt. 5. ARRANGE follow up.

GENERIC	BRAND		ADRs	BBW	C/I	NOTES
Nicotine Patch	**NicoDerm CQ**	**Nicotine Replacement Tx** (mostly OTC) - ALL products; wait 15 mins after eating or drinking for use	1. HA/Dizzy 2. Insomnia 3. Nervousness *Patch: vivid dreams *Inhaler: throat irritation	AVOID in post-MI, arrhythmias, angina, and pregnancy.		1. >18 yo + ID for purchase 2. Combo w/ short-acting = Most effective 3. Remove patch before MRI. 4. Gum/Lozenge (4mg) shown to reduce weight gain.
Nicotine Polacrilex Gum	**Nicorette**					
Nicotine Polacrilix Lozenge	**Nicorette Mini**					
Nicotine inhaler	Nicotrol inhaler (RX)					
Nicotine Nasal Spray	Nicotrol Spray (RX)					

Other Medications

GENERIC	BRAND	MOA	ADRs	BBW	CONTRAINDICATIONS	NOTES
Buproprion SR	**Zyban**	Dopamine/NE Blocker tapering not needed	**1. Dry mouth** **3. Agitation** **2. Insomnia** **4. Headache** N/V/Dizzy, constipation, tremors, blurred vision, anxiety, tachycardia, sweating.	Suicidal behavior in young pts like other Anti-depressants.	1. Seizure disorder 2. Anorexia/Bulimia 3. MAOi 14 days 4. Benzos, AEDs, Barbiturates	- Do NOT use w/ other forms of Buproprion. - Start 1 week before quitting smoke. - MAX Dose = 300 mg/day - Wait 8 hrs if splitting dose.
Varenicline	**Chantix**	α-4-β-2 nicotinic agonist tapering not needed	**1. Insomnia** **3. Abnormal dreams** **2. Nausea** **4. Headache** Constipation, vomiting, flatulence.	1. Serious Psychiatric behavior 2. Seizures 3. ↑ ETOH + Blackout risk 4. Sleep walking	**pts unable to quit immediately should cut smoking by 50% every 4 weeks.**	- START 1 week before quit date OR START and quit between 8-35 days. - Take after meal + glass of H20. - Decrease ETOH use. - Caution serious rxns (facial swelling, rash, peeling skin)

Counseling & Dosing

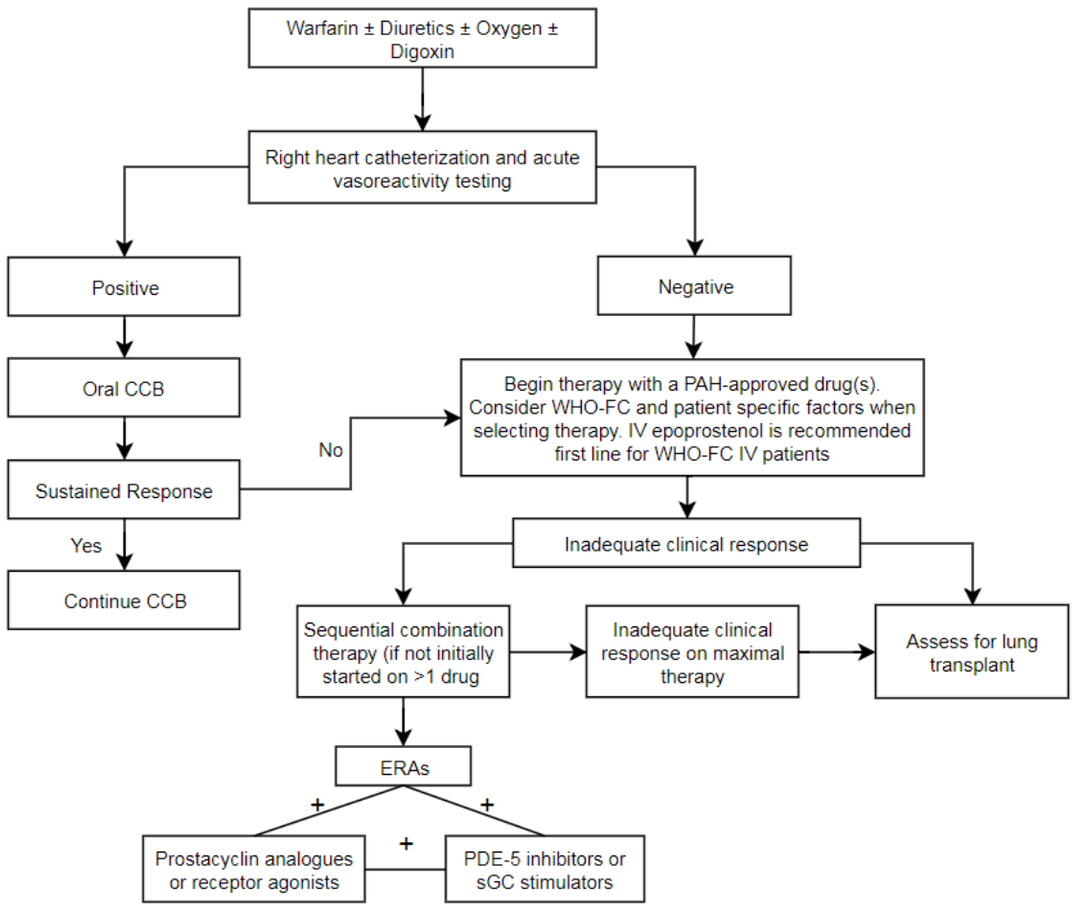
DRUG	COUNSELING	DOSING
Nicotine Patch	1. Apply new patch start of each day, dispose used in Pouch. 2. Apply to clean, dry, hairless skin & hold for 10 secs. 3. Wear the patch for 24 hrs. Only remove before sleep if abnormal dreams occur. 4. Fold inward & discard in pouch then place in trash. 5. Wash hands before/after use. 6. Rotate site of patch. Don't use same site for 1 week. 7. NEVER cut patch or use > 1 patch at a time.	**Cigarette use / Week 1-6 / Week 7-8 / Week 9-10** **> 10 cigs/day: 21 mg patch / 14 mg patch / 7 mg patch** **≤ 10 cigs/day: 14 mg patch / 7 mg patch / No recommendation**
Nicotine Gum	1. Chew slowly til "tingle" or "flavored taste" then PARK gum in cheek. a. Repeat when tingle/flavor goes away 2. Use for 30 mins. 3. Use 1 piece Q1-2hrs **No more than 24 pieces per day**	*Min 9 pieces/lozenges per day for the 1st 6 wks Smoke 1st cigarette / Dose: **> 30min after waking: 2mg**; **≤ 30 min after waking: 4mg** ⇨ Chew/Dissolve 1 piece every: Weeks 1 – 6: **Q1 – 2H**; Weeks 7 – 9: **Q2 – 4H**; Weeks 10 – 12: **Q4 – 8H**
Nicotine Lozenge	1. Place in mouth let DISSOLVE slowly 2. Move side to side for 20-30 mins. 3. NEVER use > 1 at a time. **No more than 20 lozenges per day**	
Nicotine Inhaler	1. Puff inhaler in short/freq breaths + inhale deeply. 2. Each cartridge gives 20 minutes of continuous puffing. 3. Clean mouthpiece w/ soap + water regularly. 4. Keep at room temp (in pocket).	
Nicotine Nasal Spray	1. Spray once in each nostril while breathing through mouth. 2. Do NOT sniff, swallow, or inhale through nose 3. Wait 5 mins after use before driving or heaving machines.	

PULMONARY ARTERIAL HYPERTENSION (PAH)

continuous high BP in the pulmonary arteries. **PAH = mean PAP (mPAP) ≥ 25 mmHg.**

Signs & Symptoms	Causes of Pulmonary Fibrosis:	NON-PHARM Tx:	DRUG Tx:
Fatigue Dyspnea Chest pain Syncope Edema Tachycardia	Amiodarone Methotrexate Nitrofurantoin Sulfasalazine	1. Sodium restrict < 2.4 g/day 2. Flu/Pneumonia Vaccines 3. Avoid High Altitudes. 4. O2 Sat > 90.	1. Anti-Coagulation w/ Warfarin: INR Goal = 1.5 - 2.5. 2. Loop Diuretics for volume overload. 3. Digoxin to improve CO or control HR. 4. Perform Acute Vasoreactive Testing. a. During which drugs are given to illicit a response. i. RESPONDER: mPAP falls by at least ≥10 to a value less than <40. 1. Give CCB: Nifedipine, Diltiazem, and Amlodipine. a. NOT Recommended = Verapamil. ii. NON-RESPONDERS: or PTs failing CCB Tx need ≥1 vasodilator. 1. Prostacyclins, ERAs, PDE-5, or sGC.

Treatment Algorithm



WHO-FC: World Health Organization Functional Classification

- **Class I** = patients with PH but without limitation of physical activity
- **Class II** = patients with PH resulting in slight limitation of physical activity
- **Class III** = patients with PH with marked limitation of physical activity
- **Class IV** = patients with PH unable to be physically active and with signs of right heart failure

Prostacyclin Analogues (Prostanoids) - Potent Vasodilator + Inhibit platelet aggregation.

GENERIC	BRAND	ADRs	BBW	C/I	NOTES
Epoprestenol	Flolan (IV) Veltri (IV)	Vasodilation Rxns - (Hypotension, HA, Dizzy, Flushing) N/V/D Jaw Pain Anxiety/Tremor Thrombocytopenia Infusion-site Pain	Rebound PAH (Don't DC abruptly) IV infusions → Infections	Heart failure	- Parenteral = most potent. - Avoid interruption in Tx. - Avoid large/sudden dose reductions. - Epoprostenol = Protect from light - Flolan = reqs. ice packs for solution. - Avoid NSAIDs
Trepostinil	Remodulin (IV, SQ) Tyvaso (inhaled) Orenitram (ER tab)			Hepatic imp.	
Iloprost	Ventavis (inhaled)				
Selexipag	Uptravi (tab)				

Endothelin Antagonist (ERA) - Blocks Endothelin vasoconstriction.

GENERIC	BRAND	ADRs	BBW	C/I	NOTES
Bosentan	Tracleer	HA URTI Flushing Hypotension Fluid Retention ↓Hgb/Hct	Embryo-Fetal toxicity - Women need Neg. Prego test before use & monthly. Bosentan = Hepatotoxicity (ALT/AST)	Pregnancy	- REMS Program Bosentan = ↓ effectiveness of Contraceptives.
Ambrisentan	Letairis				
Macitentan	Opsumit				

PDE-5 inhibitor - Pulmonary relaxation/vasodilation.

GENERIC	BRAND	ADRs	BBW	C/I	NOTES
Sildenafil	Revatio	HA Flushing Dyspepsia Extremity/Back pain Epitaxis	Hypotension Hearing/Vision loss Priapism	Use of Nitrates or Riociguat.	
Tadalafil	Adcirca				

Soluble Guanylate Cyclase (sGC)

GENERIC	BRAND	ADRs	BBW	C/I	NOTES
Riociguat	Adempas	Headache Bleeding Pulmonary edema Hypotension N/V/D	Embryo-Fetal toxicity - Women need Neg. Prego test before use & monthly.	- Pregnancy - use of PDE-5 or Nitrates	- REMS Program - Space out ○ Sildenafil = 24 hrs ○ Tadalafil = 48 hrs

GOUT

Uric acid built up in joints – end-product of Purine metabolism. → PT may be Asymptomatic → Sx - painful, burning, swelling joint. → Typically starts in 1 joint (Big Toe)

Risk Factors	Treatment Pearls	DRUG Tx	
• Male • Obese • Excess ETOH • HTN, CKD • Age • Meds **Reduce risk:** AVOID organ meats high-fructose corn syrup, ETOH.	1. NEVER treat asymptomatic hyperuricemia. 2. ONLY Tx after Gout Attack. 3. GOAL = Uric acid < 6mg 4. Drugs used to Tx different from ppx	**<u>Acute Gout Attacks</u>** - Use NSAID, steroid, or Colchicine - Use meds at 1st sign of attack - Combination Tx w/ any 3 for severe attacks. - Ice packs or IA injection - Chronic urate-lowering Tx (ULT) should continue w/o interruption	**<u>Chronic Urate-Lowering Treatment</u>** - ULT should be given to those w/ gout who had an attack, intermittent sx or tophi. - Gout ppx: NSAIDs or Colchicine - 1st LINE = Allopurinol (XOi) or Febuxostat - 2nd LINE = Probenecid (if XOi is C/I) or added if UA level isnt below <6mg/dL while maxed out on XOi. o Lesinurad is also 2nd Line taken w/ XOi. - Peglitocase - reserved for Severe Refractory dx

ACUTE TX

GENERIC	BRAND	ADRs	BBW	C/I	NOTES
Anti-gout = interference with migration of neutrophils					
Colchicine	Colcrys Mitigare	NVD Myelosuppression Myopathy Neuropathy Cramping Loose stools Vit-B12 ↓	GI Sx Myopathy Myelosuppression Use w/ gemfibrozil, statins, non-DHP CCBs	P-GP or CYP3A4 inhibitor	1. Start w/I 36 hrs of Sx onset. 2. Ppx dose should be held for 12 hrs AFTER Tx dose begins. 3. AVOID Cyclosporine - Dose: 1.2 mg PO (2x 0.6 mg) followed by 0.6 mg in 1 hr. o Do NOT Exceed 1.8mg/hr or 2.4mg/day. o Dose every 3 days (NO earlier)
NSAIDs					
Indomethacin	Indocin	Refer to pain handout			- AVOID use severe Renal Dx. - Celecoxib has most CVD risk
Naproxen	Naprosyn				
Celecoxib	Celebrex				
Sulindac	Clinoril				
Steroids – can be given PO, IV, IM, ACTH					
Prednisolone	Prednisolone	Hyperglycemia, HTN, insomnia, appetite increase	Refer to steroids handout		- 0.5 mg/kg/day 5-10 days **OR** 0.5 mg/kg/day 2-5 days followed by taper over 7-10 days
Methylprednisolone	Medrol				
Triamcinolone					

CHRONIC TX

Xanthine Oxidase Inhibitors					
Allopurinol	Zyloprim	Rash, Nausea, Gout attacks, diarrhea, LFTs ↑	Hepatotoxicity (in Asians HLA-B*5801test prior)	- Hypersensitivity (SJS/TEN) - Do not use for asymptomatic hyperuricemia - Didanosine - Mercaptopurine - Azathioprine - Peglitocase	- Lower dose w/ CKD - Take w/ FOOD - 1st 3-6 mons. use w/ Colchicine or NSAID - AVOID Antacids use - Allopurinol - Start 100mg titrate up to 300mg divide BID
Febuxostat	Uloric	Rash, nausea, arthralgia, LFTs ↑	Hepatotoxicity, Thrombosis, Gout attack		
Uriosurics					
Probenecid		Hypersensitivity Hemolytic Anemia	Warning: CrCl <30 Hemolytic anemia in G6PD deficiency	Do NOT with use ASA Blood dyscrasias, nephrolithiasis G6PD deficiency, child <2 yo	- Combination with Colchicine available (Col-Benemid) - Probenecid can be used to ↑ Beta-Lactam levels - Decrease clearance of ASA, PCNs, cephalosporins, carbapenems. - Decreases efficacy of Loop diuretics while increasing toxicity.
Lesinurad	Zurampic	SCr ↑, renal failure, nephrolithiasis, HA	Acute Renal failure	CrCl <30, ESRD, Dialysis, Kidney Transplant	- Take QAM w/ XOI + FOOD + H2O
Recombinant Uriocase					
Pegloticase	Krystexxa	AB formation, gout flare, infusion rxn, nausea, skin probs	Anaphylaxis – (pre-medicate w/ Anti-histamines & Steroids.)	G6PD deficiency	- Injection ONLY - Give NSAID or Colchicine 1 week prior to infusion for 6 months. - NEVER use w/ Allopurinol or Febuxostat
Rasburicase	Elitek	Edema, HA, anxiety, rash, NV, ab pain, diarrhea, constipation	Anaphylaxis	**ONLY USED FOR: Tumor Lysis Syndrome**	- Injection ONLY - PT's at risk for TLS should receive IV hydration - Monitor CBC - Life-threatening complication of Chemo-Tx or Cancer. Cells lyse open and purines are released quickly converting to uric Acid, aka "Acute Gout" attack causing electrolyte abnormalities.

MOTION SICKNESS

Signs & Symptoms	NON-PHARM Tx:	DRUG Tx:	
1. Nausea 2. Dizziness 3. Fatigue	1. Sea-Band (acupuncture) 2. Ginger Tea 3. Peppermint	1. Transderm Scop 2. Meclizine	3. Diphenhydramine (Benadryl) 4. Promethazine (not for children) 5. Cyclizine (Marezine)

Anti-Histamine/Anti-Cholinergic MOST commonly prescribed — NOT more effective than OTC					
GENERIC	**BRAND**	**ADRs**	**BBW**	**CONTRAINDICATION**	**NOTES**
Scopolamine 3-Day Patch	**Transderm Scop**	Dry mouth CNS effects (drowsy, dizzy, confusion) Eyes Stinging Pupil Dilation Risk of IOP Tachycardia (rare)		Belladonna Allergy Angle Closure Glaucoma	Applied behind EAR Lasts 3 days.

Anti-Histamine					
GENERIC	**BRAND**	**ADRs**	**BBW**	**CONTRAINDICATION**	**NOTES**
Meclizine	Dramamine Bonine Day-Less Drowsy Motion Time Travel Sickness	Sedation Dry mouth Dry/Blurry Vision Tachycardia	WARNING: CNS Depression Impairment Worsens BPH Sx Increase IOP		Oral agents must be taken 30 - 60 mins prior.

TRANSDERM SCOP – Counseling Instructions

1. Apply to clean, dry, hairless area behind the ear.
2. Press firmly for at least 30 seconds to seal edges of patch.
3. Apply 4 hrs. before needed effect
4. Wash hands w/ soap before & after. (Avoid Eyes)
5. Renew patch only every 3 days & only one at a time.
6. Causes drowsiness so avoid ETOH.
7. Remove patch before MRI.

ERECTILE DYSFUNCTION

Most commonly caused by reduced blood flow to penis. Common in CVD such as HTN, Atherosclerosis, or Diabetes.

Psychological Causes	NON-PHARM Tx	DRUG Tx:	Drugs Causing ED
• Depression • Stress • Spinal cord injury • Stroke	1. Weight Loss 2. Quit smoking/ETOH 3. Yohimbe 4. L-Arginine 5. Panax Ginseng	• 1st Line = PDE-5 inhibitors • 2nd Line = Alprostadil	SSRIs/SNRIs Beta-Blockers Clonidine 1st Gen Anti-Psychotics • (Haloperidol, Fluphenazine, Chlorpromazine, Risperidone, Paliperidone) BPH Meds • Finasteride, Dutasteride, Silodosin

PDE-5 Inhibitors
Release NO → cGMP increase → Smooth muscle relaxation → Increase BF to penis.

GENERIC	BRAND	ADRs	BBW	CONTRAINDICATION	NOTES
Sildenafil	Viagra Revatio (for PAH)	**HA/Dizzy** **Flushing** **Dyspepsia** Blurred vision Tinnitus Photosensitivity Epistaxis Diarrhea Myalgia/Back pain • mostly Cialis	WARNING: Color discrimination Hearing/Vision loss Hypotension Priapism Chest Pain - Refer to PCP	Use w/ Nitrates or Riociguat **<u>Viagra/Cialis</u>** 50% dose reduction if: • ≥ 65 yo • Using Alpha-Blocker (HypoTN) • Using CYP3A4 inhibitor • Severe Renal/Liver Dx	Start 50mg 1hr before sex.
Tadalafil	Cialis Adcirca (for PAH)				Daily 2.5-5 mg PRN 5-20 mg
Avanafil	Stendra				
Vardenafil	Levitra Staxyn ODT				

Prostaglandin E1 - vasodilator that allows blood to flow

GENERIC	BRAND	ADRs	BBW	CONTRAINDICATION	NOTES
Alprostadil - (Injections)	Caverject Edex	Penile pain Priapism HA/Dizzy		Penile implants Penile abnormalities	Must refrigerate
Alprostadil - (Urethral Pellets)	Muse			Conditions that predispose to priapism (sickle-cell anemia, myeloma, leukemia)	

5-HT1A agonist/5-HT2A antagonist - does NOT enhance sexual performance

GENERIC	BRAND	ADRs	BBW	CONTRAINDICATION	NOTES
Flibanserin	Addyi	Dizzy Somnolence Nausea Fatigue Dry mouth Insomnia	• ETOH causes Hypotension + Syncope. • AVOID CYP3A4 inhibitors • Hepatic impairment	ETOH Pregnancy	• For premenopausal women ONLY • REMS Program • Treatment for hypo-active sexual desire disorder (HSDD): ○ Low sexual desire that is not caused by health condition or drugs.

BENIGN PROSTATE HYPERPLASIA

General Information	Signs & Symptoms (LUTS)	Drugs that Worsen BPH	AUA Guidelines for Tx
• Enlarged gland leads to Lower urinary tract Sx (LUTS) • Bladder outlet obstruction (BOO) + contractions lead to freq. urination. • DRE - Digital Rectal exam • Study urinalysis + Prostate specific antigen (PSA) • NOT associated with prostate cancer • Sx are similar to prostate cancer • UTI infections are uncommon	Hesitancy Intermittency Weak stream of urine Urgency Leaking/Dribbling Incomplete emptying Frequency Nocturia	Anticholinergic medications Antihistamines Caffeine Decongestants Diuretics Testosterone products SNRIs TCA's Phenothiazines	• Depends on severity of Sx. • No natural product recs. 1. Alpha-blockers 2. 5α-reductase inhibitors a. Do NOT use in BPH w/o enlargement. 3. Tolterodine optional 4. PDE-5 inhibitors

α-blockers - relax smooth muscle leading to improved urinary flow

GENERIC	BRAND	ADRs	BBW	CONTRAINDICATION	NOTES	COUNSELING
Terazosin (Non-selective)		Dizziness/HA Fatigue Abnormal Ejaculation Fluid retention Rhinitis	Orthostatic hypotension Syncope Floppy Iris Syndrome Priapism Angina	Silodosin/Alfuzosin + CYP3A4 Hepatic imp. (Child-Pugh C) Renal imp.	• Non-selective α-blockers must be titrated • Usually taken at bedtime to avoid first dose effect of orthostatic HTN.	• Alone or combo w/ 5-alpha • 1st Line for Mod-Sev Sx. • Non-selective = More side Fx. • Caution w/ PDE-5 inhibitors (BP) • Alpha-Blockers do NOT shrink prostate or alter PSA levels. • Counseling: 1. Caution standing up 2. CNS Fx 3. Avoid ETOH
Doxazosin (Non-selective)	Cardura					
Tamsulosin (Selective Alpha-1A Blocker)	Flomax				0.4mg 30 min after same meal each day.	
Alfuzosin (Selective Alpha-1A Blocker)	Uroxatral				Do NOT use if risk for QT Prolongation.	
Silodosin (Selective Alpha-1A Blocker)	Rapaflo				Can cause retrograde ejaculation (reduced or NO semen)	

5α-reductase inhibitors - blocks conversion of Testosterone → DHT

GENERIC	BRAND	ADRs	BBW	CONTRAINDICATION	NOTES	COUNSELING
Finasteride	Proscar	Impotence Libido Ejaculation disturbance Breast enlargement/tender	Increase risk of Prostate cancer.	Women of child-bearing age Pregnancy Children	• Pregnant women should not handle/take. • Shrink prostate + ↓PSA level • Do NOT use Proscar in a PT using Propecia for hair loss.	Only used in BPH + enlargement
Dutasteride	Avodart					

PDE-5 inhibitors

GENERIC	BRAND	ADRs	BBW	CONTRAINDICATION	NOTES	COUNSELING
Tadalafil	Cialis Adcirca	HA/Dizzy Flushing Dyspepsia Blurred vision Myalgia Diarrhea	Color discrimination Hearing loss Vision loss Hypotension Priapism Chest pain	Do NOT use w/ nitrates or Riociguat	5mg daily same meal.	

OVERACTIVE BLADDER

General Information	NON-PHARM Tx	DRUG Tx:	How to Minimize Dry Mouth Sx
• Urinary urgency w/ or w/o incontinence (lacking control). • Increased frequency + nocturia • M3-Muscarinic receptors via ACH trigger stimulation of detrusor muscles → involuntary contractions. • 1st Line Tx = Behavioral therapy	**Non-Drug Tx is 1st line** 1. Bladder training 2. Kegel exercises 3. Dietary changes 4. Weight loss	**Drug Tx is 2nd line** **Combo w/ Non-Pharm tx.** 1. Anti-Cholinergics 2. B-3 Agonists 3. Onabotulinumtoxin-A	• Avoid combo Anti-cholinergics • Try Extended-Release • Try Oxybutynin gel/patch • Mirabegron - less dry mouth

Anticholinergics - block ACH binding to Muscarinic receptors. XR formulations are preferred (less dry mouth)					
GENERIC	**BRAND**	**ADRs**	**BBW**	**CONTRAINDICATION**	**NOTES**
Oxybutynin	Ditropan	Dizzy/Drowsy Xerostomia Constipation Blurred vision Urinary retention	Agitation Confusion Drowsiness Angioedema	Urinary retention Gastric retention Low gastric motility Narrow Angle Glaucoma	Oxybutynin Patch/Gel = Less dry mouth. Trospium XR = Empty Stomach
Oxybutynin Patch	Oxytrol				
Tolterodine	Detrol				
Trospium XR	Sanctura XR				
Solifenacin	Vesicare				
Darifenacin	Enablex				
Fesoterodine	Toviaz				

Beta-3 agonist - causes less dry mouth					
GENERIC	**BRAND**	**ADRs**	**BBW**	**CONTRAINDICATION**	**NOTES**
Mirabegron	Myrbetriq	HTN Nasopharyngitis UTI HA/Dizzy Constipation	Angioedema Urinary retention in BPH	Caution w/ Digoxin	

Inhibit ACH release – 3rd Line Tx					
GENERIC	**BRAND**	**ADRs**	**BBW**	**CONTRAINDICATION**	**NOTES**
Onabotulinumtoxin-A	Botox	UTI Urinary retention Dysuria	Swallowing trouble Breathing trouble	Infection at injection site	Prophylaxis with abx before admin.

Anti-Diuretic Hormone					
GENERIC	**BRAND**	**ADRs**	**BBW**	**CONTRAINDICATION**	**NOTES**
Desmopressin	Noctiva DDAVP injection		Hyponatremia Nasal conditions	Risk for Hyponatremia Loop diuretics CKD SIADH Fluid retention	

SICKLE CELL ANEMIA

General Information	NON-PHARM Tx:	DRUG Tx:	Immunizations
• Inherited RBC genetic disorder (most common in Blacks) • PTs have abnormal hemoglobin called HgbS. • Give concave sickle shape of RBC shortening lifespan of RBCs to 10-20 days → anemia & fatigue. • PTs lack O2 transport & clumping in blood vessels. • **Sickle Cell Crises:** ○ Vascular occlusion leads to ischemia + O2-deprivation. ○ Vaso-occlusive Crisis (VOC) aka Acute Pain Crisis. ▪ Leads to pain in lower back, abdomen, chest, & extremities. • **Functional Asplenia:** ○ Decreased or absence of spleen function. ▪ Spleen becomes fibrotic & shrinks in size. ▪ PT unable to recycle RBCs & store/produce WBCs. • PTS are risk for Infections. Should get immunizations, ABX.	1. Blood Transfusions: a. GOAL Hgb = < 10 g/dL. b. Risk of Iron overload. 2. Chelation Therapy: a. Used to remove excess Iron. **Only cure is bone marrow transplant but risky + cost.**	1. Immunizations 2. ABX 3. Analgesics a. Mild-Mod Pain: i. Tx w/ NSAIDs or acetaminophen, rest, compresses. b. Severe Pain: i. IV Opioids ii. PT-Controlled Analgesia (PCA) 4. Chelation Tx 5. Hydroxyurea or L-Glutamine a. Reduce complications	1. Influenza Type B Vaccine (HiB) 2. Pneumococcal vaccine 3. Meningococcal vaccine.

Stimulates Hgb-F production					
GENERIC	**BRAND**	**ADRs**	**BBW**	**CONTRAINDICATION**	**NOTES**
Hydroxyurea	Droxia Hydrea	LFTs Uric Acid BUN/SCr N/V/D Mouth ulcers Anorexia Hyperpigmentation Atrophy of Skin/Nails Low Sperm count	Myelosuppression Leukemia/Skin cancer	Embryo-Fetal toxicity Avoid Live Vaccines Skin ulcers Pancreatitis Macrocytosis **Use Sun Screen to protect skin.**	• IND: ≥ 3 Mod-Sev Pain crises in 1 year • Contraception is required - During & up to 1 year after • Hazardous - Wash hands & wear Gloves • Supplement Folic Acid • Monitor: ○ CBC w/ Differential ○ ANC < 2000

Unknown					
GENERIC	**BRAND**	**ADRs**	**BBW**	**CONTRAINDICATION**	**NOTES**
L-Glutamine	Endari	Constipation Nausea HA Back/Extremity pain Cough			Mix each dose in 8 oz. of COLD or ROOM temp. beverage OR in 4-6 oz. of food.

BIPOLAR DISORDER

General Information

- Mood disorder w/ fluctuations from extreme sadness or hopelessness → abnormally elevated overexcitement or irritable mood called mania or hypomania.
- Each episode is a drastic change in mood/behavior.
- Bipolar PTs are more susceptible to Drug-Induced extrapyramidal symptoms (EPS) esp. with first generation antipsychotics

BIPOLAR 1:

- Severe Mania
- Intense Depression
- May be Psychotic/Delusional (may req. hospitalization)

BIPOLAR 2:

- Hypomania
- Does NOT affect social/work
- NO cause of psychosis
- Intense Depression
- PTs feel better during Mania so often misdiagnosed for only Depression during that phase.

Mania Diagnosis

- Abnormally elevated/irritable mood for 1 week OR any duration req. hospitalization.
- Depression
- Inflated Self-esteem
- Talkative
- One topic to next
- Easily distracted
- High risk activities

DRUG Tx:

1st line: SGAs are preferred for Tx of Bipolar disorders.

1. Toxicology should be performed if due to illicit drug use.
2. GOAL: to stabilize mood w/o inducing fluctuations.
3. Anti-Psychotics: only used if PT has psychosis.
4. Anti-Depressants: NOT recommended - induce mania
   a. ONLY given if PT is already on Mood Stabilizer

ACUTE Tx:

1st line for manic state

- Valproate + Anti-Psychotic
- Lithium + Anti-Psychotic

1st line for bipolar depression

- Lithium
- Lamotrigine

MAINTENANCE Tx:

Bipolar Depression:

- Lamotrigine

Bipolar Mania:

- Valproate
- Carbamazepine (Equetro)

Mania + Depression:

- Lithium +/- SGA

Mood Stabilizers

Treatment for both mania + depression

Lithium
Valproate
Lamotrigine

- NOT used for acute mania due to slow titration & severe rash.

Carbamazepine

Pregnancy

Avoid

- Valproate
  - Causes fetal syndrome
- Carbamazepine
  - Causes fetal syndrome
- Lithium
  - Causes abnormalities

SGAs = Preferred

Medication Guides

Anti-Depressants

- MedGuide for Suicide risk.

Anti-Psychotics

- MedGuide for Death risk in elderly PTs w/dementia-related psychosis

GENERIC	BRAND	ADRs	BBW	C/I	NOTES	DOSING
Lithium	Lithobid	GI upset • Nausea, Anorexia, Ab-pain Cognitive Fx Cogwheel Rigidity Tremor Weight gain Polyuria/Polydipsia Hypothyroidism	Lithium toxicity ↑Risk of Serotonin Syndrome • SSRIs/SNRIs • Triptans • Linezolid ↑Risk of Neurotoxicity (Ataxia, tremor, nausea) • Non-DHP CCBs • Phenytoin • Carbamazepine	• Mild-Mod Renal Imp. (Lithium is 100% renally cleared)	INITIATION: 1. Titrate slowly → QHS 2. Take w/ FOOD 3. Drink plenty of FLUIDS Factors affecting concentration **↑Lithium levels** • ↓ sodium intake • ACEi/ARBs • NSAIDs (use ASA) **↓Lithium levels** • ↑ sodium Intake • Caffeine • Theophylline	Dose Correctly: • 5 mL Solution = 8 mEq • 300mg Tab/Cap = 8 mEq Therapeutic Range: 0.6 - 1.2

ANXIETY

General Information	NON-PHARM Tx:	DRUG Tx:		Benzodiazepines
1. Continuous + Severe amount of great distress, fear, & worry. 2. Inability to focus at school/work. 3. Harmful to relationships. **DSM-5 Classifcation of Major Types of Anxiety:** General Anxiety Disorder (GAD) Panic Disorder (PD) Social Anxiety Disorder (SAD) Obsessive Compulsive Disorder (OCD) Post-Traumatic Stress Disorder (PTSD)	Cognitive Behavioral Tx (CBT) AVOID Drug-induced Anxiety • Albuterol • Anti-Psychotics • Bupropion • Caffeine • Decongestants (PSE) • Illicit Drugs • Steroids • Stimulants • Levothyroxine • Theophylline	**1st line = SSRI or SNRI** • Escitalopram • Fluoxetine • Paroxetine • Sertraline • Duloxetine • Venlafaxine XR 1. Start at 1/2 initial dose 2. Slowly Titrate 3. Take 4-wks for relief	**2nd line:** • Buspirone ○ takes 2-4 wks • Amitriptyline (Elavil) • Imipramine (Tofranil) • Nortriptyline (Pamelor) • Hydroxyzine (Vistaril) ○ Sedating Anti-histamine ○ NOT used long-term • Pregabalin (Lyrica) ○ C5 - Tx anxiety + neuropathy • Propranolol (Inderal)	**Metabolism + Safety** • Lorazepam • Oxazepam • Temazepam "L-O-T" are less harmful for PTs w/ Liver impairment since metabolized to inactive compounds (Glucuronides) 1. Used short-term & fast relief. 2. Used for acute-anxiety. 3. D/C after 1-2 wks. 4. ANTI-DOTE = Flumazenil

GENERIC	BRAND	ADRs	BBW	CONTRAINDICATIONS	NOTES
Buspirone		Nausea/Headache Dizziness Drowsiness	• MAOi w/in 14 days • Avoid Serotonergic Meds (Serotonin Syndrome)		

Benzodiazepines (C4)					
GENERIC	**BRAND**	**ADRs**	**BBW**	**CONTRAINDICATION**	**NOTES**
Lorazepam	Ativan	Somnolence Dizziness Lightheadedness Weakness Ataxia	**BBW:** Respiratory Depression Coma/Death **WARNINGS:** • Dependence/Tolerance in chronic use so must taper off (if using > 10 days) • Amnesia • CNS depression • Abuse • > 65 yo: safety risks.	• Opioids • Pregnancy • AVOID other CNS Depressants **ALPRAZOLAM:** • C/I with Ketoconazole/Itraconazole (Strong CYP3A4)	**Diazepam:** • Lipophilic • Fast Onset/Long Half-life • High Abuse potential **Used for ETOH Withdrawal Sx:** • Lorazepam • Diazepam • Chlordiazepoxide
Alprazolam	Xanax				
Clonazepam	Klonopin				
Diazepam	Valium				
Oxazepam					
Chlordiazepoxide					
Clorazepate	Tranxene-T				
Temazepam	Restoril				**NOT FOR ANXIETY**

ALZHEIMER'S DISEASE

General Information	Signs & Symptoms	Drugs that WORSEN Dementia:	NON-PHARM Tx:	DRUG Tx:
• Cognitive decline → dementia w/ noticeable memory loss. • Tx does very little for neurotic plaques & tangles. • DIAGNOSIS: Mini-Mental State Exam (MMSE Score < 24) • ELDERLY PTs: ○ AVOID use of Anti-Cholinergics such as Diphenhydramine or Benztropine.	• Memory loss • Difficulty communicating • Inability to learn • Difficulty planning or organizing • Poor coordination/ motor fxn • Personality changes • Paranoia/agitation/ hallucination	• Anti-Histamines • Anti-Cholinergics • Anti-Emetics • Anti-Psychotics • Barbiturates • BZDs • Benztropine • Muscle Relaxants • Other CNS Depressants	1. Vitamin-E 2. Gingko Biloba (↑bleed risk) 3. Vitamin-D (helps memory) 4. Diet & Exercise	• ACH inhibitors - slows progression ○ Donepezil - Take at bedtime. ○ Memantine - Alone or Adjunct to other meds • Anti-Psychotics/Anti-Depressants may be used but risk of: ○ Death in elderly (Psychotics)

ACH Inhibitors - inhibit Acetylcholinesterase (↑ACH)					
GENERIC	**BRAND**	**ADRs**	**BBW**	**CONTRAINDICATIONS**	**NOTES**
Donepezil	Aricept	N/V/D Bradycardia Fainting Insomnia QT-Prolongation		• Avoid drugs that ↓ HR due to risk of dizziness/falls. • Avoid Anti-Cholinergics = ↓efficacy • Give Donepezil at NIGHT to ↓ nausea. (5 - 10 mg QHS)	Start at low dose → Titrate Recommended: • Exelon Patch or Donepezil ODT ○ ↓ GI side fx.
Donepezil + Memantine	Namzaric				
Rivastigmine	Exelon				
Galantamine	Razadyne				

NMDA Blocker					
GENERIC	**BRAND**	**ADRs**	**BBW**	**CONTRAINDICATION**	**NOTES**
Memantine	Namenda	Dizziness Headache Constipation			• Oral Solution available • ER Caps: Do not crush/chew • May sprinkle on applesauce

STEROIDS

General Information	Reduce Systemic Risks by	Medrol Dose-Pak Dosing	PO Dosing Equivalence
• Steroids have stronger anti-inflammatory ability than NSAIDs. • Adrenal Insufficiency: endogenous steroids that the adrenal gland is not producing. • Cortisol - may be replaced by any steroid. • Steroids must be TAPERED off. • Addison's disease - adrenal gland not making enough cortisol. ○ Opposite of Cushing's syndrome ○ Treat with fludrocortisone ▪ Replacement therapy to mimic Aldosterone (↑ mineralocorticoid activity to balance H20 + electrolytes.	• Every-Other-Day dosing • Taper Off • Use injections - drug stays local • Inhaled steroids - for asthma • Use low absorption • Lowest effective dose	**(21 x 4 mg Tabs)** • **DAY 1:** 2 before breakfast, 1 after lunch, 1 after dinner, 2 QHS • **DAY 2:** 1 before breakfast, 1 after lunch, 1 after dinner, 2 QHS • **DAY 3:** 1 before breakfast, 1 after lunch, 1 after dinner, 1 QHS • **DAY 4:** 1 before breakfast, 1 after lunch, 1 QHS • **DAY 5:** 1 before breakfast, 1 QHS • **DAY 6:** 1 before breakfast.	**Cortisone** 25 mg, **Hydrocortisone** 20 — Short-acting **Prednisone** 5, **Prednisolone** 5, **Methylprednisolone** 4, **Triamcinolone** 4 — Intermediate-acting **Dexamethasone** 0.75, **Betamethasone** 0.6 mg — Long-acting **C**ute **H**ot **P**harmacists & **P**hysicians **M**arry **T**ogether & **D**eliver **B**abies

Steroids - ↑Glucocorticoid activity and ↑anti-Inflammatory effect

GENERIC	BRAND	ADRs	BBW	CONTRAINDICATION	NOTES
Cortisone		**SHORT-TERM FX:** (<1 Month) ↑Appetite Weight Gain Fluid Retention Mood Swings Insomnia Indigestion Bitter Taste ↑BP ↑BG **LONG-TERM FX:** Refer to Cushing's syndrome	**WARNING:** Adrenal Suppression (HPA axis) Taper Off when use is >14 days	Live Vaccines Serious Systemic Infections	Strong Anti-Inflammatory effects • Cortisone = Pro-Drug of Cortisol • Prednisone - Pro-Drug of Prednisolone • Prednisolone used often for child Treatment Indications • Replacement therapy • Auto-Immune diseases • Post-Transplant • Asthma QD Dosing = Take 7am - 8am to mimic body cortisol release
Betamethasone	Celestone Soluspan Ready Sharp				
Dexamethasone	DexPak 6-10-13 Day Double Dex				
Hydrocortisone	Solu-Cortef Cortef				
Methylprednisolone	Medrol Solu-Medrol A-Methapred Depo-Medrol				
Prednisone	Deltasone				
Prednisolone	Millipred Orapred ODT Prediapred				
Triamcinolone	Kenalog				

Cushing's Syndrome	High Steroid Intake/Production SE		Key Concepts
• Adrenal gland produces too much cortisol, causing many side effects (refer to → box) • Exogenous Steroids in high doses may also increase cortisol ○ ↑Cortisol → Negative FB → ↓Cortisol • Ultimately causing HPA-axis Suppression	- GI Bleed/Ulcers - Growth Retardation - Glaucoma/Cataracts - Psychiatric Changes - Poor Bone Health - Pink-Purples Stretch Marks - Moon Face - Acne	- Buffalo Hump - Diabetes - Dysmenorrhea - Hypothyroidism - Muscle Wasting - Infection - Impaired Wound Heal - Women - Hirsutism	• Immunosuppressed dosing = **≥2 mg/kg/day** OR **≥20 mg/day** of Prednisone or Prednisone-EQ for >2 weeks. • Immunosuppressed PT cannot get Live Vaccines & there is ↑ risk of Infxn. • Taper off to reduce HPA-axis Suppression and ↓ chance of Addison's disease • Common Method = ↓ dose by 10 - 20% every few days (7 - 14 days)

THYROID DISORDERS

General Information

Thyroid Pathophysiology
- T3 = Triiodothyronine
- T4 = Thyroxine

1. Thyroid cells absorb Iodine/Tyrosine to make hormones.
2. Thyroid produces T3/T4.
3. TSH secreted by Pituitary gland in Hypothalamus.
4. ↑ T4 = ↓ TSH (Negative FB loop)
5. Active Form = Free T4 (FT4)

Drugs that ↓ Thyroid hormone levels

Ca+, Fe+, Mg+, Al+3 (antacids)
Multivitamins - ADEK, Folate
Cholestyramine
Orlistat (Xenical, Alli)
Sevelamer
Sucralfate
Kayexalate
Estrogen
SSRIs
BB's
Amiodarone

Levothyroxine Colors

25 mcg = Orange	100 mcg = Yellow	150 mcg - Blue
50 mcg = White	112 mcg = Rose	175 mcg - Lilac
75 mcg = Violet	125 mcg = Brown	200 mcg = Pink
88 mcg = Olive	137 mcg = Turquoise	300 mcg - Green

Orangutans Will Vomit On You Right Before They Become Large Proud Giants

Counseling

1. Different brands are not equal.
2. Safe in pregnancy + breastfeeding.
3. Take w/ H2O 60 mins before breakfast or 3 hrs after dinner.

Hypothyroidism = ↓T4/↑TSH (low Metabolism)

Signs/Sx:
Fatigue
Weight gain
Cold intolerance
Muscle cramps
Constipation
Myalgias
Bradycardia
Coarse/Loss of hair
Memory impairment
Menorrhagia
Goiter - due to iodine

Myxedema Coma:
Occurs when pt is untreated for a long period of hypothyroidism. (Life-threatening emergency)

Treatment:
1. Levothyroxine (T4) = 1st Line
2. Consistent preparation minimizing variability.
3. PTs who "don't feel right" may use other formulations.

Hashimoto's Disease:
- Autoimmune - AB's attack Thyroid
- Caused by conditions + drugs:
  - Amiodarone
  - Carbamazepine
  - Eslicarbazepine
  - Oxcarbazepine
  - Interferon
  - Lithium
  - Phenytoin
  - Tyrosine Kinase inhibitors (esp. Sunitinib)

Diagnosis:
↓ FT4 | Normal = 0.9-2.3
↑ TSH | Normal = 0.3-3.0
Screen at age 60

Monitor:
Check TSH q4-6 wks til levels are normal then q4-6 months.
Too high dose leads to Afib + fractures.

Pregnancy:
causes low birth weight, loss of pregnancy, premature birth, lower IQ in children

Thyroid Replacement

GENERIC	BRAND	ADRs	BBW	C/I	NOTES	DOSING
Levothyroxine (T4)	Synthroid Levoxyl Tirosint Unithroid	Euthyroid = No Sx **↑↑↑ dose = hyperthyroidism sx.**	Not used for obesity/weight reduction	- Acute MI - Thyrotoxicosis - Uncorrected Adrenal insufficiency	- Decrease dose in CVD - IV to PO ratio = 0.75-1 - Levothyroxine is safe & recommended in pregnancy (requiring 30-50% increase in dose)	- Full Dose = 1.6 mcg/kg/day (IBW) for healthy, young-middle age (<50) - CAD = 12.5-25 mcg/day
Thyroid Desiccated USP (T3/T4)	Armour Thyroid					
Liothyronine (T3)	Cytomel Triostat					
Liotrix (T3/T4)	Thyrolar					

Hyperthyroidism = ↑T4/↓TSH

Signs/Sx:
Heat intolerance
Weight loss or gain
Tremor
Palpitations/Tachycardia
Freq bowel movements
Agitation, nervous, anxiety
Fatigue/Muscle weakness
Insomnia
Thinning hair
Goiter (possible)
Exophthalmos
Light/Absent menses

Treatment:
1. BB's for Sx control
2. PTU or Methimazole (temporary til surgery)
3. RAI-131(Takes 1-3 months of HIGHER doses to control Sx but later must REDUCE dose to avoid hypothyroidism)

Overview:
- Over-Production of thyroid hormones.
- Mostly caused by Grave's disease (autoimmune in women 30-40's that stimulates too much T4)
- Drugs that cause hyperthyroidism:
  - iodine
  - amiodarone
  - Interferon
- Thyroid Storm - life-threatening emergency that is treated w/ PTU.
  - Fever (> 103), tachycardia, tachypnea, dehydration, sweating, agitation, delirium, psychosis, coma.

Anti-Thyroid Medications

GENERIC	BRAND	ADRs	BBW	C/I	NOTES
Beta-Blockers		Used for Sx control: Palpitations, tremors, tachycardia.			
Propylthiouracil	PTU	GI upset HA Rash Hepatitis Agranulocytosis (rare)	Liver failure (PTU)		Pregnancy: 1st trimester = use PTU 2nd/3rd trimester = Methimazole
Methimazole	Tapazole				
Potassium Iodide	Lugol's Solution	Rash Metallic taste GI upset		Hypersensitivity to Iodine	Temporarily inhibits secretion of T4/T3 for only weeks
Saturated K+ Iodide	SSKI Thyroshield				

TRAVELER'S DISEASES

Traveler's Diarrhea (TD)

General Information

1. Travelers should carry a list of all medical conditions & medications (Rx/OTC).
2. Pack any medical supplies on Carry-On luggage.
3. "YELLOW Book" has all CDC travel information.
4. Consider food/H2O, blood/body fluids, & insects for transmission.
5. Dysentery TD occurs if blood in stool - Worse Sx.
6. Mostly caused by Bacterial (E. coli).

Prevention

1. Cook it, peel it, or forget it!
2. Bismuth Subsalicylate (BSS)
   a. Pepto-Bismol
   b. Anti-Secretory Anti-Diarrheal
   c. S/E of black tongue/stool
   d. Caution: Reye's Syndrome
3. ABX only used for HIGH risk.

Treatment:

1. Hydrate (fluid/salt).
2. Loperamide (Imodium A-D)
   a. Primary Tx for acute diarrhea.
   b. Decreases freq/urgency
3. Macrolides, FQ's, or Rifaximin preferred.
4. Azithromycin = Severe TD or Dysentery TD.

Prophylaxis	1. **BSS** - tabs/liquid dose **525-1050 mg QID** w/ **FOOD** & **QHS.** 2. **Rifaximin** - preferred for pt at high risk.	
Mild TD	• **Loperamide PRN (NO ABX)**	**Dose:** **4mg after 1st loose stool.** **2mg after for each loose stool.** **MAX Dose = 16 mg/day** **MAX Use = 2 days.**
Moderate TD	• **Loperamide PRN +/- ABX**	
Severe/Dysentery TD	• **Azithromycin 1000mg x 1 dose +/- Loperamide**	

Malaria

General Information

- Plasmodium Vivax is most common cause and resistant to drugs.
- P. Faciparum - MOST deadly!
- Prophylaxis is recommended and Tx varies depending on region.
- Malaria drugs cause nausea & GI stress so need to be taken w/ FOOD + H2O/Milk.

Insect Bites Transmitting Disease:

- Vector is usually Mosquitoes: Japanese Encephalitis, Yellow Fever, Dengue, Malaria, Zika virus.
- Protect from insect bites is key.
- DEET 20-50% is the active ingredient in insect repellant.
- Permethrin is used to Tx clothing.

	GENERIC	BRAND	WHEN TO USE	CONTRAINDICATION	NOTES
QUICK START Px: Initiate 1-2 days prior to travel.	Atovaquone/Proguanil	Malarone	Take daily & STOP 1 week after travel	Pregnancy Breastfeeding	ALL do not use in Pregnancy.
	Doxycycline	Doryx Vibramycin	Take daily & STOP 4 weeks after travel	Child < 8 yo Pregnancy Breastfeeding *Photosensitivity	
	Primaquine		Take daily & STOP 1 week after travel	G6PD - Deficiency Pregnancy Breastfeeding	
ADVANCE Start Px: Start 1-2 weeks prior to travel.	Chloroquine		Taken WEEKLY	ADRs: Skin Rxns Visual changes Blue/Grey skin pigmentation	- Safe in children/pregnancy - Choice depends on regional resistance
	Mefloquine	Lariam		Psychiatric conditions Seizures Arrhythmias	

Other Diseases

Cholera:
- Vibrio Cholera
- Food/H2O contaminants
- Vaccine: Vaxchora (PO, Live)

Polio:
CDC recommends 1-Lifetime Booster dose 4 wks before travel for adults.

Hepatitis-B:
1. Spread by Blood/Body fluids
2. Avoid high risk behaviors.
3. Dose vaccine 6 months to complete. Administer as MANY doses as possible before travel.

Meningococcal Meningitis:
1. Neiserria meningitis
2. Fever, HA, stiff neck Sx req UREGENT care.
3. Spread by Respiratory secretions.
4. HAJJ & Umrah pilgrimages from Saudi Arabia to req vaccines during travel.

Air Travel
Compression stockings

Acute Mountain Sickness
Need Acetazolamide (CI = Sulfa allergy)

Typhoid Fever:
1. Caused by Salmonella Typhi.
2. Spread by contaminated Feces.
3. Vaccines: Vivotif or Typhim Vi. (IM). Give ≥2 wks before travel.

Dengue Fever:
- NO vaccine available
- AVOID Mosquitoes is crucial.

Japanese Encephalitis:
- AVOID Mosquitoes
- Vaccine: Ixiaro

Zika Virus:
1. Transmitted by Mosquitoes, sexual contact, or blood transfusions.
2. Causes Microcephaly
3. NO Vaccine
4. Use contraception w/ sex.

Yellow Fever:
- ASA/NSAIDs = Bleeding do NOT use.
- LIVE Vaccine: YF-VAX.
- Given certificate for vaccination & must be completed w/in 10 days before arrival.
- C/I = Egg Allergy.

WEIGHT LOSS

AACE/ACE Guidelines = Exercise > 150 mins/wk for 3-5 days/wk + resistance training.

General Information	Drugs that cause Weight Gain	Drugs that cause Weight Loss	Bariatric Surgery	Caution/Avoid
• Meds not appropriate for small weight loss. • ONLY indicated for BMI ≥30 OR BMI ≥27 +1 weight-related condition (DLD, HTN, and DM). • Rx meds only used adjunct to diet plan + exercise. • Drugs are selected based on PT's comorbid conditions. • Older stimulant agents are ONLY used short-term to jump-start a diet. • Newer agents are used Long-term for maintenance. (Qsymia, Belviq, Contrave, Saxenda) • Weight loss drugs should be D/C if they don't produce at least 5% weight loss at 12 weeks.	• Insulin • Sulfonylureas • Glitazones • Anti-Psychotics • Steroids • Mirtazapine (Remeron) • Dronabinol (Marinol) • Megestrol (Megace) • Condition – Hypothyroidism	• ADHD Stimulants (Ritalin, Concerta, Adderall, Vyvanse) • Exenatide (Byetta/Bydureon) • Liraglutide (Victoza) • Saxenda (at high dose) • Topiramate (Topamax)	• BMI > 40 or >30 + condition • Nutrient Deficiency: ○ Ca^+ Citrate is preferred. ○ Vit-B12 & Iron supplements ○ Iron/Ca^+ 2 hrs. before or 4 hrs. after antacids. ○ Supplement Vit-ADEK for LIFE. • Medication Concerns: • May need to crush, liquid, or transdermal for 2 months post-surgery • PT's may need Ursodiol for gallstones. • AVOID GI irritants (NSAIDs + Bisphosphonates)	• Pregnancy ○ Avoid all WL drugs • Depression ○ Contrave (contains bupropion) • Hypertension ○ Qsymia, Contrave • Opioid Use ○ Contrave • Seizures ○ Qsymia, Contrave

GENERIC	BRAND	MOA	ADRs	BBW	CONTRAINDICATION	NOTES
Phentermine/Topiramate	Qsymia (C4)	- Phentermine - Sympathomimetic stimulant amphetamine like ↑ NE. - Topiramate - GABA/Glutamate.	Anxiety Depression Suicidal thoughts Tachycardia		- Hyperthyroidism - Glaucoma - MAOi in 14 days Pregnancy	Taper off due to seizure.
Naltrexone/Buproprion	Contrave	Decreases cravings/appetite.	N/V/C/HA Dizziness Dry Mouth	- NOT approved for MDD - Suicidal ideation - Caution in psychiatric/seizures disorders. - Can ↑ HR/BP	- Opioid use - Uncontrolled HTN - Seizure disorder - Bulimia/Anorexia - Bupropion-containing products	Naltrexone - blocks opioids + buprenorphine → blocking analgesia.
Lorcaserin	Belviq (C4)	Serotonin 5HT-2C agonist (increasing satiety)	Dizzy/HA Fatigue Nausea Dry mouth	Serotonin Syndrome w/ other serotonergic agents	Pregnancy	
Liraglutide	Saxenda	GLP-1 agonist	Nausea/Vomiting Diarrhea/Constipation Dizzy/HA/Fatigue	- Family Hx of Medullary Thyroid Carcinoma (MTC) - Hypoglycemia - ↑ HR	Pregnancy	- Victoza - for Diabetes. - Saxenda - REMS for MTC + Pancreatitis
Phentermine (C4)	Adipex-P	Sympathomimetic Stimulants (Similar to amphetamines, increasing NE)	Tachycardia Agitation ↑ BP	Adipex-P: Avoid in Pregnancy	- AVOID in HTN, PAH, Hyperthyroidism, or Glaucoma. - MAOi in 14 days	- Stimulants are used for 12 weeks to jump start a diet. - Monitor - HR/BP
Diethylproprion (C4)	Tenuate					
Phendimetrazine (C3)						
Benzphetamine (C3)	Regimex					
Orlistat Rx	Xenical	Lipase inhibitor - decreases fat absorption by 30%	Gas w/ Discharge Fecal urgency Fatty stool	- Liver damage - Cholelithiasis - Kidney Stones - Hypoglycemia	- Pregnancy - Cholelithiasis - Malabsorption Syndrome	- Take Vitamin ADEK + Beta-Carotene at bedtime or separate by 2 hours. - Do NOT use Cyclosporine or separate by 3 hrs. - Separate Levothyroxine by 4 hrs.
Orlistat OTC	Alli					

MIGRAINE

Chronic headaches causing pain for hours or days.

General Information	Diagnosis	Treatment		
• Most cause N/V, sensitivity to light, or auras of flashing lights, blind spots or tingling in arms or legs. • May be due to NT's, especially Serotonin - 5HT • Identify and avoid migraine "triggers" (Female hormonal changes, food, stress, sleep pattern, weather) • Women who have migraine w/ aura = ↑ Stroke risk. ○ Should AVOID Estrogen-containing contraceptives.	≥5 attacks not attributed to other disorders with: • Last 4-72 hrs. + recur sporadically. • ≥2 characteristics: Unilateral location, pulsating, mod-severe pain, aggravated by physical activity. • If N/V, photophobia, or phonophobia occurs.	**NON-DRUG Tx:** 1. Avoid Triggers 2. Stress management 3. Massage 4. Spinal manipulation 5. Cold compress/Ice pack 6. Acupuncture **Natural Products:** • Caffeine combo w/ ASA or Tylenol • Butterbur • CoQ-10 • Feverfew • Magnesium Peppermint • Riboflavin	**Prophylactic Tx:** Used to decrease frequency of migraines. Consider 2-6 month use if: 1. Using Acute Tx ≥2 days/wk OR ≥3x/month. 2. If migraines decrease QOL. 3. If acute tx are ineffective or contraindicated. Ex. Beta-Blockers, Topiramate Valproic Acid, TCAs, Venlafaxine, or Botox (chronic migraines only)	**RX Options:** - Triptans (5HT) - Ergotamine - Butalbital (barbiturate used for combo meds) ○ NOT recommended due to abuse/dependency & need to be tapered off due to worsening of headaches. ○ Fioricet: Acetaminophen/Butalbital/Caffeine ○ Fiorinal: ASA/Butalbital/Caffeine ○ BOTH are used in combo w/ Codeine = C3 - Opioids - Diclofenac **OTC Tx:** - Acetaminophen - Advil (Ibuprofen) - Excedrin (ASA + APAP + Caffeine) - Aleve (Naproxen) • Avoid Opioid, Tramadol, and Tapentadol for last line. • Some PTs benefit from OTC products + Triptan • Medication "Overuse" (MOH) = REBOUND Headaches: ○ Headaches that occur >10-15 days/month ○ MUST limit medication 2-3x/wk. & taper off Butalbital.

GENERIC	BRAND	MOA	ADRs	BBW	CONTRAINDICATION	NOTES
Sumatriptan	Imitrex Onzetra Xsail Zembrace SymTouch Sumavel	**5HT-1 Agonist** Vasoconstriction of cranial blood vessels	- Paresthesia (tingling/numbness) - Hot/Cold sensations - Dizzy/Somnolence - Dry mouth - Nausea - Chest pain/tightness - Triptan Sensations (Chest/Neck pressure or heaviness)	- ↑ BP - Cardiac/CV events - Arrhythmias - Serotonin Syndrome - Medication Overuse HA (MOH) - Seizures (Sumatriptan ONLY) - Caution in Hepatic/Renal imp	- CV Disease (Stroke/TIA) - Uncontrolled HTN - Ischemic Heart Dx - Peripher Vascular Dx Use w/in 24 hrs. of other Triptan or Ergotamine. AVOID Maxalt-ODT in Phenylketonuria (PKU)	ALL injections are SQ (Lateral Thigh or Upper Arm) Protect from light.
Sumatriptan + Naproxen (Child >12 yo)	Treximet					1. 1st Line for Acute Tx 2. MUST take at 1st sign of Migraine 3. ODTs, nasal spray, injections are useful if PT has nausea. 4. Imitrex/Zomig Nasal spray (Do NOT Prime) 5. Frovatriptan/Naratriptan = Long-Acting but SLOWER onset. 6. D/I: SSRI, SNRI, MAOi, or CYP3A4 inhbitors.
Almotriptan (Tab, Child >12 yo)	Axert					
Eletriptan	Relpax					
Frovatriptan	Frova					
Naratriptan	Amerge					
Rizatriptan (Child 6-17 yo)	Maxalt					
Zolmitriptan (Nasal Spray, Child >12 yo)	Zomig					

GENERIC	BRAND	MOA	ADRs	BBW	CONTRAINDICATION	NOTES
Dihydroergotamine (Injection, Nasal Spray)	DHE 45 Migranal	**Ergotamines:** ONLY for PTs who get no relief from Triptans.	**Nasal Spray:** Rhinitis Nausea/Dizziness Dysguesia (altered taste)	Life-threaten Peripheral Ischemia Avoid CYP3A4 inhibitors CV/Cerebral Vascular events	Uncontrolled HTN Ischemic Heart Dx Pregnancy Strong CYP3A4 inhibitors	- Must PRIME 4x for nasal spray. - Do NOT inhale deeply - Let drug absorb into nose skin.
Ergotamine + Caffeine (Tablet, Suppository)	Cafergot Migergot					

GENERIC	BRAND	MOA	ADRs	BBW	CONTRAINDICATION	NOTES
Propanolol	Inderal LA	**Beta-Blockers**	Propranolol = MOST Lipophilic			Propranolol + Timolol: Non-selective so avoid in COPD/Asthma
Metoprolol	Lopressor Toprol XL					
Timolol						

GENERIC	BRAND	MOA	ADRs	BBW	CONTRAINDICATION	NOTES
Divalproex	Depakote Depakene Valproic Acid	**Anti-Epileptics**	Liver Toxicity Pancreatitis Weight Gain	Teratogenic Thrombocytopenia	Pregnancy	
Topiramate	Topamax Trokendi XR		Weight LOSS Parasthesia Cognitive Impairment		Pregnancy	

ATTENTION DEFICIT HYPERACTIVITY DISORDER

General Information	DSM-5 Diagnostic Criteria	DRUG Tx	Dosing Formulations	
• Chronic inattention, hyperactivity, & impulsivity. • Due to Dopamine + Norepinephrine. • **1st LINE Tx** = Cognitive Behavioral Tx (CBT) • **Non-Drug Tx** = Fish Oils	**INATTENTION** = >6 Sx **HYPER-ACTIVITY & IMPULSIVE** = >6 Sx **3 Conditions MUST Be Met:** 1. Sx must be present before age 12 yo. 2. Sx must be present in 2 or more settings. 3. Sx interfere w/ functioning.	**1st Line: Stimulants (C2)** Concerta, Daytrana Patch, Ritalin, Vyvanse, Adderall • Dose in QAM • Titrate up every 7 days • No need to taper **2nd Line or Suspected Abuse Risk: Non-stimulants** Strattera **ADJUNCT/Alone:** Intuniv, Kapvay **Sleep Aids:** Clonidine, Diphenhydramine	**LA Suspensions:** • Quillivant XR ○ Shake bottle 10 secs. ○ Push plunger down. ○ Measure to white end. • Dyanavel XR **Chewable Tabs:** • Quillichew ER • Vyvanse **ODT:** • Contempla XR • Adzenys XR	**Sprinkle Capsules:** • Focalin XR • Ritalin LA • Aptensio XR • Adderall XR • When SPRINKLING capsules into food, use small amount of food, do not chew the beads, do not warm the food, take immediately. **PATCH:** • Daytrana

GENERIC	BRAND	MOA	ADRs	BBW	CONTRAINDICATION	NOTES
Methylphenidate IR	Ritalin Methylin	**Methylphenidate Stimulants**	Nausea Insomnia Loss of appetite Stunt Growth Headache Irritability Blurry Vision Dry mouth Cardiac/CNS Sx	**BBW:** Abuse/Dependence **WARNING:** • Caution in Psychiatric conditions: Exacerbate Suicidal thoughts, Mania in Bipolar PTs, Seizures. • Serotonin Syndrome • Certain food coloring or preservatives may worsen hyperactive behavior.	• MAOi in 14 Days • HF/Recent MI/Arrhythmias ○ PTs do NOT use if Heart problems. • Mod-Sev HTN • Ritalin = Pheochromocytoma **Check:** • Contact PCP if chest pain/SOB • Check BP + HR regularly • Consider ECG prior to Tx • Check Ht/Wt regularly (esp in children)	
Methylphenidate ER	Ritalin LA Methylin ER Aptensio XR Metadate ER Concerta (OROS Tab)					Concerta: Start 18-36 mg QAM (Ghost Tablet)
Methylphenidate XR	Quillichew ER Quillivant XR Contempla XR-ODT					
Methylphenidate (Transdermal Patch)	Daytrana					Apply 2 hrs before desired Fx & remove after 9 hrs. Alternate Hips daily.
Dexmethylphenidate	Focalin					
Amphetamine	Adzenys XR-ODT Dyanavel XR Evekeo	**Amphetamines:** (Approved in Child ≥ 3 yo)				AVOID acidic FOOD/JUICE or Vitamin-C
Dextro-amphetamine + Amphetamine IR	Adderall					
Dextro-amphetamine + Amphetamine ER	Adderal XR MyDayis					
Lisdexamfetamine	Vyvanse	**Prodrug of Dextroamphetamine**				• Can MIX: H20 | Yogurt | Orange Juice • Take Right Away • Low Abuse Potential: Fx muted if injected/snorted.
Methamphetamine	Desoxyn	**Methamphetamine**				

GENERIC	BRAND	MOA	ADRs	BBW	CONTRAINDICATION	NOTES
Atomoxetine	Straterra	**SNRI**	Headache Insomnia Somnolence HTN Tachycardia Dry mouth Nausea Abdominal Pain ↓ Appetite Sex Dysfxn/ED/Libido	Suicidal Ideation	Aggressive behavior Psychotic or Manic Sx Hepatotoxicity CVD Events	Do NOT open capsules
Guanfacine ER	Intuniv	**Central Alpha-2 Agonists**	Somnolence Dizziness/Headache ↓ BP: Bradycardia/Hypotension		**WARNING:** Sedation, drowsiness dose-dependent CVD Fx	Do NOT discontinue abruptly - Must TAPER off Guanfacine = rare SKIN rash.
Clonidine ER	Kapvay					

PARKINSON'S DISEASE

General Information	Symptoms	DRUG Tx:	
• Brain disorder where Substantia Nigra is damaged → Failure to produce Dopamine. • Disease will continue to progress despite tx w/ extended "OFF" periods ○ Disease worsens before next dose. • Depression - use Secondary Amines ○ ex. Desipramine or Nortriptyline ▪ ↑ Efficacy ↓ S/E SSRIs: used but contribute to Tremor + Serotonin Syndrome • Psychosis: use Quetiapine or Clozapine or Pimavanserin (Nuplazid) ○ New approved drug for hallucinations or delusions. • **Drugs that WORSEN Parkinson's Dx**: Prochlorperazine, Phenothiazines, Haloperidol, Risperidone or SGAs, Metoclopramide	**MOTOR Sx: "TRAP" Sx** Bradykinesia (slow move) Akinesia (lack of move) Shaking/Tremors Leg/Trunk Rigidity Postural Instability **Additional Sx:** Small/Cramped Handwriting Bent over body Shuffling walk Muffled Speech or Drooling Depression/Anxiety	**1st LINE = Replace DOPAMINE:** 1. Give DA-Precursors 2. Give DA-Agonists 3. Other Rx to control Sx. (ex. Tremors) Amantidine = Treat Tremors MAO-B inhibitors Catecholo-Methyltransferase (COMT) inhibitors • Also blocks Levodopa metabolism. • C/I with Dopamine drugs. **NOT Recommended:** Bromocriptine	**MOST Effective = Levodopa = Prodrug** • Give w/ Carbidopa to prevent peripheral metabolism of Levodopa. • Important to give RIGHT AMOUNT of Carbidopa = **70-100mg QD** to block metabolism w/o causing excess S/E • ELDERLY: initial Tx should be Carbidopa/Levodopa • YOUNG: Usually give Dopamine-agonists to limit "OFF" periods & dyskinesia. • Tremor dominant: Tx w/ Central-Acting Anti-Cholinergic • BEERS: Avoid in Elderly due to S/E.

GENERIC	BRAND	MOA	ADRs	BBW	C/I	NOTES
Carbidopa/Levodopa	Sinemet Rytary Duopa	**Levodopa** DA Precursor **Carbidopa** inhibit Decarboxylase	Nausea/Dizziness Orthostasis Dyskinesias Dystonias Brown/Black/Dark urine, saliva, sweat Unusual Sexual urges Priapism **Coombs Test:** D/C due to Hemolysis	Long-term use can lead to response fluctuations + dyskinesia		• Titrate Cautiously • CR-Tab may cut in ½ • Must separate from Iron products.

GENERIC	BRAND	MOA	ADRs	BBW	C/I	NOTES
Pramipexole	Mirapex	**Dopamine-Agonist**	Somnolence Daytime sleep attack Nausea/Dizziness Orthostasis Hallucinations Dyskinesia **Patch:** may cause Skin-site rxns			
Ropinirole	Requip					
Rotigotine	Neupro					1. Apply QD same time each day. 2. Do NOT apply to same site for 14days. 3. No Heat source over patch. 4. Remove patch before MRI. 5. Avoid in SULFITE allergies.
Apomorphine	Apokyn	**DA INJECTION** "Rescue" agent for "OFF" period	Severe N/V Hypotension		5HT-3 Antagonist (Ondansetron due to hypotension)	**CAUTION** Dose written in mL NOT mg.

GENERIC	BRAND	MOA	ADRs	BBW	C/I	NOTES
Entacapone	Comtan	**COMT inhibitor** Inhibit COMT to prevent conversion of Levodopa.	Similar S/E to Levodopa			• Give 200mg w/ EACH dose of Carbidopa/Levodopa. • ↓ Levodopa dose by10-30% when giving COMT inhibitor.
Entacapone + Levodopa/Carbidopa	Stelvo					
Tolcapone	Tasmar					
Amantadine		**Block DA-Reuptake**	Dizziness	Toxic Delirium w/ Renal imp.	Livedo Reticularis - cutaneous reddening skin rxn.	
Selegeline	Eldepryl Zelapar Emsam	**MAO-B inhibitors**		Serotonin Syndrome HTN CNS Depression	Other MAOi Linezolid Opioid/TCA SNRIs	Xadago = Severe Hepatic Imp.
Rasagiline	Azilect					
Safinamide	Xadago					
Benztropine	Cogentin	**Anti-Cholinergic/Histamine**	↑↑ Anti-Cholinergic effects			Used primarily for Tremors
Trihexphenidyl						
Droxidopa	Northera	**Alpha+Beta agonist**	Syncope/Headache Falls			Used for Neurogenic Hypotension

SLEEP DISORDERS

Insomnia

General Information

1. Difficulty initiating sleep or sleep latency
2. Non-Drug Tx:
   a. Includes Cognitive Behavior Tx (CBT) & Sleep Hygiene.
   b. Natural products such as St. John's Wort & Chamomile tea
3. Drug Tx:
   a. Do NOT use OTC products long-term (Ex. Diphenhydramine or Doxylamine)
   b. Different drugs for sleep onset vs sleep maintenance.
   c. Non-BZDs preferred long-term
      i. Limit BZDs to 7-10 days
4. NOT Recommended: Diphenhydramine, Melatonin, Tiagabine, Trazodone, & Valerian

Sleep Hygiene Methods

1. Keep bedroom dark, quiet, comfortable.
2. Keep regular sleep schedule.
3. Avoid daytime naps even after poor night of sleep (limit 30 min.)
4. Reserve bedroom for sleep appropriate activities.
5. Turn clock face away to minimize anxiety to fall sleep.
6. Get up do something to take mind off sleeping.
7. Establish pre-bedtime ritual to condition for sleep.
8. Relax before sleep w/ soft music, reading, stretching.
9. Avoid exercise before bedtime.
10. No heavy meals before bed or caffeine in afternoon.

Sleep ONSET:

Eszopiclone
Ramelteon
Temazepam
Triazolam
Zaleplon
Zolpidem

Sleep MAINTENANCE:

Doxepin
Suvorexant
Eszopiclone
Temazepam
Zolpidem

Drugs WORSEN Insomnia:

ETOH/Caffeine
Appetite Suppressants
Buproprion
Decongestants
Fluoxetine
MAO-B inhibitors
Steroids
Stimulants
Drugs causing Nocturia/Urinary retention

GENERIC	BRAND	MOA	ADRs	BBW	C/I	NOTES
Zolpidem	Ambien Zolpimist Edluar SL Intermezzo SL	**Non-BZD GABA agonist (C4)**	Somnolence Dizziness Ataxia Parasomnias (abnormal sleep movements)	CNS Depression Next-Day impairment Respiratory Depression Potential Abuse/Dependence		1st LINE
Zaleplon	Sonata					
Eszopiclone	Lunesta					
GENERIC	**BRAND**	**MOA**	**ADRs**	**BBW**	**C/I**	**NOTES**
Suvorexant	Belsomra	**Orexin-Receptor Antagonist (C4)**	Somnolence Dizziness/HA Abnormal Dreams		Narcolepsy	
Ramelteon	Rozerem	**Melatonin Agonist**	Somnolence Dizziness			Do NOT take w/ FATTY food
Tasimelteon	Hetlioz		Headache Abnormal Dreams			Takes weeks to affect
Doxepin	Silenor	**Anti-Depressant**				
Diphenhydramine	Benadryl	**Anti-Histamines**	Sedation Tolerance after 10 days Anti-Cholinergic effects (Dry mouth, urinary retention, BPH, blurry vision, constipation)		BPH & Glaucoma	
Doxylamine	Unisom					
Lorazepam	Ativan	**BZDs: C4** Potentiate GABA				BEERs Criteria - Avoid in > 65 yo
Temazepam	Restoril					
Quazepam	Doral					
Triazolam	Halcion					
Estazolam						
Flurazepam						

Restless Leg Syndrome

- "Creeping" sensation or urge to move lower legs.
- Worsens at night and relieved by movement.
- Due to Dopamine imbalance
- **Primary Tx = DA-agonist**

Dopamine-Agonist:

- Pramipexole (Mirapex)
- Ropinirole (Requip)
  IR Formulations - Take 1-3 hrs. before bedtime.
- Rotigotine (Neupro) - Patch applied daily. Do NOT use same site for 14 days.
- Gabapentin (Horizant): Req reduced dose if CrCl <62

ALL cause orthostasis + somnolence (dose-related)

- Titrate
- Monitor: Psychiatric hallucination or abnormal dreams.

Narcolepsy

- Excessive daytime sleepiness w/ Cataplexy (sudden loss of muscle tone) + sleep paralysis.
- PT's fall asleep anywhere during day & have trouble sleeping at night.
- May also be Tx w/ ADHD stimulant

GENERIC	BRAND	MOA	ADRs	BBW	C/I	NOTES
Modafinil Armodafinil	Provigil Nuvigil	Stimulants	Headache/Dizziness Anxiety/Agitation Risk of severe Rash			Med Guides: Life-threatening risk of severe rash.
Sodium Oxybate	Xyrem		Dizzy/Somnolence	CNS Depressant	ETOH Sedating agents	- Contains high Sodium - REMS Program - "Date-Rape" drug GHB - Indication for narcolepsy and cataplexy

EPILEPSY

General Information	Status Epilepticus (SE)	NON-PHARM:	Drugs/Conditions Lowering Seizure Threshold	Anti-Epileptic Drugs (AEDs)	AEDs w/ Most DDI
• Diagnosis = Electro-Encephalogram (EEG) • Focal Seizure: start on 1-side of the brain & spread. • Focal Aware Seizure: no loss of consciousness (Simple Partial) • Focal Seizure Impaired Awareness: loss of consciousness (Complex Partial Seizure) • Generalized Seizure: start on both sides of the brain. • Absence Seizure: present as "staring spells"	• Seizure lasting >5 mins ○ Initial 5 - 20 mins: ▪ Initial Tx = IV Lorazepam (Ativan) • NO IV Access = IM Midazolam (Versed) • NO Hospital: Diazepam rectal gel (Diastat AcuDial) ○ Phase 2 Tx (20 - 40 mins): ▪ IV Fosphenytoin ▪ Valproic Acid ▪ Levetiracetam ▪ Phenobarbital	Ketogenic Diet may be used in Refractory Seizures	Anti-Psychotics Anti-Virals Buproprion Carbapenems (Imipenem esp) Cephalosporins ETOH Withdrawal Lithium Lindane Mefloquine Meperidine Metoclopramide PCNs FQ's Infection & Fever Theophylline Tramadol Varenicline	• Selection is PT-specific w/ seizure type, age, pregnancy, S/E. • ALL AEDs cause CNS Depression. • Consider other formulations for kids w/ difficulty swallowing. • AEDs cause bone-loss + increase fracture risk. • Supplement PTs w/ Ca+ & Vitamin-D. • AEDs have many drug interactions. • Many AEDs are teratogenic & ↓ Oral Contraceptive efficacy. • Use Non-Hormonal Contraceptives • Dosage adjustment is required to maintain Tx levels & safety. • ALL AEDs require MEDGUIDE: Suicide, Teratogenic, SJS/TEN. • **Chronic Seizure Management:** ○ AVOID meds that lower seizure threshold. ○ NEVER stop AEDs abruptly.	Carbamazepine Oxcarbamazepine Phenytoin Fosphenytoin Phenobarbital Primidone Topiramate (> 200mg/day) Valproic Acid ↑ Lamotrigine levels

GENERIC	BRAND	MOA	ADRs	BBW	C/I	NOTES
Levetiracetam	Keppra	**Ca^+ Blocker + ↑GABA**	Irritability Dizziness Weakness Asthenia	WARNING: Psychiatric Rxns - Psychotic Sx Somnolence, Fatigue		- NO significant Drug Interactions - IV:PO = 1:1
Lamotrigine	Lamictal Chewable, ODT, Tab	**Na^+ Blocker**	Rash N/V Somnolence Dizzy	Serious Skin Rxn: SJS/TEN		- ↑Lamotrigine levels = Valproic Acid = Use Low-dose (BLUE) - ↓Lamotrigine levels = Carbamazepine, Phenytoin, Phenobarbital, Primidone, Rifampin, Navir (PI's), Oral Contraceptives - Use Higher Dose = GREEN - Standard Dose Kit = ORANGE
Carbamazepine	Tegretol Chew Tab, Caps	**Na^+ Blocker** GOAL Level = 4-12 mcg/mL	N/V Dry Mouth Rash Photosensitivity Blurred Vision	Aplastic Anemia Agranulocytosis SJS/TEN (Asian HLA-B*1502 testing)	MAOi Nefazodone NNRTIs	- Monitor: CBC, Na^+, Platelets - CYP450 Inducer + Auto-Inducer - ↓ levels of drugs + itself - Use Non-Hormonal Contraceptive
Oxcarbamazepine	Trileptal	**Na^+/Ca^+ Blocker**	N/V Somnolence Dizzy Visual Disturbances	WARNING: HLA-B*1502 Test (Asians) Hyponatremia		Monitor: Na^+
Phenobarbital (C4)		**↑ GABA** GOAL = 20-40 mcg/mL Child = 15-40 mcg/mL	Physiological Dependence Tolerance Hangover Fx CNS Fx	WARNING: Habit Forming Respiratory Depression Fetal Harm SJS/TEN		- Monitor: LFTs, CBC w/ Diff - Use Non-Hormonal Contraceptive
Phenytoin Fosphenytoin (Pro-Drug)	Dilantin Dilantin Infatabs Phenytek Cerebyx	**Na^+ Blocker** - Fosphenytoin always dose in Phenytoin Equivalents (PE) - 1mg PE = 1 mg PHT - 1 mg PE = 1.5 Fos-PHT - IV:PO = 1:1	Nystagmus Ataxia Diplopia Blurred Vision Gingival Hyperplasia Hair Growth Hepatotoxicity	**IV PHT** = Do NOT exceed 50 mg/min **IV Fos-PHT** = NOT exceed 150 mg/min	HLA-B*1502 Test (Asians) Fetal Harm Blood Dyscrasias	- Highly Protein-Bound - Use Non-Hormonal Contraceptives - Monitor: LFTs, CBC w/ Diff - Trough Level = 10 - 20 mcg/mL - Free Trough = 1 - 2.5 mcg/mL
Topiramate	Topomax Trokendi	**Na^+ Blocker**	Weight Loss CNS Fx	WARNING: Metabolic Acidosis Oligohydrosis (less sweating) Nephrolithiasis Hyperammonemia Fetal Harm		- Monitor: - Electrolytes - Bicarbonate - Intra-Ocular Pressure
Lacosamide (C5)	Vimpat		N/V Diplopia Blurred Vision	WARNING: Prolong PR-Interval ↑ Arrhythmias		
Valproic Acid Divalproex	Depakene Depacon Depakote	**↑GABA** GOAL Level = 50-100 mcg/mL	Weight Gain CNS Fx Edema PCOS	Hepatic Failure Fetal Harm Neural Tube Defects	Hyperammonemia Thrombocytopenia Lamotrigine - Serious Rash	- Monitor: - LFTs @ Baseline + 6 months - CBC w/ Diff | Platelets

Other AEDs

Clobazam (Onfi) **Brivaracetam (Briviact)** **Perampanel (Fycompa)** **Rufinamide (Banzel)** **Tiagabine (Gabitril)**	**Eslicarbazepine (Aptiom)** Active metabolite of Oxcarbamazepine ↓ Na^+	**Felbamate (Felbatol)** BBW: Hepatic Failure Aplastic Anemia	**Vigabatrin (Sabril)** BBW: Permanent Vision Loss	**Ethosuximide (Zarontin)** Used for Absence seizure ADR: N/V, Ab pain, Weight Loss, Hiccups	**Gabapentin (Neurontin)** Peripheral Edema, Weight Gain, Mild Euphoria	**Zonisamide (Zonegran)** Sulfonamide Allergy Oligohydrosis Hyperthermia Nephrolithiasis	**Primidone (Mysoline)** Pro-Drug of Phenobarbital	**Pregabalin (Lyrica)** Peripheral Edema Weight Gain Mild Euphoria

STROKE (TIA) : CEREBROVASCULAR ACCIDENT (CVA)

General Information

- Blood flow is restricted to an area of the brain
- Early recognition of stroke is essential to survival.
- Call 911 immediately to save brain tissue.
- CT Scan to differentiate b/t Ischemic vs Hemorrhagic within 45 minutes of arrival to ER is crucial.
- Ischemic Stroke - caused by thrombus in the brain, aka **Non-Cardioembolic Stroke**.
- **Cardioembolic Stroke** - embolus in heart traveling to brain.
- **Hemorrhagic Stroke** - ICH or SAH or Subdural hematoma are bleeding events in the brain due to ruptured blood vessels.
  - Intracerebral Hemorrhage (ICH)
    - Is associated w/ increased intracranial pressure (ICP) and should be controlled.
    - Prophylactic Anti-Convulsants should NOT be used.
    - Tx = MANNITOL
  - Subarachnoid Hemorrhage (SAH)
    - Bleeding results from cerebral aneurysm & presents w/ severe headache. (Worst HA ever)
    - Prophylactic Anti-Convulsants may be considered.
    - Tx = NIMODIPINE
- AHA/ASA Guidelines
- Signs/Sx: ACT "FAST"
  - Face - ask person to smile. Is 1-side droopy or numb?
  - Arms - raise both arms. Does 1 arm shift down?
  - Speech - repeat a sentence. Are the words slurred?
  - Time - Call 911 if any of Sx.
- The 5 "SUDDENS":
  1. Sudden numbness/weakness in arms, face, or leg?
  2. Sudden confusion?
  3. Sudden trouble seeing?
  4. Sudden dizziness?
  5. Sudden severe headache?
- STROKE Risk Factors:
  - HTN - most important
  - AFIB
  - African American
  - Age > 55 yo
  - Atherosclerosis
  - Diabetes
  - Hx of Stroke/TIA
  - Smoking
  - Dyslipidemia
  - Sickle-Cell Dx
  - Patent Foramen Ovale (PFO)

Treatment

Goals:
1. Restore blood flow to brain.
2. Maintain normal intracranial pressure (ICP).
3. Control cerebral perfusion.
4. Manage blood pressure (BP)

Alteplase (TPA):
Only Fibrinolytic agent used to Tx acute ischemic stroke.
1. Must be given in 3 hrs of Sx.
2. May be given 4.5 hrs for some.
3. 60-minute door-to-needle time.
4. BP must be lowered to ≤185/110 mmHg to be given.
5. Anti-Coags should NOT be given w/in 24 hrs of Alteplase

Aspirin (ASA) Tx:
- ASA 325mg PO should be given in 24-48 hrs after stroke onset.
- Recommended for most PTs to prevent early recurrent stroke.
- NOT to be given w/in 24 hrs of Fibrinolytic Tx

HTN Management:
- BP meds given to lower BP prior to Alteplase use.
- If PT is not receiving Alteplase, BP meds should NOT be given unless it is > 220/120.

Secondary Prevention

1. HTN - Goal = < 140/90
2. Dyslipidemia
3. Diabetes
   a. BG should be maintained in the range of 140 -180 mg/dL.
4. Lifestyle Mods:
   a. Sodium = <2.4 grams or <1.5 grams to control BP.
   b. Physical Activity
   c. BMI = 18.5 - 24.9
   d. Waist = < 35 (F) / < 40 (M)
   e. Stroke due to AFIB - Anti-Coag
5. Anti-Platelet Tx:
   a. Recommended to reduce risk of recurrent stroke.
      i. ASA
      ii. Dipyridamole XR
      iii. Clopidogrel
   b. ASA + Clopidogrel DAPT should NOT be used longterm due to risk of hemorrhage

GENERIC	BRAND	MOA	ADRs	BBW	C/I	NOTES
Alteplase	Activase	**Fibrinolytic**		WARNING: Major bleeding (ICH) Angioedema Cholesterol embolization (rare)	Active bleed (ICH, SAH) Recent Trauma (3 months) Uncontrolled BP	- MUST keep BP ≤185/110 - 0.9 mg/kg (MAX = 90 mg - MUST exclude Intracranial Hemorrhage before use.
Aspirin (ASA)	Bayer Bufferin Ecotrin Ascriptin Durlaza	**<u>Irreversible COX-1/2 inhibitor</u>** ↓ Prostaglandins (PG) ↓ Thromboxane (TXA2) Anti-platelet Anti-Pyretic Analgesic Anti-Inflammatory	Dyspepsia Heartburn Nausea Tinnitus	WARNING: Bleeding GI Bleed/Ulcers Reye's Syndrome	NSAID or Salicylate allergy Asthma Children/Teens with Viral Infxn	Yosprala - is for PTs at risk of developing gastric ulcers associated w/ ASA
ASA + Omeprazole	Yosprala					
Dipyridamole XR + Aspirin	Aggrenox	**Inhibits Adenosine/cAMP ↑**	Headache Diarrhea	WARNING: Hypotension		
Clopidogrel	Plavix	**Irreversible P2Y12 inhibitor** (Pro-Drug)	GI Hemorrhage Hematoma Pruritus	Bleeding risk Stop 5 days before surgery <u>AVOID:</u> Omeprazole/Esomeprazole TTP	Serious Bleed	Used only if PT is allergic or contraindicated to ASA. Do NOT use DAPT + ASA long term.
Mannitol	Osmitrol	**Promotes Osmotic Diuresis to reduce ICP in ICH**	Fluid/Electrolyte Loss Dehydration Hyperosmolar Hyperkalemia Acidosis ↑ Osmolar GAP	WARNING: May accumulate in the brain causing Rebound ICP	Renal Disease Anuria Dehydration Heart Failure Pulmonary Edema/Congestion	
Nimodipine	Nymalize	**DHP-CCB**	Hypotension Bradycardia Headache Nausea Edema	Do NOT administer as IV or any Parental route = DEADLY.	Hypotension risk	- For ORAL use ONLY - If capsule cannot be swallowed, may be transferred to syringe but w/o needle and squirted into mouth.

ANGINA

General Information	Pathophysiology	Diagnosis	Risk Factors	Treatment	
• **Angina**: chest pain, pressure, or tightness caused by Ischemic heart muscles of coronary arteries. • **Stable Angina**: aka "Stable Ischemic Heart Dx" (SIHD), is a form of ASCVD w/ predictable chest pain triggered by exertion or emotional stress but relieved w/in mins by Nitroglycerin. • **Unstable Angina**: is a form of ACS, medical emergency that is NOT relieved by Nitroglycerin. • **Prinzmetal's Angina**: chest pain caused by vasospasms or coronary arteries, occurs at rest, and caused by illicit drug use such as Cocaine.	• Chest pain occurs due to imbalance of Myocardial O2 demand & blood flow supply. • SIHD is due to Atherosclerosis aka Coronary Artery Dx (CAD)	• Cardiac stress test performed. Making PT exercise to look for Sx or by using drugs like: Dipyridamole, Adenosine (AdenoScan), Regadenoson (LexiScan) or Dobutamine. • Evaluation: ○ Hx/Physical ○ CBC ○ CK-MB ○ Troponin I/T ○ aPTT, PT/INER ○ Lipid panel ○ ECG, Cardiac Stress Test, ○ Catheterization/Angiography • EVERYONE should get Pneumococcal Vaccine	HTN, smoking, DLD, DM, obesity, lack of exercise. **Non-Drug Tx:** - Eat healthy - BMI = 18.5-24.9 - Waist = 35/40 in. - Exercise - ETOH = ½ drinks	**Treatment Approach:** A. Antiplatelet/Anti-Anginal B. Beta-Blockers C. Cholesterol (Statins)/Smoke Cessation D. Diet / Diabetes E. Exercise / Education **Anti-Platelet Tx:** 1. Take w/o regard to meals 2. Helps to prevent clotting issues 3. Bleeding/Bruising is common 4. AVOID ETOH due to stomach bleeds	**Drug Tx:** 1. ASA 2. Clopidogrel (Plavix) if PT has ASA allergy or C/I. 3. DAPT = Plavix (75) + ASA (81) for 6 months after Stent or 12 months post-CABG **Anti-Anginal Tx:** - 1st LINE = Beta-Blockers - 2nd LINE = CCBs or LA Nitrates; Ranolazine ± BB **Immediate Relief** - Nitroglycerin (SL, powder, or Transublingual Spray)

Anti-platelet Agents

GENERIC	BRAND	MOA	ADRs	BBW	C/I	NOTES
Aspirin (ASA)	Bayer, Bufferin, Ecotrin + Omeprazole (Yosprala)	**<u>Irreversible COX 1-2</u>** Prostaglandin (PG)↓ Thromboxane A2 (TXA2)↓ (Anti-platelet, anti-pyretic, analgesic, anti-inflammatory properties)	Dyspepsia heartburn nausea Tinnitus	Warning: - Bleeding - AVOID ETOH and other blood thinners	- NSAID or ASA allergy - Asthma patients - Children w/ Viral infxn (Reye's Syndrome)	- Tx is for LIFE - Chewable ASA 325 is preferred - Durlaza/Yosprala NOT to be used when rapid onset is needed.
Clopidogrel	Plavix	**Irreversibly inhibits P2Y12-ADP preventing platelet activation & aggregation** (Prodrug)	GI hemorrhage hematoma pruritus	Test 2C19 genotype	Serious bleeding	- Bleeding risk- stop 5 days before surgery. - AVOID w/ Omeprazole or Esomeprazole. - TTP has been reported. - Prodrug converted to active metabolite by CYP2C19.

Anti-anginal Tx:

DRUG	TREATMENT PREFERENCE	HOW IT WORKS	ADRs	C/I	NOTES
Beta-Blockers	**1ST LINE drug in SIHD**	Reduces O2 demand, HR, contractility.	Warning: AVOID in Prinzmetal's angina		- Titrate to resting HR 55-65 BPM - Can be alone or in combo w/ CCBs, Nitrates, or Ranolazine.
Calcium Channel Blockers	<u>Preferred:</u> Prinzmetal's angina		Warning: AVOID short-acting CCB (Nifedipine IR)		- 2nd Line = if BB's C/I or Add-on Tx + BB - DHP's preferred as ADD-ON w/ BB
Ranolazine (Ranexa)		Inhibits Na^+ current & Ca^+ to decrease O2 demand	Dizzy HA Constipation Nausea	Warning: QT Prolongation Liver cirrhosis CYP3A4 inhibitor/inducer	- Has NO effect on HR or BP - Limit dose to 500mg BID if taken w/ MOD CYP3A4 (Azole/Non-DHP CCB) - Can be used w/ other drugs - AVOID Grapefruit juice

Nitrates - AVOID Sildenafil, Tadalifil, Vardenafil, Avanafil, and Riociguat. Flushing/HA lessens over time. AVOID getting up too fast

GENERIC	BRAND	MOA	ADRs	BBW	C/I	NOTES	COUNSELING
Nitroglycerin SL Tablet	Nitrostat	**Short-Acting NITRATES:** O2 demand ↓ O2 supply ↑ Preload ↓	Dizzy Lightheadedness Flushing Syncope	Warning: Hypotension HA Tachyphylaxis (tolerance) CAUTION w/ Antihypertensives	PDE-5 Inhibitors (AVOID for 12-48 hrs. after) or Riociguat Intracranial Pressure ↑	- Call 911 if chest pain does NOT go away after SL, Spray, or Powder. - Use PRN for immediate relief - Keep in OG glass amber vial.	1. Let dissolve under tongue or between cheek & gums/teeth. 2. Keep stored in glass amber vial at room temp.
Nitroglycerin TL Spray	NitroMist						1. Prime pump before use 2. Prime again if not used w/in 6 months. 3. Do NOT shake 4. Spray onto or under tongue w/o inhaling the spray
Nitroglycerin SL Powder	GoNitro						Dispense packet contents under tongue and let dissolve w/o swallowing.
Nitroglycerin Ointment	Nitro-BID	**Long-Acting NITRATES:** O2 demand ↓ O2 supply ↑ Preload ↓				- LA-Nitrates: ONLY used 2nd Line to ±BB - Req. 10-12 hr. nitrate-free period to reduce tolerance.	Can stain clothing.
Nitroglycerin Patch	Nitro-DUR						1. Apply to clean, dry, hairless skin on ANY AREA except below the knee. 2. Must have 12-14 hr. free period 3. Apply new patch to different area of skin. 4. Dispose by folding in half & discard away from children/pets.
Isosorbide Mononitrate	Monoket						
Isosorbide Dinitrate	Isordil Titradose/Dilatrate						

DEPRESSION

General Information	DSM-5 Criteria	Treatment	Drugs that Worsen Depression	Warnings
• Depression: aka "Major Depressive Disorder" (MDD) • Caused by imbalances of NTs: Glutumate, Acetylcholine, Dopamine, Norepinephrine, Epinephrine, mostly Serotonin. • Medication trial 6-8 wks. then switch in same class or combo w/ different class if there is no change. • MUST rule out Bi-Polar disorder before initiating Anti-Depressant Tx due to inducing mania or rapid-cycling. • Benzos should NOT be used alone in when Tx depression + anxiety as it leaves depression untreated. • Natural Products: St. John's Wort or SAMe (S-adenosyl-L-methionine may be helpful Tx of depression but should NOT be used w/ Serotonergic agents (Serotonin Syndrome). • Bereavement Period is ok for 6 months. • TSH levels can contribute to depression as well. • Sleep & appetite improve in 1st 4-6 wks so you usually see Benzo use. • May try different drugs w/in same class then try different class. • Paroxetine = most sedating, Escitalopram = least amount of drug interactions.	**DSM-5 Criteria:** req. ≥5 symptoms in same 2-wk period BUT must include depressed mood OR diminished interest/pleasure **DSM-5 Criteria:** • Mood - Depressed • Sleep - ↑/↓ • Interest/Pleasure - diminished • Guilt - feeling worthless • Energy - ↓ • Concentration - ↓ • Appetite - ↑/↓ • Psychomotor Agitation or Retardation • Suicidal Ideation • **M-SIG-E-CAPS** ○ ≥5 Sx in 2 wks	• 1st choice: start w/ agent based on S/E profile, safety, & PT-specific Sx. • 1st Line = SSRI, SNRI, Mirtazapine, or Bupropion is preferred. • AVOID: MAOi such as Phenelzine, Tranylcypromine, Isocarboxazid are all LAST LINE due to Serotonin Syndrome. • ALL Anti-Depressant must be tapered off for D/C except Fluoxetine, which self-tapers due to long half-life. • Tx-Resistant Depression: ○ Trial of 6-8 wks. to determine if no response then proceeds: 1. Dosage increase 2. Combo w/ agent of other MOA 3. Augment w/ Buspirone, Aripiprazole, Quetiapine XR, or Olanzapine + Fluoxetine (Symbyvax) 4. Recommended for augmentation is Lithium, Thyroid hormone, or Electroconvulsive Tx (ECT) • Depression + Pain: Duloxetine is indicated for both • Insomnia or Low-Body Weight: Mirtazapine S/E are beneficial	1. ADHD: Methylphenidate or Atomoxetine (Strattera) stimulants. 2. Analgesics: Indomethacin, Methadone, other Opioids. 3. Retrovirals: Efavirenz or Rilpivirine. 4. BP: Beta-blockers, Clonidine, Methyldopa, Procainamide, Reserpine. 5. Hormones: Contraceptives or Anabolic steroids. 6. Others: Systemic steroids, Cyclosporine, Isotretinoin, Interferons, Varenicline.	**BLACK-BOX WARNINGS:** • ALL anti-depressants carry BBW for increased suicidal ideation in child, teens, or young adults in the 1st few months of Tx or dose changed. **RISK OF SEIZURES:** • Bupropion is C/I ○ Do NOT exceed 450 mg dose **CARDIAC ISSUES:** • Avoid Citalopram/Escitalopram • Preferred: Sertraline **WEIGHT ISSUES:** • Avoid Mirtazapine if weight gain concerns • Use Bupropion for weight loss

GENERIC	BRAND	MOA	ADRs	BBW	C/I	NOTES
Fluoxetine (2D6/2C19 inhibitor)	Prozac	**SSRI's:** - Fluoxetine - Needs to be taken AM due to activation. - Others - Usually taken AM - Sedating - Take PM - ALL increase BLEEDING RISK: ○ Anti-Coags, Anti-Platelets, NSAIDs - ↓ Tamoxifen efficacy	Sexual/Erectile dysfunction ↓Libido, Ejaculation, Anorgasmia Somnolence Insomnia Nausea Dry mouth Diaphoresis Dizziness/Headache Tremor/Weakness SIADH/Hyponatremia (elderly) Restless Leg Syndrome Fall risk - caution in osteoporosis	**BBW:** Suicidal risk in child, teen, young adults. **WARNING:** QT-Prolongation	Concurrent use of MAOi, Linezolid, IV Methylene Blue Pregnancy – Brisdelle	- ALL req 2 week washout period between MAOi & SSRi. EXCEPT Fluoxetine - Long half-life → 5 week washout period. - Fluvoxamine has most drug interactions. - Switching Fluoxetine from daily to weekly dose must start 7 days after last daily dose. - QT-Prolong: Most in Citalopram & Escitalopram. (dose > 20/10) - Limit Citalopram dose < 40 mg or < 20 mg in elderly (> 60 yo)
Fluoxetine + Olanzapine	Symbyvax					
Paroxetine (2D6 inhibitor)	Paxil					
Fluvoxamine	Luvox					
Sertraline	Zoloft					
Citalopram	Celexa					
Escitalopram	Lexapro					
Vilazodone	Viibryd	**Combined SSRIs:** 5HT-1A agonist + SSRI	N/V/D ↓Libido	Suicidal risk AVOID in Hx of seizure	Use w/in 14 days of MAOi	- Take w/ FOOD - LESS sexual S/E
Vortioxetine	Tintellix		N/V/C	Suicidal risk	Use w/in 14 days of MAOi	
Venlafaxine	Effexor	**SNRI:** Serotonin + NE re-uptake inhibitor Bleeding Risks: Avoid Anti-Coags, Anti-platelets, NSAIDs	Similar S/E to SSRI + NE re-uptake: ↑ HR Dilated pupils Dry mouth ↑ BP risk: at higher doses.	Suicidal risk	Lethal MAOi washout period	- Additive QT-Prolong - Venlafaxine - Decreased Tamoxifen efficacy - AVOID Linezolid, methylene blue
Duloxetine	Cymbalta					
Desvenlafaxine	Pristiq Khedezla					
Levomalnicipran	Fetzima					
Amitriptyline	Elavil	**TCA's:** NE, 5HT, Ach, Histamine	Cardiotoxicity: QT-Prolong Orthostasis (Orthostatic HTN) Tachycardia Anti-Cholinergic Fx: (Dry mouth, blurred vision, urinary retention, constipation)	Suicidal risk	MAOi Linezolid Methylene Blue	Additive QT-Prolongation
Doxepin						
Nortriptyline	Pamelor					
Desipramine	Norpramin					
Maprotiline						
Clomipramine						
Trimipramine						
Isocarboxazid	Marplan	**MAOi**	Anti-Cholinergic Fx Orthostasis Sedation Sexual Dysfunction Weight Gain Insomnia/HA	Suicidal risk	CVD/CVA **2-Wk Washout Period with:** SSRI, SNRI, TCA, Bupropion, Linezolid, Methylene Blue **5-Wk** = Fluoxetine	- NOT commonly used - Lethal Drug-Drug + Drug-Food Rxns. - Hypertensive Crisis & Serotonin Sx.
Phenelzine	Nardil					
Tranylcypromine	Parnate					
Selegiline	Emsam (PATCH) Zelepar	**MAOi-B inhibitor**			Foods high in Tyramine	
Buproprion	Wellbutrin Zyban - smoke cessation Contrave = + Naltrexone Aplenzin Forfivo	**DA + NE re-uptake inhibitor:** 1. Avoid at bedtime. 2. Avoid in seizure, anorexia, and bulimia.	Dry mouth Insomnia Tremors Seizures (dose-related)	Suicidal risk	Seizure disorder Anorexia Bulimia	- Sexual Dysfxn is RARE - Do NOT use multiple formulation of this drug concurrently. - Decreases Tamoxifen efficacy
Mirtazapine	Remeron	**Miscellaneous:** Take ALL at BEDTIME	Sedation ↑ Appetite/Weight Gain	Suicidal risk Additive QT-Prolongation		AVOID: MAOi, SSRI
Trazodone	Oleptro Desyrel		Sedation Priapism			
Nefazodone					Hepatotoxicity	Rarely used due to Hepatotoxicity

Resistant Depression Tx						
GENERIC	**BRAND**	**MOA**	**ADRs**	**BBW**	**C/I**	**NOTES**
Aripiprazole	Abilify	**ADJUNCT Agents:** Used to augment after 2 failed trials	Anxiety, insomnia, constipation	Suicidal risk	Symbyvax: Caution w/ QT-Prolong	ALL cause Orthostasis
Olanzapine/Fluoxetine	Symbyvax		Sedation, weight gain, QT-Prolong			
Quetiapine	Seroquel		Sedation, weight gain			
Brexipiprazole	Rexulti		Weight Gain			

ANEMIA

General Information

- ↓ Hgb/Hct in immature RBCs, aka Reticulocytes.
- ↓ O2 carrying capacity in blood.
- Caused by nutritional deficiency (Iron, Folate, Vit-B12)
- Also caused by CKD or Malignancy.
- Chronic Anemia - less O2 leads to ischemia → organ damage → Tachycardia compensation → Heart Failure.

Signs & Symptoms

Fatigue/Weakness
SOB
Exercise Intolerance
HA/Dizzy
Anorexia
Pallor

% Elemental Iron (PO)

- Ferrous Gluconate 12%
- Ferrous Sulfate 20%
- Dried Ferrous Sulfate 30%
- Ferrous Fumurate 33%
- Carbonyl Iron 100%
- Polysaccharide Iron Complex 100%

Types of Anemia

- **APLASTIC Anemia:**
  - Bone marrow fails to make RBCs, WBCs, and Platelets.
  - Tx: Eltrombopag (Promacta) - increases Platelet count.
- **HEMOLYTIC Anemia:**
  - RBCs are destroyed before lifespan of 120 days.
  - Can be drug-induced
    - Beta-Lactamase inhibitors
    - Cephalosporin's
    - Isoniazid
    - Levodopa/Methyldopa
    - PCNs (esp. Piperacillin)
    - Platinum-Based Chemo Tx (Carbaplatin, Cisplatin)
  - Can be genetic (G6PD-deficiency)
    - Chloroquine
    - Dapsone
    - Methylene Blue
    - Nitrofurantoin
    - Quinidine
    - Quinine
    - Primaquine
    - Probenacid
    - Rasburicase
    - Ribavirin
    - Rifampin
    - Sulfonamides
  - Coombs Test - detects ABs.

- **Normocytic Anemia** = Normal Hgb | Normal MCV (80-100). Anemia of Chronic Kidney Dx (CKD)
  - Primarily due to deficiency in Erythropoietin (EPO)
  - EPO produced in kidneys & stimulates RBC production in bone marrow.
  - **Treatment:**
    1. Iron Therapy
    2. EPO Stimulating Agents (ESA) - maintain Hgb levels & reduce need for blood transfusions. Do NOT SHAKE vials or syringe or ESA's will not work. Rotate injection sites.
- **Macrocytic Anemia** = ↓ Hgb | ↑MCV (>100). **AKA Pernicious Anemia** - occurs due to lack of Intrinsic Factor. Caused by Vitamin-B12 or Folate deficiency, alcoholism, poor nutrition, GI disorders, long term use of (>2 yrs) Metformin, H2RAs, or PPIs.
  - **Vit-B12 Deficiency Anemia:**
    - Neurological dysfxn (may be irreversible), Peripheral Neuropathy, Visual disturbance, Psychiatric Sx
  - **Folic Acid Deficiency:**
    - Ulcerations of tongue, oral mucosa, skin, nails.
  - **Treatment:** 1st Line = Vitamin-B12 injections (Cyanocobalamin) & Folic Acid
- **Microcytic Anemia** = ↓ Hgb | ↑MCV (<80). Caused by Iron deficiency
  - **Iron-Deficiency Anemia:**
    - Glossitis, Koilonychias (thin/concave nails), Pica (craving non-foods like clay)
    - ↓Hgb (< 80); ↓RBC; ↓Iron; Ferritin, TSAT; ↑TIBC
    - **Treatment:** Oral Iron Therapy = 100-200mg Iron per day.
      - PARENTAL Iron Tx: is more effective (100% absorption). Leads to more S/E + cost.
    - PTs w/ CKD on Hemodialysis need IV iron.

GENERIC	BRAND	MOA	ADRs	BBW	C/I	NOTES
Ferrous Sulfate		**PO Elemental Iron**	Nausea Upset Stomach Constipation Dark/Tarry stools	Accidental overdose = FATAL in child. Call poison control center.	Hemolytic anemia Hemochromatosis Hemosiderosis	- Docusate for constipation. - ANTIDOTE = Deferoxamine (Desferal) - AVOID: H2RAs, PPIs, Antacids - SEPARATE: FQ's/Tetracyclines ABX, Bisphosphonates, Levothyroxine, Vitamin-C - Take Iron on an empty stomach (1 hr before or 2 hrs after). - Some may cause GI irritation. - All iron formulations are equal if dosed properly.
Dried Ferrous Sulfate						
Ferrous Fumurate						
Ferrous Gluconate						
Carbonyl Iron						
Polysaccharide Iron Complex						
Iron Dextran	INFED	**IV Iron Meds**	ALL Hypersensitivity Risk Hypo/Hypertension Muscle aches Tachycardia Chest pain Peripheral Edema	<u>Iron Dextran & Ferumoxytol</u> Have FATAL anaphylactic rxns. Must use TEST DOSE w/ Iron Dextran.		- Triferic is only indicated for PTs w/ CKD on Hemodialysis - Must add Bicarbonate concentrate to hemodialysate.
Sodium Ferric Gluconate	Ferrlecit					
Iron Sucrose	Venofer					
Ferumoxytol	Feraheme					
Ferric Carboxymaltose	Injectafer					
Ferric Pyrophosphate Citrate	Triferic					
Cyanocobalamin Vit-B12	B-12 Compliance Nascobal	**Vitamin-B12**	Rash Pain w/ Injection Peripheral Edema Polycythemia Vera	**WARNING:** Contains Al^{+} & Benzyl ETOH • May accumulate causing CNS + Bone toxicity if renally imp.	Hypersensitivity	
Folic Acid | Folate	FA-8					
Epoetin Alfa	Epogen Procrit	**EPO Stimulating Agents (ESA)**	Arthralgia/Bone pain N/V/HA Pruritus/Rash Cough/Dyspnea Edema Dizziness Injection site pain	**CKD:** ↑risk of death, CV events, Stroke if Hgb >11 g/dL. **Cancer:** Shortened overall survival. Increased Tumor progression or Tumor recurrence.	Uncontrolled HTN	- Monitor: Hgb, Hct, TSAT, serum Ferritin, BP - Do NOT shake vials/syringes - Use lowest effective dose to avoid need for Blood Transfusion. - NOT indicated for a CURE outcome - Initiate when Hgb <10 g/dL - ↓Dose/DC if Hgb >11 g/dL (for CKD or Hemodialysis) - Do NOT ↑ dose in less than Q4wks - Store ALL ESA in Fridge.
Darbepoetin	Aranesp					

ACUTE CORONARY SYNDROME

General Information

- Reduced blood flow → myocardial oxygen supply & demand imbalance.
- Caused by plaque buildup in arteries (Atherosclerosis).
  - Fatty streaks build up leading to clots or ischemia.
- NSTE-ACS: is Unstable Angina (UA) or NSTEMI.
- STEMI: relates to ST-elevation

	UA	NSTEMI	STEMI
Sx	Chest pain		
Cardiac Enzymes	-	+	+
ECG Changes	None/ transient ischemic changes ST depression / T-wave inversion		↑ ST-segment
Blockage	Partial blockage		Complete blockage

- Diagnosis:
  - 12-Lead ECG w/I 10 mins. of 1st medical contact.
  - PTs w/ MI need to be taken to hospital w/ PCI capability.
  - Cardiac enzymes - Troponin I & T are biomarkers for ACS.
    - Must have w/in 3-6 hrs. after Sx onset.
  - CK-MB & Myoglobin may also be used.

Signs & Symptoms

- Chest pain
- Pressure/chest tightness
- Dyspnea
- Diaphoresis
- Syncope
- Palpitations
- Pain may radiate to arms, back, neck or epigastric area.
- Sx can occur at rest w/ little exertion or caused by exercise or stress.

Risk Factors

1. Men >45, Women >55
2. Family Hx 1st degree - Men <55, Women <65
3. Smoking
4. HTN
5. Dyslipidemia
6. Diabetes
7. Chronic Angina
8. CAD
9. Sedentary/ETOH use

DRUG Tx:

MONA-GAP-BA

- **M**orphine
- **O**xygen
- **N**itrates
- **A**spirin
  - NEVER use NSAIDs other than ASA (in hospital setting)
- **G**P2B/3A Antagonists
- **A**nti-coagulants
  - LMWHs for NSTEMI
  - UFH or Bivalirudin for STEMI
  - Warfarin Use: May use lesser goal of 2-2.5. Use for shortest time possible.
    - PPI's should be given to all Pt w/ Hx of GI bleed on Triple ABX Tx.
- **P**2Y12 inhibitors
- **B**eta-blockers
  - IR Nifedipine NEVER used
- **A**CE inhibitors

ALL PTs should get HIGH INTENSITY STATIN

- NSTE-ACS: **MONA-GAP-BA +/- PCI**
- STEMI: **MONA-GAP-BA + PCI** or Fibrinolytic (PCI preferred)
  - Fibrinolytics used if PT isn't able to get PCI w/in 2 hours of 1st contact.
  - CABG surgery is also an option

Long-Term Management after ACS (2nd Prevention)

- ASA - 81mg QD for LIFE
- P2Y12 - Ticagrelor/Clopidogrel + ASA for 12 months
- PCI Patients - Prasugrel/Ticagrelor/Clopidogrel + ASA 12 mo.
- NTG - for LIFE (Spray or SL)
- Beta-Blocker - 3 years or LIFE (if HTN or HF)
  - O2, BP, HR, Ischemia ↓
  - PO Low dose Beta-1 Selective BB w/o ISA activity preferred & started w/I 24 hrs.
  - If BB is contraindicated - Use NON-DHP CCB (Verapamil or Diltiazem)
- ACEi/ARBs - for LIFE in all pts w/ LVEF <40%, HTN, DM, CKD
  - PO started w/in 24 hrs
- Statin - High ≥75 yo, Moderate <75 yo

GENERIC	BRAND	MOA	ADRs	BBW	C/I	NOTES
Morphine Sulfate		**Arterial/Venous dilation** → decreasing O2 demand	- Hypotension - Bradycardia - N/V - sedation - respiratory depression			- May be used w/ or w/o NTG - 2-5 mg IV Q5-30 min PRN
Oxygen						- Given if O2 saturation (SaO2) <90% or in resp. distress
Nitrates		**Dilate coronary arteries** 02 demand ↓ Preload ↓			SBP <90 mmHg HR <50 bpm Right Ventricle infarction	- NEVER use w/ PDE-5 inhibitor
Aspirin		**Irreversible COX-1/2 inhibitor** → inhibit TXA2				- NEVER use ER ASA products - Maintenance = 81-162 mg for LIFE - Non-enteric coated, chewable ASA (162-325mg) for ALL Pts
Abciximab	ReoPro	**GP2B/3A Antagonists** Blocks Fibrinogen → inhibit platelet aggregation	Bleeding Thrombocytopenia Hypotension		- Thrombocytopenia (Platelet <100,000) - Hx of bleeding/stroke - Uncontrolled HTN - Recent surgery/trauma	- NOT for medical management - If used in PCI must be given w/ Heparin - Abciximab must be FILTERED for reconstitution
Eptifibatide	Integrillin					
Tirofiban	Aggrastat					
Clopidogrel	Plavix	**Thienopyridines:** Pro-drugs that bind irreversibly to P2Y12 receptors Given + ASA = DAPT	Bleeding Hematoma Pruritus		Serious bleeding	- Stop 5 days before surgery. - AVOID Omeprazole, Esomeprazole (CYP2C19 inhibitors) - TTP has been reported - D/C = Clotting risk ↑
Prasugrel	Effient				Serious bleed Hx of TIA or Stroke	- Only given if PCI. - Keep in OG container. - NOT used for Pt > 75 yo
Ticagrelor	Brilinta	**P2Y12 inhibitors** Inhibit receptors → prevent platelet aggregation		- Serious bleeding - ASA >100 mg must AVOID Ticagrelor due decrease effectiveness.	Serious bleed Hx of ICH	- Stop 5 days before surgery. - NOT a Prodrug - Maintenance Dose = 90 mg BID for 1 year ○ After 1 year = 60 mg BID
Cangrelor	Kengreal					- Transition to Oral P2Y12: Ticagrelor 180 mg can be given during or after stopping Cangrelor infusion BUT Prasugrel 60 mg or Clopidogrel 600 mg only after Cangrelor NOT during
Alteplase	Activase	**Fibrinolytics:** Convert Plasminogen → Plasmin ONLY for STEMI	Bleeding Intracranial Hemorrhage Hypotension	- Only given if STEMI & unable to perform PCI in 90-120 min. - MUST be given w/in 30 min.	Hx of ICH Hx of bleeding/stroke Uncontrolled HTN Recent surgery/trauma	- Accelerated Infusion: 100 mg IV over 1.5 hrs
Tenecteplase	TNKase					- Door to needle <30 min.
Reteplase	Retavase					

CHRONIC OBSTRUCTIVE PULMONARY DISEASE

Persistent airflow limits NOT reversible unlike asthma

General Information

1. Mostly caused by Tobacco smoke (also other smoking).
2. Genetic Alpha-1 Anti-Trypsin deficiency (AATD) high risk
3. Chronic inflammation leads to lung damage.
4. **DIAGNOSIS:**
   a. Dyspnea
   b. Chronic cough/sputum
   c. Hx of exposure to smoke
   d. Spirometry required
      i. FEV1/FVC <0.70 = COPD
      ii. MUST differentiate from Asthma
5. **Key features:**
   a. Usually >40 YO
   b. >10 Smoking Hx
   c. Sputum production
   d. Unlikely allergies
   e. Persistent Sx
   f. Progressive Dx
   g. Exacerbations common
   h. 1st LINE = Bronchodilator
6. **COPD Inhaler Products:**
   a. Budesonide/Formoterol (Symbicort)
   b. Fluticasone/Salmeterol (Advair Diskus)
   c. Fluticasone/Vilanterol (Breo Ellipta)
   d. Glycopyrrolate/Formoterol (Bevespi Aerosphere)

Assessment

MUST assess Airflow limitation, Sx, Risks of exacerbation, comorbidities

Comorbidities

1. CVD
2. Osteoporosis
3. Diabetes
4. Depression/Anxiety
5. Muscle Dysfxn
6. Lung cancer

Poor control → mortality ↑

Symptom Assessment:

1. Chronic cough
2. Sputum
3. Dyspnea

Combined Assessment of COPD:

- mMRC: Dyspnea scale assess breathlessness 0-4 scale.
- CAT Score: Assess Sx 0-40 scale.
- Assess Sx + Risk of exacerbation to drive drug Tx.

≥ 2 or ≥ 1 lead to hospital admit	**C**	**D**
0 or 1 not hospital	**A**	**B**
Exacerbation Risk Hx	**CAT < 10** **mMRC > 10**	**CAT ≥ 10** **mMRC ≥ 2**

Degree of Post-Bronchodilator Airflow Limitation:		
GOLD 1	Mild	FEV1 ≥ 80% predicted
GOLD 2	Mod	50% ≤ FEV1 < 80%
GOLD 3	Severe	30% ≤ FEV1 < 50%
GOLD 4	Very Severe	FEV1 < 30%

Treatment

- **Non-Pharm Tx/Px:**
  - Smoking cessation (Only 1 to slow progression)
  - Flu vaccine/Pneumococcal vaccine
- **Drug Tx:**
  - ICS is NOT 1st line in COPD. Bronchodilators are 1st LINE.
  - COPD meds do NOT help declining lung fxn.
  - Meds decrease Sx, prevent complications/exacerbations.
  - SAMA/SABA = PRN. LAMA/LABA = Regular use
  - PO meds or ICS as mono Tx is not recommended.
  - Combining bronchodilators can decrease side effects

Drug Tx ABCD Scale for COPD

Patient Group	Initial Tx	Assessment	Tx Escalation
A	SABA or SAMA PRN LABA or LAMA	Sx NOT well controlled	Try different class of bronchodilator for Mono Tx
B	LABA or LAMA	Persistent Sx	LAMA + LABA
C	LAMA	Further Exacerbations	LAMA + LABA Alt: LABA + ICS
D	LABA + LAMA Alt: LABA + ICS	Persistent Sx + Exacerbations	LAMA + LABA + ICS

- **COPD Exacerbations:**
  - Lead to URTIs typically Tx w/ **SABA** +/- **SAMA** + **Steroid**
  - If sputum purulence, volume, increased dyspnea, or req. mechanical vent = ABX needed for 5-10 days.

GENERIC	BRAND	MOA	ADRs	BBW	C/I	NOTES
Ipratropium Bromide	Atrovent HFA	**SAMA:** Muscarinic antagonist Anti-Cholinergic Block Acetylcholine → Dilate bronchioles MDI or Nebulizer	1. Dry mouth 2. URTI 3. Cough 4. Bitter taste	**WARNING:** Caution in Myasthenia Gravis, Narrow-angle glaucoma, Urinary retention, BPH, bladder obstruction.		- AVOID spraying into Eyes. - Do NOT swallow capsules. - Monitor smoking status & COPD questionnaires
Ipratropium Bromide + Albuterol	Combivent Respimat					
Tiotropium	Spiriva Handihaler Spiriva Respimat	**LAMA:** DPI only				
Glycopyrrolate	Seebri Neohaler					
Umeclidinium	Incuse Ellipta					
Aclidinium	Turdoza Pressair					
Albuterol	ProAir HFA ProAir RespiClick Ventolin HFA Proventil HFA	**SABA:** Beta-2 agonist → Relax smooth muscle → Bronchodilation	Nervousness Tremor Tachycardia Palpitations Hyperglycemia K^+ ↓		**WARNING:** Caution w/ CVD, Glaucoma, Hyperthyroidism, Seizures, Diabetes	- MDI's (HFA): Shake well before use - Most Albuterol inhalers = 200 inhalations/canister - Except Ventolin HFA = 60 inhales - EIB: 2 inhales 5 min. before exercise
Levabuterol	Xopenex					
Racepinepherine OTC						
Salmeterol	Serevent Diskus (DPI)	**LABA:** MONO Tx ONLY (unlike Asthma which uses ICS)		↑ Risk of Asthma death	Status asthmaticus, acute asthma or COPD episodes.	- Do NOT swallow capsules - ONLY for PTs on ICS but not controlled - NEVER use MONO Tx in Asthma but ok for COPD
Formoterol	Perforomist					
Aformoterol	Brovana					
Indaceterol	Arcapta Neohaler					
Olodaterol	Striverdi Respimat					
Roflumilast	Daliresp	**PDE-4 inhibitor:** ↑ cAMP → inflammation ↓	Diarrhea Weight Loss Appetite decrease Nausea HA	**WARNING:** Psychiatric events (Behavior)	Mod-Sev Liver imp	- CYP3A4 substrate - AVOID Carbamazepine, Phenobarbital, Phenytoin, Rifampin, Erythromycin, Azoles, Fluvoxamine, and Cimetidine.

	Atrovent HFA:	Respimat Products:	Spiriva Handihaler:	Turdoza Pressair:	Ellipta Products:	Neohaler Products:
Counseling	1. No Shaking 2. Keep eyes closed while inhaling. 3. Inhale SLOW/DEEP. 4. Hold breath long/10 sec. 5. Wait 15 secs b/t inhales. 6. Prime 2x (3 days no use) 7. Clean w/ H2O & air dry WEEKLY	1. Turn clear base to click. 2. Open cap turn away & exhale. 3. Inhale SLOW/DEEP 4. Hold long/10 sec 5. Priming required 6. Clean w/ damp cloth or tissue weekly.	1. Place capsule from blister pack & insert into chamber. 2. Press Green button ONCE. 3. Turn away exhale. 4. Inhale DEEP/FULLY 5. Spiriva capsule VIBRATES 6. MUST inhale 2x to get full dose. 7. Clean H2O + Air dry	1. Ready when control window changes RED → GREEN. 2. Inhale til it CLICKS. 3. Inhale fully. 4. Hold breath & exhale through NOSE. 5. Check window for RED shows full dose was used.	1. Accidental double-dose is NOT possible. 2. Inhale but do NOT block AIR VENT. 3. Rinse mouth for ICS. 4. Cleaning NOT required.	1. Insert capsule from blister pack into chamber. 2. Turn away & exhale fully. 3. Capsule chamber must be empty of ALL POWDER. 4. Cleaning NOT required.

TRANSPLANT

General Information

- Prior to transplant crossmatching to assess compatibility for Human Leukocyte Antigen (HLA) & ABO Blood Group to prevent immune rejection.
- Auto-Rejection = requires Biopsy + High Dose Steroids
- Allograft - Transplant of organ/tissue from person to person.
- Isograft - Transplant from genetically identical twin.
- Autograft - Transplant from one site to another in same PT.

Blood Matching	
Type A	React w/ Type **B** | **AB**
Type B	React w/ Type **A** | **AB**
Type O only matches O	React w/ Type **A** | **B** | **AB**
Type AB	**Matches A | B | AB**

Complications

- Immunosuppressant Drugs
  - cause metabolic syndrome
- High risk for CVD
  - Control BP, BG, cholesterol, weight
- Cancer
  - High risk of skin cancer so sunscreen must be used.
- ALL drugs ↑ BP, BG, Lipids
- Use Daily Log:
  - Temp, Weight, BP, BG
- AVOID OTC | Herbal

- Tacrolimus & cyclosporine
  - Nephrotoxicity, diabetes, HTN
- MTOR inhibitors, cyclosporine = lipids

DRUG Tx:

INDUCTION Tx:

- Given before or at time of transplant to prevent acute rejection.

- Most Common Drug: Basiliximab - IL2 antagonist

- if High-Risk of Rejection: Antithymocyte globulin

MAINTENANCE Tx:

- 1st Line = Tacrolimus (CNI)
- 1st Line Anti-Proliferate Agent: Mycophenolate

Other drug options:
- Azathioprine
- Everolimus
- Sirolimus
- Belatacept
- Steroids
- Antithymocyte globulin (at higher dose than in induction)
- Basiliximab (at higher dose than in induction)

Immunosuppression

- Goal is to ↓ toxicity risk & graft rejection
- Monitor: trough levels

Pre-Transplant Vaccines:
- Flu vaccine (inactivated) annually
- Pneumococcal if ≥ 19 yo PCV13 →8wks →PPSV23
- Varicella (Pre-transplant)
- Vaccinate PT's household members

Reduce Infection Risk:
1. Hand washing
2. Keep away from contaminates
3. Vaccinations (no live when post-transplant)
4. Treat infections (prophylactic tx is common)

Induction Therapy

GENERIC	BRAND	MOA	ADRs	BBW	NOTES
Antithymocyte Globulin	ATGAM Thymoglobulin	AB's attack T-lymphocytes:	• Infusion Rxns • Leukopenia • Thrombocytopenia	Should only be given by experienced physician.	Pre-medicate for infusion-related rxn Dose Difference: ATGAM (equine) | Thymoglobulin (rabbit)
Basiliximab	Simulect	Interleukin-2 (IL-2) RA: Chimeric Human MAB	• N/V/D (Well Tolerated)		

Maintenance Therapy

GENERIC	BRAND	MOA	ADRs	BBW	C/I	NOTES	
Prednisone		Steroid	Short Term SE: Fluid retention, Upset stomach, Mood swings, Insomnia, ↑Appetite/Weight gain, ↑BP, ↑BG			Long Term: Adrenal suppression, Cushing's, Poor wound heal, HTN, Diabetes, Acne, Osteoporosis, Stunted growth	
Mycophenolate Mofetil	CellCept	**Anti-Proliferatives:** ↓ Hormonal Contraception Levels Cyclosporine = ↓ levels	Leukopenia Diarrhea GI upset Vomiting	Infection Lymphoma Skin cancer Birth defects Spontaneous abortions	NEVER take on Empty stomach	**Counseling:** Take missed dose if <4 hrs passed, > 4hrs = skip Take on EMPTY stomach. Avoid in pregnancy. AVOID: Antacids, Multi-vitamins	- REMS Program - Drugs NOT interchangeable - Protect from light - CellCept = D5W only
Mycophenolic Acid	Myfortic						
Azathiopurine	Imuran Azasan		Leukopenia Anemia Thrombocytopenia Hepatotoxicity Myelosuppression (if genetic ↓TPMT)				
Tacrolimus	Prograf	**Calcineurin inhibitors (CNI):** Inducers = ↓ CNI conc. Inhibitors = ↑ CNI conc. AVOID: St. John's Wort, Grapefruit	HTN Hyperglycemia (diabetes) Nephrotoxicity Neurotoxicity ↑K+, ↓Mg+ QT-prolong	Infection		Never START/STOP other meds.	
Cyclosporine	Neoral Gengraf SandImmune			Renal impairment Sandimmune NOT interchangeable	Hirsutism Gingival Hyperplasia Edema Monitor: Trough, Electrolytes, Renal Fxn, BP, BG	*Never switch Brands w/o PCP consent. *Never START/STOP other meds *Do NOT give solution from plastic/Styrofoam cup. *Causes BP, kidney issues, Gingival Hyperplasia **DDI = CYP3A4 + P-gp**	
Everolimus	Zotress	**mTOR inhibitors**	Peripheral Edema HTN Hepatic Artery Thrombosis (Do NOT use w/I 30 days of transplant)	Infection		CYP3A4 Substrate	
Sirolimus	Rapamune		Hyperglycemia Irreversible ADRs Pneumonitis Bronchitis Cough D/C Tx if this happens		Poor Wound Healing Hyperlipidemia	Monitor: Trough Tabs vs. Oral Sol = NOT EQ CYP3A4 Substrate	
Belatacept	Nulojix	CD-80 CD-86	Common ADRs (N/V/D)	ONLY use in EBV+ Pts	Tx Latent TB inxn BEFORE use		

DYSLIPIDEMIA

ACC/AHA Guidelines: Statins are 1st Line unless not tolerated.

General Information

- Elevations in non-HDL, LDL, & TG increase risk of atherogenic disease. ↑TC, LDL, TG or ↓HDL
- Aim for 5-6% Sat fat, physical activity, BMI, avoid tabacco/ETOH.
- STOP all liver toxic drugs if AST/ALT (10-40) is >3x ULN.
- For **Simvastatin & Lovastatin**: avoid strong CYP3A4 inhibitors
  - Azoles, erythromycin, clarithromycin, HIV protease inhibitors, cobicistat, nefazodone, cyclosporine, danazol, grapefruit juice

High Dose	Low Dose
Atorvastatin 40-80 mg	Simvastatin 10 mg
Rosuvastatin 20-40 mg	Pravastatin 10-20 mg
	Lovastatin 20 mg
	Fluvastatin 20-40 mg
	Pitavastatin 1 mg

EQ Doses
Pitavastatin = 2
Rosuvastatin = 5
Atorvastatin = 10
Simvastatin = 20
Lovastatin = 40
Pravastatin = 40
Fluvastatin = 80 mg
Pharmacist Rock At Saving Lives & Preventing Flu

Labs

	Non-HDL	LDL	HDL	TG
Desirable	<130	<100	>40 (men) >50 (women)	<150
Above desirable	130-159	100-129		
Borderline high	160-189	130-159		150-199
High	190-219	160-189		200-499
Very high	>220	>190		>500

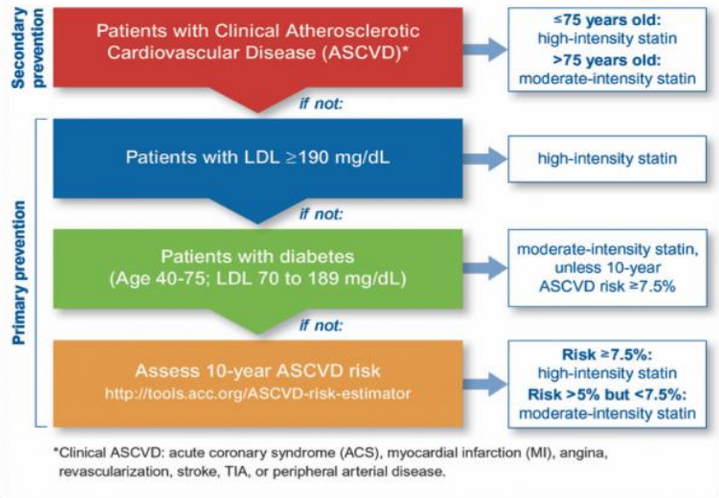
When to treat (risk factors):

1. LDL >160 + genetic DLD
2. Family Hx of ASCVD (Men >55 | Women >65)
3. High CRP = > 2
4. Ankle/Brachial Index = > 0.9

Friedewald EQ: [LDL = TC - HDL - (TC/G)]

a. PT should be on 9-12 hr fast or LDL will be lower than measured.

Treatment Algorithm



- Primary (Familial) - Genetic, cholesterol ↑
- Secondary (Acquired) - Diet, drugs, ASCVD

GENERIC	BRAND	MOA	ADRs	BBW	CONTRAINDICATION	NOTES	COUNSELING
Atorvastatin	Lipitor	**STATINS:** Inhibit HMG-CoA reductase preventing the rate-limiting step for cholesterol synthesis.	Myalgias, arthralgia, myopathy, diarrhea cognitive imp.	Skeletal muscle Fx, diabetes, Hepatotoxicity (LFT's ↑)	Active liver Dx Pregnancy Breast-feeding Use w/ Cyclosporine Simvastatin/Lovastatin (CYP3A4)	1. ONLY Simvastatin, Lovastatin, & Lescol XL must be taken QHS. 2. Rosuvastatin - start 5mg for Asians 3. Simvastatin - Max 10mg (Verapamil, Diltiazem, Dronedarone) Max 20mg - (Amiodarone, Amlodipine, Lomitapide, Ranolazine). 4. Lovastatin - Max 20mg (Verapamil, Amlodipine, Diltiazem, Dronedarone, Danazol). Max 40mg - (Amiodarone, Ticagrelor)	1. AVOID Gemfibrozil 2. AVOID Niacin > 1 g 3. AVOID Colchicine 4. Contact PCP - muscle Sx 5. Contact PCP - dark urine 6. Take Zocor & Lescol QHS 7. AVOID in Pregnancy + Nursing 8. Titrate dose to limit Sx
Lovastatin	Mevacor/Altoprev						
Rosuvastatin	Crestor						
Simvastatin	Zocor						
Pravastatin	Pravachol						
Pitavastatin	Livalo						
Fluvastatin	Lescol						
Simvastatin + Ezetimibe	Vytorin						
Ezetimibe	Zetia	Inhibits cholesterol at brush border of small intestine.	Diarrhea, URTI's, arthralgia, myalgias sinusitis	AVOID in Hepatic imp., Skeletal muscle Fx		1. Monitor LFT's when used w/ Statin or Fibrate 2. Give 2 hours before or 4 hrs after BAS. (Decrease levels) 3. AVOID use w/ Gemfibrozil. 4. Cyclosporine - causes increase of levels of both drugs.	1. Contact PCP - dark urine 2. Contact PCP - muscle Sx 3. w/ or w/o food 4. Give 2 hrs before or 4 hrs after Bile Acid Sequestrants. 5. May increase Cyclosporine lvl 6. Monitor INR w/ Warfarin
Cholestyramine	Questran	**Bile Acid Sequestrants (BAS):** Binds bile acid in the intestine to be excreted in the feces.	Constipation, dyspepsia, ab pain, cramping, gas, bloating, TG ↑, esophageal obstruction, LFTs ↑	Cholestyramine NOT taken w/ PKU.	Biliary obstruction	1. Welchol: Take w/ FOOD + DRINK 2. Space out Drugs/Multivitamin by 4 hrs 3. ACC/AHA do NOT recommend use if TG >300 4. Monitor Warfarin INR	1. Take w/ FOOD + H20 2. May need laxative for constipation. 3. Space out Multivitamins as it may decrease absorption of ADEK, Folate, Iron.
Colesevelam	Welchol				Bowel obstruction, TG >500		
Colestipol	Colestid						
Fenofibrate Fenofibric Acid	Fibricor/TriCor/Lipofen Antara/Trilipx/Triglide	**Fibrates:** PPAR-α Activators - Express Apo-C to VLDL ↓+ TG ↓.	Dyspepsia, ab pain, LFTs, CPK, URTI's ↑	Myopathy risk w/ Statin Cholelithiasis, SCr ↑	1. Liver Dx 2. Renal Dx 3. Gallbladder Dx 4. Use w/ Repaglinide	• Can ↑LDL when TG are high. • Fenoglid/Lofibra/Lipofen - w/ FOOD • Do NOT give Gemfibrozil + Statin	1. Contact PCP - muscle Sx, dark urine, or ab pain, N/V. 2. Lopid - BID 30 mins before breakfast/dinner.
Gemfibrozil	Lopid						

DYSLIPIDEMIA

GENERIC	BRAND	MOA	ADRs	BBW	CONTRAINDICATION	NOTES	COUNSELING
Niacin	Niacor/Niaspan	**Nicotinic acid/Vitamin B3:** Decreases synthesis of VLDL, TG, LDL	Flushing, pruritis, NVD, Hyperglycemia, Hyperuricemia, cough, orthostatic hypotension	Hepatotoxicity, Rhabdo w/ Statin. Caution: Angina or MI	Liver Dx, PUD, arterial bleed	1. Check LFTs 2. Niacin IR - flushing/itching 3. CR/SR - more Hepatotoxicity 4. BEST choice is Niacin XR 5. Take ASA 30-60 mins before or w/food to reduce flushing. 6. Take 4-6 hrs before BAS 7. Monitor other hepatotoxic drugs	1. Niaspan - Take QHS & less flushing than IR 2. ALL - Take w/ FOOD 3. AVOID spicy food + ETOH 4. Contact PCP - dark urine 5. Monitor other Hepatotoxic drugs 6. Take 4-6 hrs after BAS
Omega -3 Acid	Lovaza	**Fish Oils:** Unknown (Used adjunct to diet in PTs w/ TG >500)	LDL ↑, Eructation (burping), dyspepsia, flatulence.	Caution: Fish/Shellfish allergy		1. No LDL increase w/ Vascepa 2. Prolong bleeding time (INR). 3. Monitor LFTs	1. Take whole 2. Vascepa w/ FOOD 3. Indigestion, burping, bad taste 4. Monitor INR w/ Warfarin (May prolong bleeding time)
Icosapent Ethyl	Vascepa						
Alirocumab	Oraluent	**PCSK-9 Inhibitors:** Monoclonal AB - LDL ↓	Injection site Rxn, Nasopharyngitis, Flu, URTI, UTI			Expensive Special storage NLA Recommended Alirocumab - SQ injection in thigh, abdomen, upper arm. Store in fridge Evolocumab - SQ injection. Store in fridge	1. Common Cold Sx 2. Prior to use - Let syringe warm to room temp 30-45 mins & inspect for color changes or particulates. 3. AVOID freezing/extreme heat. 4. Rotate injection sites.
Evolocumab	Repatha, SureClick, Pushtronex						
Lopitapide	Juxtapid	Inhibits MTP to reduce VLDL + LDL ↓	NVD, Dyspepsia ab pain, constipation flatulence, LFTs ↑	Hepatotoxicity (REMS)	Pregnancy	1. Capsule ONLY 2. Expensive 3. CYP3A4 (Max 30mg) 4. Limit dose of Simvastatin/Lovastatin	
Mipomersen	Kynamro	Inhbits Apo-B to VLDL + LDL ↓	Nausea, HA, fatigue, ALT ↑	Hepatotoxicity (REMS)	Active Liver Dx	Injection ONLY	
Metreleptin	Myalept	Recombinant Human Leptin Analog	Leptin AB's	REMS - Lymphoma Risk		Used to Tx Leptin deficiency	

INFLAMMATORY BOWEL DISEASE

General Information

- Group of inflammatory diseases of Colon & Small intestine.
- Intermittent chronic disease with flares & remission.
- Major Types:
  - Ulcerative Colitis (UC)
  - Crohn's disease.
- Triggered by infxns, NSAIDs, food
- IBD is different from IBS which has NO inflammation
- General signs & symptoms
  - Bloody Diarrhea, rectal urgency, tenesmus (Feeling to GO), abdominal pain, weight loss, N/V, constipation, night sweats

NON-Pharm Tx

1. Eat smaller meals frequently low in fat/dairy.
2. Drink plenty of H20 - avoid ETOH/Caffeine.
3. Avoid Sorbitol & Lactose. (Excipients - tab binders)
4. Anti-Diarrheals or Anti-Spasmodics may help.
   Ex. Dicyclomine (Bentyl)
5. Vitamin Supplements prevent deficiencies.
6. Lactobacillus or Bifidobaterium may help pain/bloating.

Ulcerative Colitis vs. Crohn's Disease

Differences in signs & symptoms

	Crohn's	UC
Diarrhea	Bloody/Non-bloody (nocturnal diarrhea is very common)	Bloody
Smoking	Risk factor	Protective
Location	Entire GI tract (esp. ileum & colon)	Descending colon (esp. rectum)
Depth	Transmural	Superficial
Pattern	Non-continuous	Continuous
Fistulas/Strictures	Common	Uncommon

Induction of Remission

Crohn's	UC
1. Steroids +/- Thiopurine or MTX (Methotrexate) 2. Anti-TNF +/- Thiopurine. 3. Interleukin-receptor antagonist	1. Steroids (PO/Rectal) +/- Thiopurine or 5-ASA. 2. Anti-TNF +/- Thiopurine. 3. IV Cyclosporine

1. Short courses of PO or IV steroids used to Tx exacerbations.
2. Steroid doses are tapered off 8-12 weeks after remission.
3. Systemic steroids NOT recommended for maintenance.

Maintenance of Remission

	Crohn's	UC
Mild Dx	PO Budesonide	Mesalamine (5-ASA) PO/Rectal
Mod-Severe Dx	**Anti-TNF:** Adalimumab (Humira) Infliximab (Remicade) Certolizumab (Cimzia) --- **Thiopurine:** Azathioprine Mercaptopurine --- **IL-antagonist:** Ustekinumab (Stelara) --- Methotrexate (immunosuppressant) is recommended in PTs who cannot tolerate Azathioprine. Dose is 1x/week IM/SC	**Anti-TNF:** Adalimumab (Humira) Infliximab (Remicade) Golimumab (Simponi) --- **Thiopurine:** Azathioprine Mercaptopurine --- Cyclosporine (only for severe)
Refractory/Steroid dependent Dx	**Integrin-antagonist:** Natalizumab Vedolizumab	Vedolizumab

GENERIC	BRAND	MOA	ADRs	BBW	C/I	NOTES
Prednisone	Deltasone Rayos	Oral Steroids	**SHORT-Term:** ↑ Appetite/Weight Fluid retention Mood swings Insomnia GI upset ↑ BP/BG **LONG-Term:** Adrenal suppression Cushing's Syndrome Immunosuppression Poor wound healing Osteoporosis Cataracts ↑ BP/BG	1. Avoid long-term use. 2. May use alternate day Tx (ADT) 3. Taper off doses > 2 wks. 4. Long-term use: assess Bone density by optimizing Ca+ & Vit-D → Bisphosphonates PRN.	Systemic Fungal infections Live Vaccines	
Budesonide	Entocort (CD Only) Uceris (UC Only)					Budesonide has extensive 1st Pass metabolism - Swallow WHOLE. - CYP3A4: Avoid Grapefruit
Hydrocortisone (Rectal)	Cortifoam Cortenema	Rectal Steroids				Rectal steroids: Indicated only for UC NOT effective for maintenance.
Budesonide (Rectal)	Uceris					
Mesalamine (5-ASA)	Aprisol	**Aminosalicylates:** Indicated = UC Topical anti-inflammatory Fx Mesalamine (5-ASA) used most. Other formulations need to be converted to Mesalamine to have Fx. Sulfasalazine used LESS due to many side Fx.	Abdominal pain N/HA/Flatulence Belching Pharyngitis	Intolerance/Hypersensitivity (More w/ Sulfasalazine)	Salicylate allergy	Do NOT crush/chew. Mesalamine is best tolerated. Distal Dx/Proctitis = Use Rectal Mesalamine.
Sulfasalazine	Azulfidine					
Balsalazide (INDUCTION)	Giazo (Males only) Colazal		N/V/D/HA Abdominal pain	Gastric retention		Colazal capsule may be sprinkled. (beads are not coated → may chew but will stain teeth/tongue)
Olsalazine (MAINTENANCE)	Dipentum		Diarrhea Abdominal pain			
Azathioprine	Azasan Imuran	**Thiopurines:** Immunosuppressive drugs used for Induction & Maintenance.	N/V/D Rash LFTs ↑	Immunosuppression = ↑ Risk of Malignancy	Pregnancy	- Hematologic Toxicity (Leukopenia/Thrombocytopenia) - Genetic deficiency of Thiopurine Methyltransferase (TPMT) → Risk of Myelosuppression.
Mercaptopurine	Purixan					
Natalizumab	Tysabri	**Integrin-receptor Antagonists:** Monoclonal AB's used for Induction & Maintenance for Inadequate PT response or Steroid dependent.	Infusion Rxns Headache Fatigue Arthralgia	Progressive Multifocal Leukoencephalopathy (PML)	Approved for Crohn's Dx.	Dosed Q4wk 12 wk No-Response = DC REMS Program
Vedolizumab	Entyvio		Nasopharyngitis Headache Arthralgia		Approved for Crohn's + UC.	DC if no response by 14 wk.

SCHIZOPHRENIA

General Information

- Due to brain structure/chemistry inovling DA & Glutamine.
- Symptoms: Hallucination, Delusions, Disorganized behavior.
- Diagnosis: Negative & Positive Signs/Sx based on DSM-5.
  - DSM-5 Diagnostic Criteria for Schizophrenia:
    - 1 month of Sx
    - Delusions, Hallucinatiions, OR Disorganized Speech MUST be present.
- Treatment: adherence is important but difficult to obtain.
  - Anti-Psychotics mainly block Dopamine (DA) but newer agents blocking additional receptors are beneficial.
  - Always assess adherence before changing Tx.
  - Assess cost, formulations, side effects.
  - Drug Tx: select according to S/E profile but 2nd Gen Anti-Psychotics (SGAs) have less Extrapyramidal S/E (EPS).
  - 1st Gen Anti-Psychotics (FGAs) have better PT response.
  - BBW: ALL have risk of Mortality in elderly w/ dementia-related psychosis.

Signs & Symptoms

NEGATIVE:
Loss of Interest
Lack of Emotion (Apathy)
Loss of Motivation
Social Withdrawal
Poor Hygiene
Lack of Speech (Alogia)
Inability to plan/do activities

POSITIVE:
Hallucinations
Delusions
Disorganized Behavior
Difficulty paying attention

Drug Formulations

- **Acute IM Injections:** Provide "STAT" relief
- **ODT:** Used for "Cheeking" PTs who spit out medication
- **Long-Acting Injections:** Good for adherence/compliance

Drugs Causing Psychotic Sx

Anti-Cholinergics
Cannabis
Illicit Drugs
Interferons
Amphetamine Stimulants
Systemic Steroids
DA-Agonist (Requip, Mirapex, Sinemet)

NEUROLEPTIC Syndrome

Neuroleptic Malignant Syndome (NMS)
- Rare but highly lethal
- Signs/Sx:
  - Hyperthermia (fever/sweat)
  - Muscle Rigidity
  - Altered mental status
  - Tachycardia,
  - Tachypnea, ↑BP
- TREATMENT:
  - Taper off Anti-Psychotics quickly
  - Consider Olanzapine/Clozapine
  - Cool the PT down
  - Dantrolene or BZD for muscle relaxation

Drug Tx

1st-Gen Anti-Psychotics (FGAs):
- Haloperidol: High-potency w/ ↑ EPS
- Cogentin can be added to level off Ach/Dopamine imbalance. Moderate risk of sedation
- Thioridazine = ↑ QT-Prolong Risk
- ↓ Risk of:
  - Orthostasis, tachycardia, anti-Cholinergic effects

2nd Gen Anti-Psychotics (SGAs):
- Preferred as 1st option
- Metabolic S/E (+ weight gain, lipid abnormalities): Avoid in overweight pts
  - Highest risk: Clozapine, Olanzapine, Quetiapine
  - Mod. Risk: Risperidone, Paliperidone
  - Low risk: Aripiprazole, Ziprasidone
- Hyperglycemia
- ↑ Prolactin Levels: Risperidone, Paliperidone = highest risk
- QT-Prolongation: Ziprasidone = highest Risk
- Agranulocytosis: Clozapine = highest risk. Only consider after 2 trials
- Extrapyramidal S/E (EPS): Quetiapine = lowest risk (used for Parkinson's)
- Seizure: Clozapine = highest risk

MONITOR = Weight, DLD, BG, BP, Family Hx

GENERIC	BRAND	MOA	ADRs	BBW	C/I	NOTES
Chlorpromazine		**First generation antipsychotic (FGA)** Dopamine-2 Blocker	- Sedation - EPS - Dyskinesias - Akathisia (restlessness) ○ Treat with diphenhydramine, Benztropine, BZDs, or Propranolol - Parkinsonism (tremors, bradykinesia) ○ Anticholinergics, Propranolol - Dystonia (painful muscle spasm) - ↑ Risk in young Males. ○ Treat with Benadryl or benztropine - Tardive Dyskinesia (Irreversible) (face, tongue, mouth movements) ○ Replace w/ SGA like quetiapine or clozapine	Dementia-related Psychosis ↑ Death Risk (↑ risk death due to stroke)	Low-Potency FGA ↑ Sedation | ↓ EPS	
Thioridazine						
Loxapine	Loxitane Adasuve (inhalation)				Mid-Potency FGA	Adasuve: REMS Drug Bad taste, Bronchospasms, Sedation
Perphenazine						
Fluphenazine	Decanoate = 2 weeks				High Potency FGA ↑ EPS | ↓ Sedation	
Haloperidol Class: Butyrophenone	Haldol Decanoate = Monthly					IV Haloperidol: ↑ Risk of CVD effects (Orthostasis, Tachycardia, QT-prolongation) Haldol Cocktail: Haloperidol, Lorazepam, Benadryl
Thiothixine	Navane					
Trifluoperazine						
Aripiprazole	Abilify Aristada (injection)	**2nd-Gen SGAs:** D2 + 5HT-2A blockers	Akathisia Anxiety Insomnia			
Asenapine	Saphris (SL tab)		Tongue numbness			
Clozapine	Clozaril Fazaclo ODT Versacloz (suspension)		Weight gain Sialorrhea (hypersalivation) Agranulocytosis ↑ Lipids/Glucose	BBW: Agranulocytosis Monitor every week x 6 months Every 1-2 weeks x 7-12 months Every month x > 12 months	Decreases suicide by 3x Monitor ANC Start only if ANC > 1500 Some ethnic groups can start lower.	REMS Program: Pharmacy must be certified
Olanzapine	Zyprexa Zydis ODT Relprevv (injections)		Somnolence Weight Gain ↑ Lipids/Glucose	Zyprexa Relprevv: monitor PTs 3 hrs post-injection	MUST be ANC ≥ 1,500/mm to START Tx	Olanzapine NOT used w/ BZD due to Orthostasis Risk.
Paliperidone	Invega Sustenna/Trinza (injections)		↑ Prolactin EPS (esp. high doses) Sexual Dysfunction Galactorrhea Irregular menstrual cycles			
Quetiapine	Seroquel		Somnolence Orthostasis Weight Gain ↑Lipids/Glucose			Take XR at night w/o FOOD
Risperidone	Risperdal M-Tab ODT		↑ Prolactin EPS (esp. high doses) Sexual Dysfunction Galactorrhea Irregular menstrual cycles Weight Gain ↑ Lipids/Glucose			Risperdal Consta = Q2wk injection
Ziprasidone	Geodon (IM)				QT-Prolong or QT-risk	Take w/ FOOD
Iloperidone	Fanapt					
Lurasidone	Latuda					
Brexpiprazole	Rexulti					
Cariprazine	Vraylar					
Pimvanserin	Nuplazid					Used to Tx Psychosis in Parkinson's Dx
Valbenzine	Ingrezza		Somnolence			Used to Tx Tarditive Dyskinesia (TD)

OSTEOPOROSIS

General Information

- Most common in Post-Menopausal Women.
- May occur as normal age-related bone loss.
- Vertebral fractures w/o a fall and is unnoticeable.
- Hip fractures are most devastating.
- Wrist fractures occur in the young.
- Caution:
  - Avoid sedating and orthostatic drugs
  - Ensure good lighting
  - have reasonable storage heights
  - Safety bars in bathroom
  - Handrails on stairs

Lifestyle Mods.

- Weight-bearing exercise
- Muscle strengthening
- Quit smoking
- ETOH

- Risk Factors
  - Lifestyle + Family Hx + Dx state
  - Anti-Convulsant
  - Carbamazepine, Phenytoin, Phenobarbital, PPI's, Steroids

Calcium Supplements

- Important: children | pregnancy | menopause
- Dietary intake is best

<1 yr.	200-260mg daily
1-3 yr.	700mg daily
>4 yr.	100-1300mg daily

- Ca+ absorption is saturable:
  - Dose >500 – 600mg must divide
- Ca+ Citrate: Calcitrate
  - Less elemental Ca+ (21% elemental)
  - Better absorption: NOT acid dependent, take w/o regard for meal
  - Preferred is gastric PH is high
- Ca+ Carbonate: TUMS
  - 40% elemental Ca+
  - Absorption = Acid-dependent, must take with food

Vitamin D Deficiency

Daily Dose Recommended: 800 - 2,000 Units

- Child Deficiency = Rickets
- Adults deficiency = Osteomalacia

- Serum Vit-D level [25(OH)D] should be measured
- Maintain level = 30 ng/mL
  - (D2) Ergocalciferol
  - (D3) Cholecalciferol
- Tx for 8-12 wks, followed by maintenance 1000 - 2000 U/day

DEXA Scan

DEXA | DXA = T-score
Gold standard X-ray test.
Women ≥ 65, Men ≥ 70. Need BMD testing
Z-scores have more parameters.

T-Score	
Normal	≥ -1
Osteopenia – Low bone mass	From = -1 to 2.4
Osteoporosis	≤ -2.5

Drug Tx

- Tx must include Vit-D & Ca+ intake
- Treatment + Prevention =
  - Bisphosphonates or Raloxifene
- Prevention ONLY =
  - Estrogen-based meds
- Treatment ONLY:
  - IV Ibandronate,
  - **High risk pts only:** Teriparatide (Forteo), Abaloparatide (Tymlos), Denosumab (Prolia)
  - **Last Line Tx:** Calcitonin, Estrogens

When to start treatment:
- Osteoporosis: >50 yo if BMD T-score ≤2.5 at neck, hip, spine
  or presence of fragile structure (regardless of BMD)
- High risk osteopenia: Low T-score = -1 to -2.5 at neck, hip, spine
  or FRAX score = 10 yr. fracture probability ≥20%, hip fracture ≥3%

Bisphosphonates
- 1st Line for Tx + Px of Osteoporosis in most PTs.
- Oral meds: take before food or H2O staying upright for 30 mins & drinking 6-8 oz plain H2O. Must swallow whole
- Common ADR = Esophagitis | Muscle Sx | Hypocalcemia
- Rare ADR = Osteonecrosis of Jaw - ONJ + atypical femur fractures. Dental work should be performed before starting these medications.
- Weekly or Monthly PO options are available for adherence - Upright 60 mins w/ Boniva monthly
- Tx Duration = 3 - 5 years in PTs at low risk of fracture.

Estrogen Agonist/Antagonist Tx: BOTH drugs ↑ risk of VTE + Stroke = BBW
- RALOXIFENE = for Tx + Px
  - ↓ risk of Breast cancer, causes Vasomotor Sx
- DUAVEE = Only Px in Post-menopausal women who have a Uterus.
  - helps Vasomotor Sx but ↑ risk of Breast cancer.

GENERIC	BRAND	MOA	ADRs	BBW	CONTRAINDICATION	NOTES
Alendronate	Fosomax Binosto	**Oral Bisphosphonates:** Inhibit Osteoclasts Inhibit bone resorption 1st Line = Tx + Px	Hypocalcemia Hypophosphatemia N/V Dyspepsia, Heartburn Abdominal pain Dysphagia Muscle pain	Osteonecrosis - ONJ Atypical Femur fractures Esophagitis Must correct ↓ Ca+ before use Do NOT use in Renal imp CrCl < 30-35	Hypocalcemia Inability to stand/sit upright for 30 mins	Separate Ca+, Fe+, Mg+ antacids at least 2 hrs Atelvia = DR - reqs acidic gut to work - Avoid H2RA + PPI completely - Take after Breakfast w/ 4 oz water
Alendronate + D3	Fosamax Plus-D					
Risedronate	Actonel Atelvia					
Ibandronate	Boniva					
Ibandronate IV	Boniva	IV Bisphosphonates	Same PO except NO Esophagitis Acute-phase Injection rxn	Renal impairment	Hypocalcemia	
Zoledronic Acid	Reclast					
Raloxifene	Evista	**Estrogen Agonist/Antagonist:** SERM - ↓ Bone resorption	Hot Flashes Peripheral Edema Arthralgia	↑ DVT | PE | Stroke	Pregnancy VTE	Tx + Px for Post-menopausal
Conjugated Estrogen + Bazedoxifene	Duavee		GI Sx	↑ VTE | Stroke Endometrial Cancer Breast Cancer	Pregnancy Breast Cancer	Px for Post-meno w/ Uterus
Calcitonin	Miacalcin	Inhibit Osteoclastic bone-resorption	Muscle | Back pain Injection Rxn	↑ Cancer Hypersensitivity reaction Hypocalcemia		Nasal Spray: 1 spray in 1 nostril QD - Alternate nostril daily. Must Prime
Teriparatide	Forteo	**PTH 1-34:** ↑ Bone Formation Tx Duration = Limit to <2 yrs	Arthralgias Leg Cramps | Pain Nausea | Dizziness | Orthostasis	Osteosarcoma - Bone Cancer	Hypercalcemia	Use in HIGH risk of Fracture Refrigerate Medication Must find a place to sit or lie down if dizziness occurs after injection. Inject = Abdomen | Thigh Discard = > 28 days
Abaloparatide	Tymlos					
Denosumab	Prolia	**RANKL inhibitor:** Prevent Osteoclast Formation	HTN Fatigue Edema Dyspnea N/V/D/HA ↓ PO4-	Osteonecrosis - ONJ Atypical Femur Fractures Hypocalcemia	Pregnancy Hypocalcemia	

CHRONIC KIDNEY DISEASE

General Information

- Most common cause is DM or HTN (control BP/BG)
- Dehydration is a primary cause of kidney dx.
- BUN: measures nitrogen in urea (waste of protein metabolism)
- Creatinine: waste product of muscle metabolism ↑ Cr = Bad
- SGLT-2, Metformin use eGFR
- Staging = GFR + Albuminuria

Functions of the Kidney

Nephron
- Functional unit of the kidney
- Control H2O & Na+
- Regulates BV→BP

Glomerulus
- Healthy = Protein-bound drugs not filtered, remain in blood.
- Damage = Albuminuria
- Glomerular Filtration Rate (GFR) assesses severity of damage

Proximal Tubule
Na+, Cl-, Ca+, H2O ↑

Distal Tubule
Thiazides inhibit Na+/Cl- pump and ↑ Ca+ reabsorption. Weaker diuretic but protective for kidneys.

Loop of Henle:
- ADH - "Vasopressin"
- ↑H20
- Loop Diuretics: inhibit Na+/K+ pump in ascending limb. Also ↑ Ca+ leading to effects on bone density.

Collecting Duct:
- Aldosterone: ↑ Na+/H20 & ↓ K+
- Blocking leads to ↑ K+
  - Spironolactone
  - Eplerenone

Drugs Inducing Kidney Disease

Aminoglycosides
Ampho-B
Cisplatin
Colistimethate
Contrast Dye
Cyclosporine
Loop Diuretics
NSAIDs
Tacrolimus
Vancomycin

Drug Considerations

ACEi & ARBs: Proteinuria Kidney Protection
1. Tx Proteinuria regardless of BP
2. Starting - ↑SCr up to 30% is OK, Greater >30% = STOP.
3. Both may cause Hyperkalemia - Monitor 1-2 wks if CKD
4. AVOID K+ Supplements | Salt-Substitute (KCL)

Drugs requiring dose adjustments w/ CrCl 50-60 (↑interval or ↓dose)

Many ABX Anti-Arrhythmic Dabigatran Enoxaparin Colchicine Rivaroxaban Tramadol ER	Bisphosphonates Cyclosporine Lithium Topiramate Statin Allopurinol Metoclopramide	Gabapentin Pregabalin Morphine Codeine Famotidine Ranitidine

Contraindicated Drugs in Kidney Dx:

CrCl < 60	Nitrofurantoin
CrCl < 50	Stribild, IV Voriconazole
CrCl < 30	Avanafil, Bisphosphonates, Dabigatran, Duloxetine, Genvoya, NSAIDs, Fondaparinux, K+ Sparing Diuretics, Tadalifil, Xarelto
GFR < 30	Genvoya, SGLT-2, Metformin
Other	Dofetilide, Edoxaban, Glyburide, Meperidine, Sotalol

Classifications

eGFR Categories

GFR	Rate	KDIGO	KDOQI
≥ 90 + Kidney damage	Normal or ↑	G1	Stage 1
60-89 + damage	Mild ↓	G2	Stage 2
45-59	Mild-Mod ↓	G3a	Stage 3
30-44	Mod-Severe ↓	G3b	
15-29	Severe ↓	G4	Stage 4
< 15 or Dialysis	Kidney Failure (ESRD)	G5	Stage 5

Albumin to Creatinine Ratio = Albuminuria

ACR mg/g	ACR mg/mmol	KDIGO	Stage
< 30	< 3	A1	Normoalbuminuric
30-300	3-30	A2	Microalbuminuria
> 300	> 30	A3	Macroalbuminuria

CKD-MBD (Mineral and bone disorder) Tx

↑ PO_4 = Phosphate restriction and/or phosphate Binders
- If dose is missed & food is absorbed = Skip dose

↑PTH (secondary hyperparathyroidism) → ↓Ca+ = Vitamin-D supplements and/or calcimimetic to ↓PTH
- Caution Ca+ based PO_4 binders + Vit-D = ↑Ca+
- ↑ PTH must be treated w/ Vitamin-D
  - Vit-D3 | Cholecalciferol - synthesized in skin sun exposure.
  - Vit-D2 | Ergocalciferol - is primary dietary source.
  - Calcitriol - active form of D3 & used to ↑Ca+ absorption and ↓PTH
  - Vit-D Analogs = ↓ Hypercalcemia

Anemia = ↓EPO → ↓RBCs = Iron supplements or ESAs
- Hemoglobin < 13
- ESA agents are required = Procrit | Epogen | Darbepoetin Alfa (Aranesp)
  - ONLY Tx use if Hgb < 10. Hold dose if Hgb > 11 (↑ risk of clots)

Hyperkalemia

General Information
- K^+ >5
- Diabetes & Hospitalized PTs are at ↑ risk.
- Causes: Aldosterone, Diuretics (Loops > Thiazides)
- Symptoms: Muscle weakness, Bradycardia, Fatal Arrhythmias
- Monitor w/ ECG, d/c all K sources, stabilize myocardial cells

Drug Treatment

Shifts K+ Intracellularly:	Eliminates K+: (**last line**)
Calcium Gluconate (**1st line**) Insulin Sodium Bicarbonate Albuterol	Furosemide Sodium Polystyrene Sulfonate Patiromer Hemodialysis

GENERIC	BRAND	ADRs	BBW	NOTES
Sodium Polystyrene Sulfonate	SPS Kayexalate	Monitor: ↑ Na+ ↓ Ca+ ↓ K+ ↓Mg+		Binds other Drugs: Give at least 3 hrs. before or after
Patiromer	Veltassa	Constipation ↓Mg+	Long Duration of Action NOT for Emergency use	

CHRONIC KIDNEY DISEASE

GENERIC	BRAND	MOA	ADRs	NOTES
Aluminum Hydroxide	Alternagel	**Phosphate Binders:** ALL cause Constipation & N/V DDI: Levothyroxine, FQs, Tetracyclines	Poor Taste "Dialysis Dementia"	Aluminum-Based: Rarely used due to accumulation & Bone Toxicity - Limit Tx to 4 weeks
Calcium Acetate	PhosLo Phoslyra		Hypercalcemia	**1st line – avoid use with vitamin D**
Calcium Carbonate	Tums			
Sucroferric Oxyhydroxide	Velphoro		Discolored/Black Feces	Al+/Ca+ Free: more Expensive Ferric Citrate → impairs Iron absorption. May need to ↑ Iron dose
Ferric Citrate	Auryxia			
Lanthanum Carbonate	Fosrenol		Diarrhea	Must CHEW tablet thoroughly to reduce GI Fx
Sevelamer Carbonate	Renvela Renagel			Al+/Ca+ Free, additional benefit of ↓ Total Cholesterol + LDL by 15-30%

GENERIC	BRAND	MOA	ADRs	NOTES
Calcitriol	Rocaltrol	**Vit-D Analogs:** ↑ Ca+ intestinal absorption	N/V/D Hypercalcemia	**Monitor for ↑ Ca+**
Calcifediol	Rayaldee			
Doxercalciferol	Hectorol			
Paricalcitol	Zemplar			
Cinacalcet	Sensipar	**Calcimimetics:** ↑ Ca+ sensitivity ↓ PTH ↓ Ca+ ↓ PO4	Hypocalcemia	**Monitor for ↓ Ca+**
Etelcalcetide	Parsabiv		Muscle Spasms Paresthesias	

ARRHYTHMIAS

General Information

- Normal Sinus Rhythm = 60-100 BPM
- Normal HR = 60-100 (Freq. of depolarized ventricles)
- DIAGNOSIS: Electrocardiogram (ECG)
- Arrhythmia = Irregular heartbeats caused by dysfxn of electrical impulses.
  - Bradyarrhythmia's = Slow HR
  - Tachyarrhythmias = Fast HR
  - Supraventricular Arrhythmias
    - Tachycardia
    - AFIB, Atrial Flutter, PSVTs
    - A-fib is most common → mostly rapid Ventricular response → less blood in Atria → Hypotension + Blood Clots → Brain Strokes
    - Most people are unaware
  - Ventricular Arrhythmias
    - V-tach, V-fib, Premature Ventricular Contractions (PVC)
    - V-Tach (VT) = HR >100 BPM (Due to a series of PVCs in a row)
    - V-Fib - MEDICAL EMERGENCY (Due to untreated VT)

Signs & Symptoms

Palpitations
Dizziness
Lightheadedness
SOB/Chest pain
Fatigue

Most PTs are symptomatic, but some can be silent (only detected w/ physical exam

Causes

- Most common cause is MI but also: cardiac damage, valve disorders, HTN, HF.
- Electrolyte imbalances:
  - K+
  - Mg+
  - Na+
  - Ca+
- Elevated Sympathetic states:
  - Hyperthyroidism
  - Infection
  - Rx Drugs/Illicit Drugs

Cardiac Action Potential

PHASE 0	Rapid Ventricular depolarization initiates heart beat due to Na+ Influx ***QRS Complex***
PHASE 1	Early rapid repolarization; **Na+ Channels close**
PHASE 2	Plateau in response to **Ca+ Influx & K+ Efflux**
PHASE 3	Rapid ventricular repolarization in response to K+ Efflux ***T-Wave***
PHASE 4	Resting membrane potential (RMP) - arterial depolarization ***P-Wave***

QT Prolongation

- QT Prolongation = >440 ms.
- Dose-dependent & additive when drug-induced.
- K+/Mg+ ↓ increase risks.
- Torsade de Pointes (TdP): Prolongation of QT interval that may lead to Cardiac death.

KEY QTc Prolongation Causing Drugs		Other Drugs (may cause)
○ Anti-Arrhythmias (Class 1) ○ Azoles ○ Anti-Depressants (Sertraline preferred) ○ Anti-Emetics (5HT-3)	○ Anti-Psychotics ○ FQ's ○ Droperidol ○ Phenothiazines ○ Donepezil ○ Methadone	Foscarnet Telavancin Chemo Tx (Nibs + Mibs) HIV Drugs (Navirs + Rilpivirine)

VAUGHN-WILLIAMS Classification of AAD:

CLASS 1: **1A:** Disopyramide, Quinidine, Procainamide. **1B:** Lidocaine, Mexiletine **1C:** Flecainide, Propafenone	- ALL cause QT-Prolongation - ALL, especially Class 1C have BBW for PTs w/ recent Post-MI
CLASS 2: Beta-Blockers	- Indirectly block Ca+ channel - Slow Ventricular rate
CLASS 3: Dronedarone, Dofetilide, Sotalol, Ibutilide, Amiodarone	- Block K+ channel - ALL have additive QT-prolong - Caution w/ (-) Inotropes (ex. BB + Non-DHP CCBs) - Electrolyte Imbalance must be corrected. - AVOID Grapefruit juice, Ephedra, St. John's Wort. - Decrease Digoxin dose by 50% & Warfarin dose 30-50%
CLASS 4: Non-DHP CCB's (Verapamil, Diltiazem)	

Memory Tool: **DQP** Double Quarter Pounder **LM** Lettuce + Mayo **FP** Fries Please **B** Because
DDSIA Dieting During Stress Is Always **VD** Very Difficult

Treatment

RATE Control

- Asymptomatic Goal HR = < 80 BPM
- Symptomatic Goal HR = < 110 BPM
- **BB preferred or Non-DHP CCBs** (Non-DHP CCBs for A-fib)
- Digoxin may be added for Refractory PTs or cannot take BB or CCBs.
- Non-DHP CCB: do NOT give if HF or HFrEF.
- Requires stroke prophylaxis for life: based on CHADSVASC score (OAC or ASA)

RHYTHM Control

- Goal is to restore/maintain NSR
- **Use Class 1A, 1C, or Class 3 meds // or electrical cardioversion**
- Amiodarone is LAST option due to toxicity. Ex. Heart Failure.
- Prior to taking any meds for Arrhythmias - Electrolytes + Toxicology screen should be done.

ARRHYTHMIAS

GENERIC	BRAND	MOA	ADRs	BBW	C/I	NOTES
Disopyramide	Norpace	**Class 1A:** Na+ Blockers Pro-Arrhythmic (-) Inotropy Strong Anti-Cholinergic effects ALL cause QT-Prolong	Anticholinergic effects Hypotension	Pro-Arrhythmic, HF BPH	2nd/3rd Heart Block Cardiogenic Shock Congenital QT syndrome Sick Sinus Syndrome	
Quinidine			Diarrhea Stomach cramping Cinchonism (ear, eyes, HA, delirium) N/V/Rash	May increase Mortality in Afib or A-Flutter Drug-Induced Lupus (DILE) Hemolysis in G6PD	Use w/ FQ's or Ritonavir 2nd/3rd Heart Block Thrombocytopenia (TTP) Myasthenia Gravis	AVOID changes in electrolyte intake. Take w/ FOOD
Procainamide			Hypotension Rash	Fatal Blood Dyscrasias (Agranulocytosis) Long term use → ANA DILE	2nd/3rd Heart Block SLE TdP	N-Acetyl-Procainamide (NAPA) is the active metabolite.
Lidocaine	Xylocaine	**Class 1B:** Na+ Blockers ONLY useful for Ventricular Arrhythmias Cross BBB → CNS Fx	N/V/Dizzy CNS Fx Tremor/incoordination		2nd/3rd Heart Block Wolf-Parkinson's Allergy to Corn	
Mexiletine	-			Hepatotoxicity	2nd/3rd Heart Block Cardiogenic Shock Blood Dyscrasias Severe Skin Rxns (DRESS)	
Flecainide	-	**Class 1C:** Na+ Blockers Propafenone has BB Fx	Dizziness Visual Disturbances Dyspnea	Pro-Arrhythmic	HF LV Hypertrophy Recent MI	
Propafenone	Rhythmol		Metallic Taste Dizziness Visual Disturbance			MOST increase in Mortality BBW
Amiodarone	Pacerone Nexterone	**Class 3: K+ Blockers** Additive QT-Prolongation Caution w/ (-) Inotropes Correct Electrolyte Imbalances Do NOT use Grapefruit juice, Ephedra or St. John's Wort	Hypotension Bradycardia Corneal Micro-Deposits Dizziness Ataxia N/V Tremor DILE	Pro-Arrhythmic Pulmonary Hepatotoxicity	Sick Sinus Syndrome 2nd/3rd Heart Block Bradycardia Cardiogenic shock	- Must decrease dose of Digoxin 50% or Warfarin 30-50%. - Photosensitivity - AVOID Grapefruit - DOC: in Pts w/ HF - Infusions > 2 hrs MUST be given in Non-Polyvinyl Cl- (PVC) container such as Polyolefin or Glass. - Pre-mixed Nexterone comes in GALAXY container (non-PVC + non-DEHP). - Pre-mixed IV bag = Stable longer. - Slow the infusion rate or DC if Hypotension or Bradycardia occurs.

ARRHYTHMIAS

GENERIC	BRAND	MOA	ADRs	BBW	C/I	NOTES
Dronedarone	Multaq	**Class 3: K+ Blockers** Additive QT-Prolongation Caution w/ (-) Inotropes Correct Electrolyte Imbalances Do NOT use Grapefruit juice, Ephedra or St. John's Wort	QT-Prolong SCr ↑ N/V/D Bradycardia	Increase risk of death in HF or A-fib Pts.	Pregnancy	AVOID CYP3A4 or drugs QT-prolong. Take with food
Sotalol (Non-Selective BB)	Betapace Sotylize Sorine		Bradycardia Palpitations Chest Pain Dizziness/Fatigue	Adjust dose w/ Creatine clearance QT-Prolong is directly related to concentration of Sotalol.	Sick Sinus Syndrome 2nd/3rd Heart Block Bradycardia Cardiogenic shock	CrCl 40-60: must ↓Frequency.
Dofetilide	Tikosyn					Hospital only
Ibutilide	Corvert		V-tachycardia QT-Prolong Hypotension	Fatal Arrhythmias	QT syndromes	Monitor: ECG, BP, HR.
Diltiazem	Cardizem	**Class 4: Non-DHP CCBs** Slow Ventricular rate	Edema HA/Dizziness Hypotension Arrhythmias HF Constipation (Verapamil) Gingival Hyperplasia			Only Non-DHP CCBs are used as Anti-Arrhythmic
Verapamil	Calan Covera Verelan					
Adenosine	Adenocard	*Restores NSR in PSVTs	Arrhythmias Facial flushing		2nd/3rd Heart Block Bradycardia SSS	
Digoxin	Digitek Digox Lanoxin	AV Node suppression: Enhances Vagal tone	Dizziness N/V/D/HA Mental disturbances	2nd/3rd Heart block K+/Mg+↓ or Ca+↑ = Toxicity ↑	V-Fib	- Tx Range = 0.8-2.0 - Toxicity: N/V, loss appetite, bradycardia Sx. - NOT 1st Line - Ineffective during exercise - ANTIDOTE = DigiFab

DIABETES

General Information

Type-1 Diabetes:
- Caused by autoimmune destructions of Beta-cells in Pancreas.
- PT cannot produce insulin.
- Genetic - mostly young
- MUST Tx w/ insulin.
- Most common & due to insulin resistance & deficiency.
- Linked to obesity, inactivity, family hx

Pre-Diabetes:
- Refers to increased risk for DM.
- Lifestyle changes needed.
- Metformin can be used.
- Annual monitoring req. & Tx of CVD risks are needed.
- NORMAL Test results should be retested every 3 years.

TYPE-2 Diabetes RISK Factors
- 1st degree relative
- Physical inactivity
- HTN
- Hx of CVD
- Race (non-whites)
- Overweight - BMI >25, >23 (Asians)
- HDL < 35
- LDL > 250
- A1C% ≥ 5.7
- Hx of Gestational DM
- Polycystic Ovary Syndrome

Signs/Symptoms

Hyperglycemia:	Hypoglycemia: (BG = <70)
Polyuria	Shakiness
Polyphagia	Irritability
Polydipsia	Hunger
Blurred vision	Headache, Dizziness
Fatigue	Confusion, blurred vision
	Weak/Sleepy
	Sweating (Diaphoresis)
	Fast Heartbeat, Anxiety

Lifestyle Modifications

1. Reduce weight, BP, cholesterol. *DASH Diet*
   a. Cholesterol control: any patient with diabetes and ASCVD or ASCVD risk >20% should receive a high-intensity statin.
   b. Blood pressure control: a goal BP of <130/80 mmHg is appropriate for patients with diabetes and ASCVD or ASCVD risk >15%.
2. Reduce calories to < 3500 to lose 1 pound a week.
3. Waist circumference < 35 inches (F) & < 40 inches (M).
4. Use Omega-3 FA (EPA/DHA) + Omega-3 Linolenic acid (ALA)
5. Type-1 DM PTs need to count carbs.
6. Moderate exercise 150 mins/wk at least 3 days/wk.
7. Vaccines (Flu, Pneumo, Hep-B)

Drugs affecting BG

Hyperglycemia	Hypoglycemia
BB's	Linezolid
FQ's	Lorcaserin (Belviq)
STATINS	Octreotide (Hyper too)
STEROIDS	Pentamidine
Diuretics	Quinine
Immunosuppressants *(Cyclosporine/tacrolimus)*	BB's (Propranolol/NSBB)
Niacin	FQ's
Protease Inhibitors	
2nd Gen Anti-Psychotics	

Complications of DM

Microvascular Complications:
- Retinopathy
- Kidney Disease
  - Use ACEi/ARB
- Peripheral Neuropathy
  - Duloxetine/Pregabalin (1st line)
  - Foot Care:
    - Inspect feet everyday
    - Clean & Trim them
    - NO bare foot walking.
    - Keep circulation to foot.
    - Keep away from Hot/Cold.
- Autonomic Neuropathy

Macrovascular Complications:
- CVD
  - ASCVD in DM is leading cause of death in pts
  - ADA recommends Empagliflozin & Liraglutide in PTs w/ longstanding DM + ASCVD (shown to decrease CVD & mortality)
  - Aspirin is not recommended for primary prevention. Recommended for secondary prevention in any patient with ASCVD
- CAD/PAD

ADA GUIDELINES For TYPE-2 Diabetes Tx

Monotherapy	Lifestyle Mod + Metformin (unless C/I)
Dual-Tx (start if A1C not at target after 3mons.)	Start if A1C is **≥ 8.5% at baseline** Select second drug based on pt comorbid risks: - **Patient has ASCVD:** choose drug with CV benefit, either a GLP-1 agonist (liraglutide, semaglutide or exenatide extended release) or an SGLT2 inhibitor (empagliflozin or canagliflozin). - **Patient has HF or CKD** (eGFR ≤ 60 mL/min/1.73 m2 or albuminuria): SGLT2 inhibitor (empagliflozin or canagliflozin). - **Patient has no ASCVD, heart failure or CKD:** choose a drug from any of the remaining medication classes.
Triple-Tx	MOST 3-drug combos are acceptable **EXCEPT:** - Metformin + DPP-4 + GLP-1 - Metformin + Basal insulin + SU
Combo Injection Tx (If BG ≥300 or A1C ≥10%)	Start basal insulin + bolus insulin OR GLP-1 agonist

1. If already on PO med → Switch to injectable
2. If on GLP-1 agonist → ADD Basal insulin
3. If Basal insulin optimally titrated → ADD GLP-1 or bolus insulin
4. Different MOA should be selected for COMBO Tx.
5. NEVER Sulfonylureas + Meglitinides together (Hypoglycemia)

Diagnosis Criteria

PRE-Diabetes
- Fasting Plasma Glucose (FPG) = 100 - 125 mg/dL
- 2-Hour Plasma Glucose = 140-199 after 75-gram OGTT
- A1C% = 5.7 - 6.4%

Diabetes
- Polyuria, Polydipsia, Polyphagia
- Random (RPG) = ≥ 200 mg/dL
- FPG ≥ 126 mg/dL (no meal for at least 8 hours)
- 2-Hour PG ≥ 200 after 75-gram OGTT
- A1C% ≥ 6.5%

ADA Treatment Goals

A1C% = < 7% (Q3Months)
Pre-Prandial = 80 - 130
Post-Prandial = < 180

Diabetes in Pregnancy:
FASTING = ≤ 95 mg/dL
1-Hr Post-Meal = ≤ 140 mg/dL
2-Hr Post-Meal = ≤ 120 mg/dL

Hypoglycemia Treatment

- Hypoglycemia may lead to seizure, coma, and death. Mostly d/t SU's, Meglitinides, & Pramlintide.

Treatment
1. Take 15-20 g of glucose.
2. Recheck BG in 15 mins.
3. If still hypo repeat step 1.
4. Once BG normal eat a small meal or snack to prevent recurrence.
5. GLUCAGON: Only given for risk of severe hypoglycemia. Give if PT is unconscious or not conscious enough to self-tx. Lay PT in recumbent position (side) & give 1 mg SC, IM, or IV. Check BG in 15 mins.

15grams of Simple Carbs: 3-4 Glucose tabs, 1 Serving of Gel tube, 2 tbsp of Raisins, 4 oz Juice or Soda (not diet), 1Tbsp of Sugar/honey, 8 oz (1 cup) of Milk

DIABETES

ORAL MEDS

GENERIC	BRAND	MOA	ADRs	BBW/Warnings	CONTRAINDICATION	NOTES
Metformin ***1st-Line in Type-2***	Glucophage Fortamet Glumetza Riomet	**BIGUANIDE:** ↓Glucose production (Gluconeogenesis) ↓Intestinal glucose absorption ↑Insulin sensitivity	N/V/D Flatulence Abdominal cramping	Lactic Acidosis Hepatic/Renal imp Intravascular Iodinated Contrast ETOH	eGFR < 30 (Do NOT start if eGFR 30-40)	- Take w/ FOOD - ETOH increase Lactic Acidosis risk - D/C before imaging procedure & restart 48 hrs after. - Leaves ghost shell in stool.
Repaglinide	Prandin	**<u>Meglitinides</u>:** ↑Insulin secretion ↓Post-Prandial BG	Weight gain HA URTI	Hypoglycemia Liver/Renal imp.	Type-1 DM DKA Gemfibrozil	- Take 15-30 mins BEFORE meal. - SKIP dose if skipping meal.
Nateglinide	Starlix					
Glipizide	Glucotrol	**<u>Sulfonylureas</u>:** ↑Insulin secretion ↓Post-Prandial BG (Glucose Independent)	Weight gain Nausea	Hypoglycemia G6PD Deficiency	Type-1 DM DKA Sulfa allergy	- ALL SU's 30 mins BEFORE Breakfast - Glipizide IR - 30 mins before meals. - Glyburide - Avoid renal imp.
Glimperide	Amaryl					
Glyburide	Glynase					
Pioglitazone	Actos	**Thiazolidinediones (TZD):** ↑Peripheral Insulin sensitivity PPAR - gamma receptors Effect transcription on cells so takes time - weeks to months.	Weight gain Peripheral Edema URTI Good lipid profile (HDL, TG's, TC)	Exacerbate HF/MI Hepatic failure Edema Urinary Bladder tumors	NYHA Class 3-4 HF	- Take w/o regard to meals - May take several weeks to work
Rosiglitazone	Avandia					
Canagliflozin	invokana	**SGLT-2 Inhibitors:** Reduce Glucose reabsorption in renal tubules + increase glucose excretion. 60-80 grams of sugar excreted Weight loss effect due to osmotic effect and sugar losing calories.	Weight Loss Hypoglycemia	↑ Risk of Leg/Foot amputations. Ketoacidosis Genital Mycotic Infxns Urosepsis Pyelonephritis Hypotension AKI Hyperkalemia (Capagliflozin)	eGFR < 30	- Caution: Diuretics, RAAS, NSAIDs. (Hypotension & AKI) - Monitor K+ (Capagliflozin) - Genital yeast infxns. - Dehydration due to urination. - Urinary Tract infxns - Leg/Foot amputations (Canagliflozin)
Empagliflozin	Jardiance					
Dapagliflozin	Farxiga					
Sitagliptin	Januvia	**DPP-4 inhibitors:** ↑Insulin resistance ↓Glucagon secretion	Nasopharyngitis URTI/UTI Peripheral Edema Rash	Acute Pancreatitis	Risk of Heart Failure (Saxagliptin & Alogliptin)	- Take in the morning. - May cause pain & inflammation in pancreas.
Saxagliptin	Onglyza					
Linagliptin	Tradjenta					
Alogliptin	Nesina					
Acarbose	Precose	Only used in SPECIFIC situations.	Flatulence Diarrhea Abdominal Pain			- Hypoglycemia can be Tx w/ Sucrose - Take with 1st bite of each meal.
Miglitol	Glyset					
Colesevelam	Welchol		Constipation			Binds to ADEK vitamins
Bromocriptine	Cycloset				Breastfeeding (Inhibits Lactation)	Do NOT use w/ Metoclopramide or other Dopamine agonists.

DIABETES

INJECTABLE MEDS

GENERIC	BRAND	MOA	ADRs	BBW/Warnings	CONTRAINDICATION	NOTES
Exenatide	Byetta	**GLP-1 Agonists:** ↑Insulin secretion ↓Glucagon secretion	Nausea V/D/Constipation Weight Loss	Thyroid C-cell tumors Pancreatitis Do not use in severe GI disease	Family Hx of Thyroid cancer	- Byetta & Adlyxin 60 mins BEFORE meal. - ALL others w/o regard for food. - Bydureon, Trulicity, Tanzeum 1x/wk (dosing)
Exenatide XR	Bydureon					
Liraglutide	Victoza Saxenda					
Dulaglutide	Trulicity					
Albiglutide	Tanzeum					
Lixisenatide	Adlyxin					
Pramlinitide	SymlinPen	Synthetic Amylin analogue	N/V/HA Weight loss Anorexia	Severe Hypoglycemia	Gastroparesis	- May be used in both TYPE 1 and 2 DM - Must REDUCE meal-time insulin by 50%.

INSULIN

GENERIC	BRAND	MOA	ADRs	BBW/Warnings	CONTRAINDICATION	NOTES
Aspart	Novolog	**RAPID-Acting Insulin:** AKA Post-Prandial or Meal-time Onset = 10 -30 mins Peak = 0.5 - 3 hrs. Duration = 3 - 5 hrs.	Weight Gain Lipodystrophy	Hypoglycemia Hypokalemia		
Glulisine	Apidra					
Lispro	Hunalog					
Afrezza	(Oral Inhalation Powder)			Acute Bronchospasm (Asthma/COPD)	Asthma COPD	NOT recommended in PTs who smoke.
Regular Insulin	Humulin-R Relion	**SHORT-Acting Insulin:** AKA Prandial or Meal-time insulin Onset = 15 -30 mins Peak = 2.5 - 5 hrs. Duration = 4 - 12 hrs.		Hypoglycemia Hypokalemia	Can be used in IV solutions. Available w/o prescription	Give 30 mins BEFORE meal
Concentrated Regular Insulin	Humulin R U-500	Onset = 15 -30 mins Peak = 4 - 8 hrs. Duration = 13 - 24 hrs.		MUST have Rx U-500 insulin syringe. NO dose conversions. Do NOT use other syringe.	Do NOT mix w/ other insulins.	*5x concentration of U-100. Recommended if PT req. >200 units/day
NPH Insulin	Humulin-N Novolin N Novolin-N Relion	**INTERMEDIATE- Acting Insulin:** Onset = 1 - 2 hrs Peak = 4 - 12 hrs Duration = 14 - 24 hrs		Hypoglycemia Hypokalemia	Available w/o Prescription.	- NPH insulins are CLOUDY. - Can MIX w/ Rapid or Short (draw up rapid/short 1st - Clear BEFORE Cloudy)
Detemir	Levemir	**LONG-Acting Insulin:** ONSET = 3 -4 hrs DURATION = 6 - 24 hrs				
Glargine	Lantus Lantus Solostar Basaglar Toujeo					Do NOT mix w/ other insulins.
Degludec	Tresiba					
Pre-Mixed Insullins	Novolog Mix 70/30 Humalog Mix 75/25 Humalog 50/50 Humalin 70/30 Novolin 70/30	Pre-Mixed Insulins			Available w/o Prescription	NPH & Protamine insulin is CLOUDY.

DIABETES

Insulin Dosing

Type 1

1. Use Basal Bolus strategy = Long-acting + Rapid-acting.
2. Start at Total Daily Dose (TDD) of 0.6 units/kg/day [ABW]
3. Divide TDD into 50% Basal & 50% Bolus (rapid).
4. Divide Bolus Rapid insulin over 3 meals.
5. Final regimen = 1 Basal + 3 Bolus.

Meal-time insulin may be adjusted based on CARBS in a meal.

- Use "Rule of 500" (Rapid) OR "Rule of 450" (Regular)

$$\frac{\mathbf{500\ or\ 450}}{\boldsymbol{TDD}} = \boldsymbol{g\ of\ carbs\ covered\ by\ 1\ unit\ of\ insulin}$$

- Correction Factor = Amount of insulin needed to return to Normal BG. May be added to regular Bolus insulin dose to cover carbs. (Rule of 1800 for rapid, Rule of 1500 for regular)

$$\frac{\mathbf{1800\ or\ 1500}}{\boldsymbol{TDD}} = \boldsymbol{correction\ factor}$$

- Correction dose = $\frac{\mathbf{BG\ now - Target\ BG}}{\boldsymbol{correction\ factor}}$

Type 2

Basal insulin is used for PTs who fail multiple PO agents.

1. Start Basal = 0.1-0.2 units/kg/day [ABW] **OR** 10 Units/day.
2. Dose is titrated 10-15% or 2-4 units weekly to reach Fasting Goal.
3. If A1C still remains above goal → ADD 1-3 Rapid bolus insulin doses
4. Use 1:1 (unit per unit) conversion of TDD when converting from different insulins.
   a. Except NPH BID → Glargine QD = Use 80% of NPH
   b. Toujeo QD → Lantus or Basaglar QD = Use 80% of Toujeo

Insulin General Info

1. MOST contain 100 units/mL
2. MOST contain 3 mL pens.
3. MOST delivery 1 unit/increment.
   a. EXCEPT U-500, 1 increment = 5 U OR Tresiba 200 U, 1 increment = 2 U.
4. ONLY rapid/short acting should be used w/ Insulin Pumps (delivers Continuous Basal & Bolus. NOT for NEW DM Pts.)
5. Needles are NOT included in Multi-Dose pens.
   a. Multi-Dose Products:
      i. FlexPen
      ii. KwikPen
      iii. FlexTouch
      iv. SoloStar
      v. Byetta
      vi. Victoza
      vii. Adlyxin
      viii. SymlinPen

Administration

1. Wash hands
2. Check for discoloration
3. Do NOT shake Suspensions
4. Invert Pens 4-5x
5. Clean injection sites
6. Dial units or add air in INJ.
7. Mixing = Clear before Cloudy
8. Abdomen is preferred site.
9. Rotate site of injxn.
10. Properly dispose.

Insulin Stability:

1. Refrigerated + unopened is stable until expiration date.
2. Stability of room temp varies. (from 12 days to 42 days, most commonly 28 days)

Hospitalized Patients

GOAL = 140-180 mg/dL

1. Use Sliding Scale Insulin (SSI) alone is NOT recommended.
2. Use basal, bolus, + correction.
3. Use Regular U-100 insulin.

Diabetic Ketoacidosis (DKA):	- Usually occurs in Type-1 DM. - Due to insulin Non-Compliance. - BG > 250 mg/dL - Ketones present "Fruity breath". - Anion Gap - Metabolic Acidosis - pH < 7.35 | Anion gap > 12
Hyperglycemia Hyper-Osmolar State (HHS):	- Usually occurs in Type-2 DM. - Ketones are absent. - BG > 600 mg/dL - Serum Osnolality > 320 mOsm/L - Extreme Dehydration. - Altered mental status - pH > 7.3 | Bicarb > 15 mEq/L
Treatment for both:	1. Fluids - NS until BG < 250 then change to D5W + ½ NS 2. Regular insulin infusion 3. Potassium to prevent Hypokalemia 4. Give Sodium Bicarb for acidosis Tx.

Factors to consider for treatment

Biggest A1C% Decrease (> 1%)	Insulin, Metformin, SU's, TZDs, GLP-1 agonist
Biggest Hypoglycemic Risk	Insulin, SU's, Meglitinides, Pramlintide
Weight Gain	Insulin, SU's Meglitinides, TZDs
Weight Loss	SGLT-2, GLP-1, Pramlintide
Cardiac Benefits	Empagliflozin, Liraglutide
Cheapest	Metformin, SU's, TZDs
Injection Formulations	Insulin, GLP-1, Pramlintide

Medications to avoid in specific situations

eGFR or CrCl < 30	Metformin, SGLT-2, Exenatide, Glyburide
Heart Failure	TZDs, Alogliptin, Saxagliptin
Peripheral Neuropathy, PAD, or Diabetic Foot Ulcers	Canagliflozin
Gastroparesis or GI disorder	GLP-1, Pramlintide
Sulfa allergy	SU's
G6PD deficiency	SU's
Lactic Acidosis	Metformin
Hepatotoxicity	TZDs, Alogliptin
Hypotension/Dehydration	SGLT-2
UTI/Genital infections	SGLT-2
K+ abnormalities	Canagliflozin (Hyper), Insulin (Hypo)
Pancreatitis	DPP-4, GLP-1
Ketoacidosis	SGLT-2
Cancer	Pioglitazone, Dapagliflozin, GLP-1

HUMAN IMMUNODEFICIENCY VIRUS

General Information

- HIV: RNA retrovirus attack CD4+ T-helper cells.
- Transmitted through blood, semen, vaginal secretions, pregnancy, birth, and breastfeeding.
- Anti-HIV Abs (HIV Ab) undetectable for 4-8 weeks.
- HIV p24-antigen will be present.

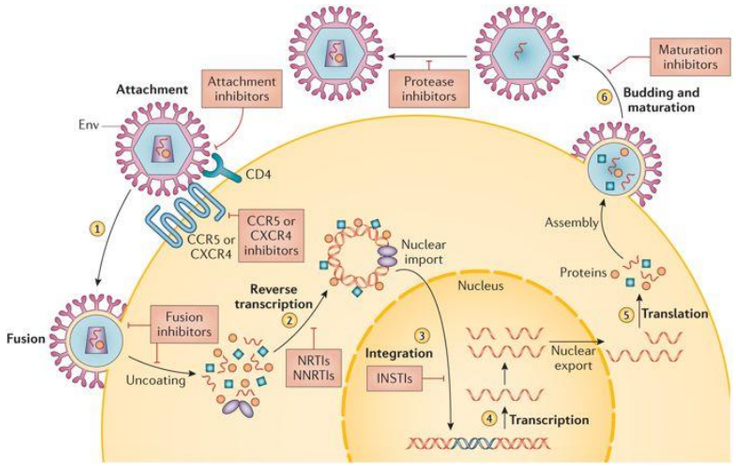
HIV SCREENING:
1. Combo HIV-Ab & p24-antigen immunoassay test.
2. P24-antigen is detected early than HIV-Abs.
3. If initial Test is + then perform confirmatory test for HIV-1/2

DIAGNOSIS:
- Both HIV immunoassay (ELISA) & Confirmatory test are +

"Home Access" & OraQuick OTC:
- Home tests for HIV Ab screen.
- Tests should only be use after 3 months (False Neg result before)

MONITOR:
1. CD4+ count.
2. Viral load - assess Tx response.
3. Tx GOAL = Undetectable viral load.

HIV Life Cycle



Stage 1	Stage 2	Stage 3	Stage 4
Attachment: HIV must attach to BOTH CD4-receptor & Co-receptor (CCR5 or CXCR4). *Drug Class Target:* CCR5-Antagonist	**Fusion:** Fusion of HIV envelope allows entry into host cell. →Uncoating →release HIV-RNA into cytoplasm. *Drug Class Target:* Fusion inhibitors	**Reverse Transcription:** Single-stranded RNA converts to double-stranded HIV DNA by Reverse Transcriptase. *Drug Class Target:* NRTI NNRTI	**Integration:** HIV DNA transported into nucleus & integrated into host DNA. *Drug Class Target:* INSTI

Stage 5	Stage 6	Stage 7
Transcription/Translation: HIV DNA transcribed & translated into new RNA virus + proteins.	**Assembly:** New RNA + viral proteins migrate to host cell-surface to form new immature HIV virus w/ Protease enzyme.	**Budding/Maturation:** Newly formed HIV virus buds off from cell to infect other CD4+ cells. *Drug Class Target:* Protease inhibitors

Anti-Retroviral Therapy (ART)

GOALS
1. To restore & preserve immune system.
2. Suppress HIV viral load to undetectable levels.
3. Reduce HIV-associated morbidity, prolong survival & prevent transmission.
4. ART is recommended to ALL HIV infected persons.
5. Reqs: Adherence rate of ≥ 95% in order to be effective long-term.

Complications of ART:
- NRTI: stop if Lactic Acidosis, Hepatomegaly, Steatosis
- NRTI + Stavudine: changes in fat distribution Lipodystrophy/Atrophy
- Protease Inhibitor: Diarrhea | Lipohypertrophy
- Fat accumulation in back & neck "Buffalo Hump"

Initial ART for most HIV-Tx Naïve Infected Patients:

INSTI-Based Regimen:
- Dolutegravir/Abacavir/Lamivudine
- Dolutegravir + Emtricitabine/Tenofovir Disoproxil Fumarate
- Dolutegravir + Emtricitabine/Tenofvir Alafenamide
- Raltegravir + Emtricitabine/Tenofovir Disoproxil Fumarate
- Raltegravir + Emtricitabine/Tenofovir Alafenamide

PI-Based Regimen:
- Darunavir + Ritonavir + Emtricitabine/Tenofovir Disproxil Fum.
- Darunavir + Ritonavir + Emtricitabine/Tenofovir Alafenamide

1. Use of Abacavir reqs test for HLA-B5701 allele. Do NOT use if +
2. Tenofovir Disoproxil Fumurate - Caution w/ Renal insufficiency.
3. Stribild should ONLY be started w/ Baseline CrCl ≥ 70.
4. Genvoya ONLY initiated w/ Baseline CrCl ≥ 30.
5. Lamuvidine & Emtricitabine are interchangeable.

Recommended Initial Regimens in Certain Clinical Situations:
- Elvitegravir/Cobicistat/Emtricitabine/Tenofovir Disoproxil Fumarate
- Elvitegravir/Cobicistat/Emtricitabine/Tenofovir Alafenamide
- Doravirine/lamivudine/tenofovir disoproxil fumarate (**DELSTRIGO**)
- Only in certain situations d/t risk of drug-drug interactions with cobicistat and a lower threshold for resistance with elvitegravir.

ART for HIV-Tx in Naïve Pregnant Women:
Regimen should include: 2 NRTI's + Boosted PI or INSTI. A pregnancy test should be done before.

START WITH EITHER
- Abacavir + Lamuvidine
- Tenofovir Disorpoxil Fumurate + Emtricitabine OR Lamuvidine

then ADD
- Atazanvir + Ritonavir
- Darunavir + Ritonavir

or ADD
- Raltegravir

Protease Inhibitor & BOOSTER Drug Interactions:

Ritonavir | Cobicistat | PI's
1. Be sure to LOOK for them on PT profile.
2. KNOW which combos contain these meds.
3. Of the PREFERRED Tx-Naive PT's remember:
   a. **Stribild | Genvoya** - contains Cobicistat
   b. Boosted **Prezista** - contains Darunavir + Ritonavir

Prophylactic Treatment

Pre-Exposure Prophylaxis - PrEP:
- Emtricitabine + TDF (Truvada)
- 1 Tab PO QD
- Follow up visits EVERY 3 Months

Non-Occupational Post-Exposure Prophylaxis - nPEP:
- MUST be given w/in 72hrs of exposure
- PREFERRED = INSTI-based: Truvada + Raltegravir or Dolutegravir.
- ALT = PI-base: Truvada + Darunavir.

Occupational Post-Expsure - PEP:
- Give w/in 72 hrs
- PREFERRED Tx: Raltegravir (Isentress) + Truvada (4-Week Course)

HUMAN IMMUNODEFICIENCY VIRUS

GENERIC	BRAND	MOA	ADRs	BBW/Warnings	CONTRAINDICATION	NOTES
Abacavir - ABC	Ziagen	**Nucleoside Reverse Transcriptase Inhibitors (NRTI):** - Results in DNA termination & stops viral DNA synthesis (Stage 3). - ALL have BBW for Lactic Acidosis + Severe Hepatomegaly w/ Steatosis. Zidovudine > Stavudine > Didanosine > Other NRTIs Key Features: 1. Renal dose adj. req. (except Abacavir) 2. NO CYP450 rxns.	**Abacavir:** N/V/HA Rash ↑LFTs/Lipids	Test for HLA-B5701 or face FATAL hypersensitivity rxns. Increased risk of MI	Hx of Hypersensitivity	
ABC + Lamuvidine	Epzicom					
ABC + Lamuvidine + Dolutegravir	Triumeq					
Lamuvidine - 3TC	Epivir		N/V/D HA	Do NOT use Epivir-HBV for HIV (contains lower dose)		
3TC + Zidovudine	Combivir					BID dosing
Emtricitabine - FTC	Emtriva		N/V/D/HA Rash Dizziness Insomnia Hyperpigmentation (Mostly in child palms/soles)	Exacerbation of HBV		Cap: 200mg QD
FTC + TDF	Truvada					1. ALL: take 1 Tab ONCE daily. 2. Take Atripla at BEDTIME + Empty stomach. Dose is 600mg QD 3. Genvoya, Odefsey, Stribild, Complera w/ FOOD.
FTC + Rilpivirine + TDF	Complera					
FTC + TDF + Elvitegravir + Cobicistat	Stribild					
FTC +TAF	Descovy					
FTC + TAF + Rilpivirine	Odefsey					
FTC + TAF + Elvitegravir + Cobicistat	Genvoya					
FTC + Efavirenz + TDF	Atripla					
Tenofovir Disporxil Fumarate TDF	Viread		N/V/D/HA Depression	NOT approved for HBV Tx.	Renal Toxicity Osteomalacia (↓BMD) Fanconi Sydrome	Dose: 300 mg daily Dispense in OG Container.
Tenofovir Alafenamide - TAF						
Zidovudine - ADV or AZT	Retrovir		Myopathy Macrocytic Anemia ↑ LFTs	Neutropenia Anemia		Monitor: MCV IV Zidovudine should be used during LABOR for HIV-infected pregnancy.
Stavudine - D4T	Zerit		N/V/D Peripheral Neuropathy Hyperbilirubinemia Lipoatrophy ↑ LFTs	Pancreatitis		Oral Solution: Stable for 30 days in FRIDGE. SHAKE vigorously.
Didanosine - DDL	Videx		N/V/D Peripheral Neuropathy ↑ Amylase	Pancreatitis (some Fatal)		Oral Solution: Stable for 30 days in FRIDGE. SHAKE vigorously. Take on EMPTY stomach.
Efavirenz - EFV	Stustiva Atripla	**Non-Nucleoside RT Inhibitors (NNRTIs):** Bind to RT Key features: - ALL CYP450 Inducers - Efavirenz = Inducer + Inhibitor - WATCH for Drug Interactions - Monitor: Erythema, Facial edema Skin Necrosis, Blisters/Swelling	CNS (confusion, abnormal dreams, dizziness, ↓concentration) Rash	Serious psychiatric sx (suicidal ideation/depression) CNS effects (resolves in 2-4 wks) QT-Prolongation Fetal Toxicity		↓Methadone Levels – watch for withdrawal ↓ contraceptive levels – unintended pregnancy
Rilpivirine - RPV	Edurant Complera Odefsey		Depressive Disorders Mood Changes Insomnia		Concurrent use PPIs Strong CYP3A4 Inducers	Take w/ FULL MEAL Keep in OG container
Nevirapine - NVP	Viramune		Rash (SJS/TEN) ↑LFTs	Hepatotoxicity Liver Failure/Death Serious Skin Rxn (SJS/TEN) Hypersensitivity	Do NOT start in Women: CD4 >250, Men: CD4 > 400	↓Methadone Levels – watch for withdrawal ↓ contraceptive levels – unintended pregnancy *Requires 14-day lead-in period to decrease rash & hepatotoxicity
Etravirine - ETR	Intelence		Rash (SJS/TEN)			Take AFTER meal
Doravirine	Pifeltro					
Enfuvirtide - T19	Fuzeon	**Fusion Inhibitor**	Local Injection Site rxn			Sub-Q injections BID

HUMAN IMMUNODEFICIENCY VIRUS

Darunavir - DRV	Prezista	**Protease Inhibitors:** - Inhibit Stage 7 - Should ONLY give w/ Cobicistat or Ritonavir Key features: 1. Names end in "navir" 2. CYP450 Inhibitors 3. NO Renal adj. 4. Metabolic Abnormalities (Lipids, Glucose) 5. ↑ CVD risk 6. GI upset (NVD) 7. Bleeding Events 8. ECG changes 9. Rash (SJS/TEN) Drug interactions: - Rifampin - St. John's Wort - Dronedarone, Amiodarone - Apixaban, Edoxaban, Xarelto, Ticagrelor - Alfuzosin - ↓INR in Warfarin PTs - Anti-Convulsants - ↓ Methadone = Withdrawal - ↓Contraceptives - ↑PDE-5 Level Toxicity - Lovastatin, Simvastatin (Rosuvastatin/Atorvastatin preferred)	N/V/D Rash ↑LFTs HA	SULFA allergy Drug-induced Hepatitis Srs Skin Rxns (SJS/TEN)		For Tx-Naïve = Take QD w/ Cobicistat or Ritonavir
DRV + Cobicistat	Prezcobix					Swallow whole w/ FOOD
Atazanavir - ATV	Reyataz		Hyperbilirubinemia (Jaundice, Scleral Icterus) Cholelithiasis N/V/D/HA Depression Myalgia Skin Rxns	PR-interval Prolongation Hyperbilirubinemia Nephrolithiasis Cholethiasis Hepatotoxicity Skin Rxns (SJS/TEN)	Atazanavir: Avoid Antacids (reduce absorption, ↓ levels)	Take QD w/ FOOD + H2O
ATV + Cobicistat	Evotaz					
Fosamprenavir - FPV	Lexiva		Rash	SULFA allergy		Oral Suspension = Take W/O food
Indinavir - IDV	Crixivan		N/V/D/HA	Nephrolithiasis, Urolithiasis		OG container w/ Desiccant to protect from Moisture Take w/ FOOD + 48 oz of H2O - due to Ritonavir component
Lopinavir + RTV	Kaletra		N/V/D ↑Lipids, ↑TG			For Tx-Naïve = Take QD or 400/100 mg BID Solution = Refrigerate + take w/ FOOD Contains 42% ETOH
Nelfinavir - NFV	Viracept		Diarrhea		NO Boosting w/ Ritonavir	Take w/ FOOD
Saquinavir – SQV	Invirase		Nausea V/D/HA			Take w/ FOOD or w/in 2hrs of full meal. Must be given w/ Ritonavir
Tipranavir - TPV	Aptivus		N/V/D	Clinical Hepatitis Hepatic Decompensation Intracranial Hemorrhage	SULFA allergy	Take w/ FOOD Must give w/ Ritonavir
Ritonavir	Norvir	**BOOSTERS:** ONLY used to boost other PI's. NOT interchangeable.	NVD	MANY Deadly Drug Interactions - Anti-Arrhythmics - Ergot Alkaloids - Sedatives/Hypnotics	Drug Interactions: CYP3A4 Alfuzosin, Amiodarone, Carbamazepine, Phenobarbital, Phenytoin, Dronedarone, Lovastatin, Rifampin, Simvastatin, St. John's Wort	Take w/ FOOD Solution = 43% ETOH
Cobicistat	Tybost					Take w/ FOOD
Elvitegravir - EVG	Stribild Genvoya	**Integrase Strand Transfer Inhibitors (INSTI):** Key features: 1. Names end in "teravir" 2. NO Renal adj. 3. NO CYP Rxns 4. Cation interaction (separate dose by 2 hrs BEFORE or 6 hrs AFTER) 5. Take w/o regard for meal (except Elvitegravir w/ food) 6. Interactions: Antacids, Multivitamins, Iron Supplements	Proteinuria HA/Insomnia	Stribild = 1 Tab QD CrCl < 70 = Do NOT start CrCl < 50 = D/C	Genvoya: 1 Tab QD CrCl < 30 = Do NOT start	
Dolutegravir - DTG	Tivicay Triumeq		HA/Insomnia ↑SCr w/o GFR effect			Dolutegravir should not be used in women who are pregnant or who might become pregnant due to a risk for neural tube defects in the infant.
Raltegravir - RAL	Isentress		Myopathy Rhabdomyolysis ↑CPK			Take BID Hemodialysis = 1200 mg daily (600 mg BID)
Maraviroc - MVC	Selzentry	**CCR-5 Antagonist:** Prevents HIV cell Entry		Hepatotoxicity		- MUST undergo Tropism Test before Tx - Will only work in PTs w/ CCR-5 Tropic disease. PT must be NEG for CXCR-4 or Dual/Mixed-Tropic

CHRONIC HEART FAILURE

General Information

- Heart not able to supply enough O2-rich blood to body.
- Impaired Ventricular filling/ejection of blood.
- Mostly due to damage from MI or long-term HTN.
- Labs: ↑BNP (norm <100 pg/mL)
  ↑NT-Pro BNP (norm <300 pg/mL)
- Medicare penalizes hospitals for excessive readmissions

ACC/AHA/HFSA Guideline

DIAGNOSIS:

1. CHF Sx due to systolic contraction/diastolic relaxation.
2. Echocardiography (ECHO)
3. LVEF = <40%

Signs & Symptoms

General Signs/Sx: Dyspnea (SOB), cough, fatigue, exercise capacity ↓

Left-Sided (Preserved)	Right Sided (Reduced)
- Orthopnea - Paroxysmal nocturnal dyspnea (PND) - Cough/SOB at night - Rales - Crackling sound - S3 Gallop - abnormal heart sound. - Hypoperfusion - renal imp. or cold extremities.	- Peripheral edema - Ascites - Abdominal fluid - JVD - neck vein distention - Hepatojugular Reflux (HJR) Neck vein distention when pressure applied abdomen. - Hepatomegaly - enlarged liver due to fluid congestion.

Ejection Fraction Ranges

55-70%	Normal	Normal
≥ 50%	HF + Preserved EF (HFpEF) Diastolic Dysfxn	Impaired Ventricle relax/filling during Diastole
40-49%	HF + Mid-range EF (HFmrEF)	Mixed Systolic/Diastolic Dysfxn
< 40%	HF + Reduced EF (HFrEF)Systolic Dysfxn	Impaired ability to eject blood during Systole

Drugs that worsen HF

- Anti-Arrhythmic: Procainamide, Quinidine, Amiodarone, Dofetilide
- Oncology (Anthracyclines): Doxorubicin, Daunorubicin
- NON-DHP CCBs: Diltiazem, verapamil
- NSAIDs, including celecoxib
- TNF-α inhibitors: Etanercept, Rituximab
- Thiazolidinediones
- Itraconazole
- Systemic steroids
- Amphetamines, illicit drugs, alcohol
- Triptans
- (Other oncology agents): Lapatinib, sunitinib, imatinib, trastuzumab, docetaxel

Pathophysiology

- CO = HR x SV
- CI = CO/BSA [CI = Cardiac Index] (related to CO to size of patient's body)

1. During low cardiac output neurohormones are released and increase BV & force/speed of contractions, leading to temporary increase in CO. Overtime this remodels the heart.
2. Cardiac Remodeling = involves RAAS, SNS, & Vasopressin.
3. RAAS + Vasopressin = Vasoconstriction + H2O retention.
4. SNS = Increase HR, Contractility (Inotropy), vasoconstriction.
5. Natriuretic Peptides - normally counteract hormones but are insufficiently expressed during this time.

Staging/Classification

ACC/AHA Staging	
A	High risk for developing HF but has no Sx or Structural heart Dx Ex. PTs w/ HTN, CAD, DM, Obesity, Metabolic syndrome
B	Structural Heart Dx but no Signs/Sx of HF. Ex. LVH, Low EF, Valvular Dx, previous MI.
C	Structural Heart Dx + Prior/Current Sx of HF
D	Advanced Structural Heart Dx + Sx of HF at rest despite medical Tx.

NYHA Classification	
1	No limits to physical activity - No Sx of HF
2	Slight limitation of physical activity. Comfy at rest BUT Sx occur w/ physical activity.
3	Marked limitation of physical activity. Comfy at rest BUT Sx caused by minimal exertion.
4	Unable to carry any physical activity w/o Sx of HF OR Sx occur at rest.

Non-Pharm Tx

1. Monitor body weight daily.
2. Sodium restrict <1500mg/day
3. Fluid restrict < 1.5-2 L/day
4. Stop smoking, ETOH, drugs.
5. Get flu/pneumo vaccines
6. Wt reduction - BMI < 30
7. Exercise
8. Notify PCP if weight increases 2-4 lbs/day OR 3-5 lbs/wk OR if Sx worsen (SOB, cough, wheeze, edema, more fatigue, pillow # Orthopnea.

Treatment

- Main PHARM Tx:
  - **ACEi, ARBs, or ARNI**
    - ALL Risk of Hyperkalemia
    - Combo w/ ARNI common
    - NEVER combine ALL 3
    - Use w/ NSAIDs worsens Renal Fxn
    - ACEi/ARBs = Lithium toxicity
  - **BB's**
    - ONLY 3 recommended in HF: Bisoprolol, Toprol XL, Carvedilol.
    - AVOID BB w/ ISA activity
    - STOP if Hypotension OR Hypoperfusion
    - MASKS Hypoglycemia Sx
    - Metoprolol IV:PO not EQ
    - Non-Selective BB: ↓ Insulin secretion = Hyperglycemia.
  - **Loop Diuretics**
- OTC Tx:
  - Omega-3 FA - 1 gram
  - Hawthorn
  - CO-Q10
  - Avoid Ephedra/Ephedrine (Decongestants)

Drugs Shown to ↓ Mortality

ACEi/ARBs	Recommended for EVERYONE
ARNI - Sacubitril/Valsartan (Entresto)	NYHA Class 2-4 PTs who have ↓EF
Beta-Blockers	Recommended for EVERYONE
Aldosterone receptor Antags (ARA's)	NYHA Class 2-4 PTs
Hydralazine OR Nitrates (BIDIL)	BLACK PTs NYHA Class 3-4 (Add to ACEi/ARBs) OR other PTs who CANNOT TOLERATE ACEi/ARB

Drugs with no mortality benefit (morbidity only)

Loop Diuretics	Reduce BV, edema, congestion - Most PTs need for Sx Relief
Digoxin	Provides small increase in CO to improve Sx
Ivabradine (Corlanor)	NYHA Class 2-3 w/ Normal Sinus rhythm + Resting HR ≥70 BPM

GENERIC	BRAND	MOA	ADRs	BBW/Warnings	CONTRAINDICATION	NOTES
Furosemide	Lasix	**LOOP Diuretics:** *Works on THICK Ascending Loop of Henle* Na+/Cl-/K+/Mg+/Ca+/H2O ↓	HCO3 (Alkalosis) Hyperuricemia (UA) Hyperglycemia (BG) TG's Total Cholesterol Orthostatic Hypotension Photosensitivity Ototoxicity (Tinnitus) Lithium Toxicity	Profound Diuresis leading to fluid + electrolyte depletion	Anuria Sulfa allergy AVOID NSAIDs (Na+/H2O) Cause retention Monitor renal fxn, fluid status, BP, electrolytes Audiology testing	- Furosemide INJ must be ROOM TEMP - May add to Thiazide if Loop isn't enough. (Metolazone) - DOSE CONVERSION PO Furosemide 40mg = Torsemide 20mg = Bumetanide 1mg = Ethacrynic Acid 50mg - FUROSEMIDE IV:PO = Ratio 1:2 20mg IV = 40mg PO
Torsemide	Demedex					
Bumetanide	Bumex					
Ethacrynic Acid	Edecrin					

CHRONIC HEART FAILURE

GENERIC	BRAND	MOA	ADRs	BBW/Warnings	CONTRAINDICATION	NOTES
Enalapril	Vasotec	**ACEi:** *Block Ang-1 → Ang-2* Vasoconstriction Aldosterone secretion Block Bradykinin degradation	Cough Dizziness Headache Rash	Pregnancy	Angioedema Use w/ Aliskiren Renal impairment Hyperkalemia Hypotension Wait 36 hrs for Neprilisyn (Sacubitril/Valsartan)	- Monitor: BP, K+, Renal Fxn, Signs/Sx of HF. - TITRATE to Target Dose - Can combine w/ ARAs - NEVER w/ ARB - BLACK = higher risk of Angioedema
Ramipril	Altace					
Lisinopril	Prinivil/Zestril/QBRELIS					
Quinapril	Accupril					
Captapril	Capoten					
Fosinopril	-					
Trandolapril	Mavik					
Candesartan	Atacand	**ARBs:** *Block binding Ang-2 -> AT1* RAAS ↓	LESS Cough (than ACEi) Dizziness Headache Rash	Pregnancy	LESS Angioedema Use w/ Aliskiren Renal impairment Hyperkalemia Hypotension NO Washout period	Monitor: BP, K+, Renal Fxn, Signs/Sx of HF. Can combine w/ ARAs NEVER w/ ACEi
Losartan	Cozaar					
Valsartan	Diovan					
Sacubitril/Valsartan	Entresto	**Angiotensin-Receptor + Neprilisyn Inhibitor (ARNI):** Degrade vasodilation peptides Adrenomedullin Substance P Bradykinin	Cough Dizziness	Pregnancy	Use with ACEi/ARNI Hx of Angioedema WASHOUT w/ ACEi (36 hours) Warning: Angioedema, Renal imp, Hyperkalemia, Hypotension.	Indication: PTs who cannot tolerate ACEi/ARBs. Monitor: BP, K+, Renal Fxn, Signs/Sx of HF.
Bisoprolol	Zebeta	**Beta-Blockers:** Block Catecholamines (NE) Vasoconstriction ↓ Improve Cardiac Fxn *Carvedilol = Non-selective	HR ↓ TG ↑ Hypotension Fatigue Dizziness Libido/Impotence	Abrupt Discontinuation TAPER off over 1-2 wks	Bradycardia 2nd/3rd Heart Block Sick Sinus Syndrome (Carvedilol - Hepatic Imp.) MASK Hypoglycemia Sx	ONLY 3 recommended in HF AVOID BB w/ ISA activity STOP if Hypotension OR Hypoperfusion Metoprolol IV:PO not EQ Monitor: BP, K+, Renal Fxn, Signs/Sx of HF.
Metoprolol Succinate ER	Toprol XL					
Carvedilol	Coreg (take with food)					
Spironolactone	Aldactone/CaroSpir (Non-Selective = Block Androgens)	**Aldosterone Receptor Antagonists:** DCT of Collecting ducts.	Hyperkalemia SCr ↑ Dizziness Spironolactone: gynecomastia/breast tenderness, impotence.	Spironolactone: Tumorigenic	Hyperkalemia Addison's Dx Anuria Renal Imp (CrCl <30)	- Do NOT initiate in HF PTs who: K+ >5 or SCr: >2.0 (F), >2.5 (M) - Monitor: BP, K+, Renal Fxn, Signs/Sx of HF.
Eplerenone	Inspra (Selective - No Endocrine Fx)					
Hydralazine + Isosorbide Dinitrate	BiDil	Hydralazine: **Arterial Vasodilator** Afterload ↓ Decreases Nitrate tolerance	HA Reflex Tachycardia Palpitations Fluid retention	WARNING: Drug-Induced Lupus Erythematosus (DILE)	CAD Mitral Rheumatic Heart Dx	Indication: 1. Cannot tolerate ACEi/ARBs 2. BLACK Class 3-4 w/ Sx despite Optimal Tx. Tachyphylaxis - Need 10-12 hr Nitrate-free period.
Isosorbide Mononitrate	Imdur/Monoket	**Nitrates:** NO causes Vasodilation Preload ↓	HA Dizzy/Lightheaded Flushing Hypotension Tachyphylaxis Syncope	Avanafil: wait 12 hrs Sildenafil: wait 24 hrs Vardenafil: wait 24 hrs Tadalafil: wait 48 hrs	CI: Use of PDE-5 inhibitors OR Riociguat	
Digoxin	Digitek/Digox/Lanoxin Tx Range HF: 0.5-0.9 ng/nL	**Inhibits Na+/K+ ATPase Pump:** + Inotropy ↑CO	Dizzy N/V/D/HA Mental Disturbances	WARNING: 2nd/3rd Heart Block TOXICITY: N/V, loss of appetite, Bradycardia	Ventricular Fibrillation Monitor renal fxn & electrolytes	Improves QOL, Sx, Exercise Tolerance Lower Dose in: Female, small size, renally imp. No mortality benefits K+↑/Mg+↓/Ca+↑ = ↑risk of Digoxin Toxicity.
Ivabradine	Corlanor	**HCN Blocker:** Blocks "Funny" (IF) current in Sinus Mode HR ↓	Bradycardia HTN AFIB Luminous Phenomena (Flashing lights)	Bradycardia QT Prolongation Arrhythmias	Acute Decompensated HF BP < 90/50 Sick Sinus Syndrome AV Block	Target Resting HR: 50-60 BPM Indicated for NYHA Class 2-3 w/EF <35 + Sinus Rhythm + HR > 70 BPM
Potassium Chloride	Klor-Con/Klor-Con M20 Micro-K	Supplementation: Counteract Loop diuretic loss of K+ and Arrhythmia risk w/ Digoxin.	N/V/D Hyperkalemia Flatulence Abdominal pain		Renal Imp/Hyperkalemia	Take with food - Micro-K: may open & sprinkle capsules. - K-Tab/Klor-Con: swallow whole. - Klor-Con M20: swallow whole OR cut 1/2 OR dissolve in 4 0z. H2O.

ANTICOAGULANTS

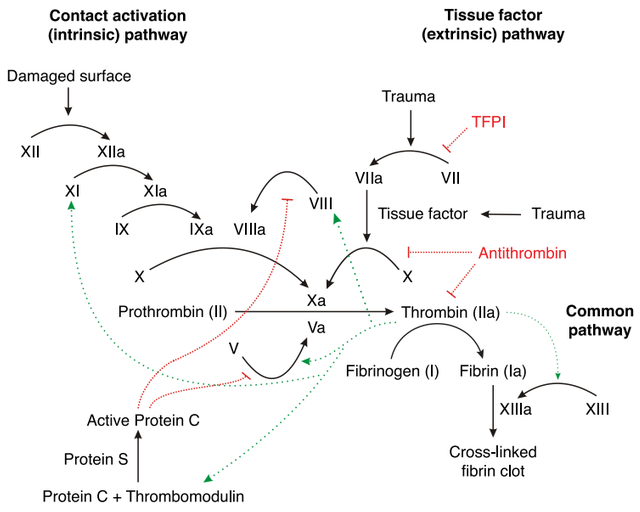
General Information

- CHEST Guidelines used for guidance
- Medications prevent clots but do NOT break down clots.
- Mostly used for ACS, Px of stroke & VTE, DVT, TIA, or PE.
- Anti-coags work by inhibiting the clotting cascade.
- Watch out for other drugs that increase bleeding.
- Red or black stools is a sign of bleeding so caution w/ use.
- HIGH-ALERT Meds: Anti-Coags cause bleeding so Joint Commission regulates protocols for ordering, dispensing, administration, monitoring, education.

Clotting-Cascade:

1. Activated by blood vessel injury, stasis, or pro-thrombotic.
2. Platelets and clotting-cascade activated until Fibrin is formed.

Clotting Cascade



Treatment

1. Anti-Coags (if contraindicated or there is a high risk for bleeding - Intermittent Pneumatic Compression (IPC) or Compression Stockings)
2. VTE should be treated for at least 3 months.
3. Estrogen meds + SERMs are contraindicated in VTE.
4. PT's w/o cancer - Dabigatran or Oral Factor Xa inhibitors are preferred over Warfarin for the 1st 3 months.
5. PT's w/ cancer - LMWH is preferred over all anti-coagulants.
6. PT's w/ Mechanical heart valve - Tx w/ Warfarin only.
7. PTs w/ Non-valvular AFIB - Tx according to CHADVASC system.

CHA_2DS_2-VASC Score

C - CHF = 1
H - HTN = 1
A - Age ≥75 = 2
D - Diabetes = 1
S - Stroke/TIA Hx = 2
V - Vascular Dx = 1 (Prior MI, PAD, CAD, plaque)
A - Age 65-74 = 1
S = Sex (Female) = 1

Score = 0, no anti-coag rec.
Score = 1, ASA considered
Score = 2, OAC rec. (warfarin, Xarelto, Eliquis, or Pradaxa)

VTE Risk Factors

Surgery
Major trauma
Immobility
Cancer/Chemo Tx
Previous VTE
Pregnancy
EPO Agents
Estrogen Meds
SERMs

Heparin Induced Thrombocytopenia

Heparin-Induced-Thrombocytopenia (HIT):

- Immune-mediated IgG drug rxn associated w/ thrombosis.
- IgG AB's complex bind w/ Heparin & bind to FC-receptors → Platelet activation → Pro-Thrombotic state.
- DIAGNOSIS: unexplained Platelet drop (> 50% drop from baseline)
- Management:
  1. STOP all forms of Heparin/LMWHs.
  2. D/C Warfarin & administer Vitamin-K.
  3. Argatroban is recommended.
  4. Bivalirudin is preferred for Cardiac Surgery or PCI.

GENERIC	BRAND + Dosing	MOA	ADRs	BBW	C/I	NOTES
Unfractionated Heparin	UFH: (ABW) VTE Px = 5,000 units SC Q8-12H VTE Tx = 80 U/kg IV bolus → + 18 U/kg/hr IV infusion. ACS/STEMI = 60 U/kg IV bolus → 12 U/kg/hr infusion.	1972-6: Binds to Anti-Thrombin (AT) → inactivates Thrombin (2a, 10a, 9a, 7a, 6a + Plasmin) → prevents conversion of Fibrinogen → Fibrin.	Bleeding Thrombocytopenia HIT Hyperkalemia Osteoporosis (long-term use)	Fatal dosing errors so verify that concentration is correct. SAFETY NOTE: Heparin Lock-Flush used for keeping open IV lines are dosed 10-100 Units. Careful w/ mistaking for UFH injections.	Active Bleed (ex. ICH) Hx of HIT Thrombocytopenia Pork allergy Caution in babies/pregnancy	- HIT antibodies sensitive to LMWH - Antidote = Protamine 1mg Protamine for 100 U of UFH, Max dose=50 - Response is unpredictable. - MONITOR: aPTT q6H til 1.5-2.5x Baseline, Anti-10a Level = 0.3-0.7, Platelets, Hgb, Hct daily
Enoxaparin (Injections - Do NOT expel air bubble in syringe before injections unless PCP has advised you to do so.)	**Lovenox** VTE Px = 30 mg SC Q12H or 40 mg SC daily. CrCl <30 = 30 mg SC QD VTE/UA/N-STEMI Tx = 1 mg/kg SC Q12H or 1.5 mg/kg SC QD CrCl <30 = 1 mg/kg SC QD STEMI Tx = 30 mg IV Bolus + 1 mg/kg SC PT >75 yo = 0.75 mg/kg SC Q12H no bolus - MAX 75 mg. PCI = if last dose given 8-12H before balloon inflation → Give 0.3 mg/kg IV Bolus	**LMWH:** Bind to AT w/ more affinity for Factor 10a + 2a.	Bleeding Anemia Thrombocytopenia Hyperkalemia LFTs	Spinal punctures (Epidural) is a risk for Hematomas or Paralysis.	Active Major Bleed Hx of HIT Pork allergy	- Monitoring Anti-10a not req. - Antidote = Protamine. - MONITOR: Platelets, Hgb, Hct, SCr, Anti-10a only for Pregnancy Q4H Post-dose - aPTT NOT used.
Dalteparin	**Fragmin** VTE Px = 2,500-5,000 SC QD UA/STEMI = 120 U/kg SC Q12					
Fondaparinux	**Arixtra**	Indirect injectable synthetic pentasaccharide selectively inhibits Factor 10a via AT. (Off-label use for HIT)	Bleeding Anemia	1. Spinal punctures (Epidural) is a risk for Hematomas or Paralysis. 2. Pre-mature D/C = Thrombosis risk. 3. Edoxaban: do NOT use in CrCl > 95	Active Pathological Bleed (no antidotes available) Caution in pregnancy Monitor: Hgb, Hct, SCr, LFTs, no efficacy monitoring needed	- CrCl < 30 = do NOT use
Apixaban	**Eliquis** DVT/PE = 10mg PO BID x 7 days then 5mg PO BID.	**Direct Factor Xa inhibitors**				- Avoid Dual inducers (3A4 + P-gp) - When switching from warfarin = INR <2
Betrixaban	Bevyxxa					
Edoxaban	**Savaysa** DVT/PE: 60mg daily started after 5-10 days of parenteral use.					- When switching from warfarin = INR ≤2.5
Rivaroxaban	**Xarelto** DVT/PE: 15mg PO BID x 21 days then 20mg PO daily, with food Take missed doses immediately even two 15 mg tabs for 30 QD. AFIB = 15mg QD w/ evening meal.					- Avoid Dual inducers (3A4 + P-gp) - When switching from warfarin = INR <3
Dabigatran	**Pradaxa** DVT/PE: 150mg BID start after 5-10 days of parenteral coags. Take w/ FULL glass of H2O. Do NOT chew, crush. Open.	**Direct Thrombin (Factor 2a)**	Dyspepsia Gastritis-like Sx Bleeding + GI bleed	Spinal punctures (Epidural) is a risk for Hematomas or Paralysis.	Active Bleeding Prosthetic Heart Valves	- Take missed doses immediately unless within 6 hrs. - Antidote: Idarucizumab (Praxbind) - Keep in OG container & discard 4 mon. after opening. - Do NOT give by NG-Tube. - No need to monitor efficacy - When switching from warfarin = INR <2
Argatroban (IV/SC)			Bleeding Anemia Hematoma		Active Major Bleed	- Indication: undergoing PCI. - Used in PTs w/ Hx of HIT. - NO cross-rxn w/ HIT AB's.
Bivalirudin (IV/SC)	Angiomax					
Desirudin	Iprivask					-

ANTICOAGULANTS

GENERIC	BRAND + Dosing	MOA	ADRs	BBW	C/I	NOTES
Warfarin (R+S Enantiomers) S-enantiomer = More Potent	**Coumadin** **Jantoven** Normal Dose = 10mg daily Adjust dose per INR values Low Dose = 5mg or Less elderly, malnourished, liver dx, HF, ↑risk of bleed, or drugs/food affecting INR.	**Competitive inhibitor of VKORC1:** Reduces Vitamin-K epoxide & depletes active clotting factors 1972 + Protein C + S	Bleeding Skin Necrosis Purple-Toe syndrome	Major/Fatal Bleeding WARNING: Tissue necrosis/Gangrene HIT 2C9*2 or *3 alleles VKORC1 Polymorphism	Pregnancy - Except for Mechanical Valve Bleeding Traumatic surgery Carditis Blood dyscrasias Uncontrolled HTN	- Antidote = Vitamin K. - MONITOR Goal INR = mostly 2 - 3 Mechanical heart valves = 2.5-3.5

Warfarin Drug/Food Interactions

Warfarin Drug Interactions:	AVOID: (Increase risk of bleeding, No INR effect)	Herbal/Natural Products: (↑Bleeding, NOT INR)	↓Warfarin Efficacy:	Vitamin-K = ↓ INR:
- CYP2C9 Inducers ↓ INR: Rifampin - CYP2C9 Inhibitors ↑ INR: Amiodarone (decrease 30-50%), Azoles, Metronidazole, TMP/SMX	- NSAIDs - Anti-Platelets - Anti-Coagulants - SSRIs - SNRIs	- Garlic - Ginger - Ginko - Ginseng - Glucosamine - Grapefruit	- Alfalfa - Green Tea - Co-Q10 - St. John's Wort	- Green Leafy Vegetables - key is to stay consistent.

Key Points

1. Healthy PTs get 10 mg daily for 1st 2 days then adjust per INR
2. DVT/PE: start Warfarin same day as Parenteral Anti-Coags (Enoxaparin or UFH) & continue both for a minimum of 5 days & until INR is ≥ 2 for at least 24 hrs. BOTH criteria MUST be met.
3. Stable INR Pts may have INR testing every 12 weeks instead of 4.
4. STOP Warfarin 5 days before major surgery.
5. PTs w/ mechanical heart valve, AFIB, or VTE need Bridging Therapy w/ LMWH or UFH. (PTs at Low risk for thromboembolism do not require bridging).

Please Let Greg Brown Bring Peaches To Your Wedding

Reversal

1. Vitamin-K (2.5 - 5mg) preferred unless significant or major bleed.
2. AVOID SC/IM administration.
3. IV injection ONLY when serious bleed is occurring because of risk of Anaphylaxis, must infuse slowly.

- INR: 4.5-10 w/o bleed = Do not give Vit-K, HOLD 1-2 Warfarin doses.
- INR > 10 w/o bleed = PO Vit-K 2.5-5mg.
- Major Bleed = IV Vit-K.

Reversal Agents

GENERIC	BRAND + Dosing	MOA	ADRs	BBW	C/I	NOTES
Protamine	Protamine 1mg will reverse 100 Units of Heparin	Stable Salt Complex	Hypotension Bradycardia Flushing	Hypotension Cardiovascular Pulmonary		
Idarucizumab	Praxbind	Dabigatran Antidote	HA Delirium Constipation	WARNING: Thromboembolic risk		
Vitamin-K (Phytonadione) PO/IV only	Mephyton	Provides vitamins for Liver synthesis of clotting factors.	Anaphylaxis Flushing Rash Dizziness	Severe allergic rxns		SC not recommended due to Variable Absorption. IM not recommended due to risk of Hematoma.
4-Factor Prothrombin Complex Concentrate	Kcentra Bebulin Profilnine	Human prothrombin Indicated for URGENT reversal of Warfarin.	N/V/D/HA	Thromboembolic events	Disseminated Intravascular Coag (DIC) Known HIT	MUST administer Vitamin-K concurrently

GASTROESOPHAGEAL REFLUX DISEASE

General Information

- Lower Esophageal Sphincter (LES) usually protects from acidic gastric contents
- PT's w/ GERD have reduced LES pressure.
- Gastric contents backflow into the esophagus.
- GERD can decrease QOL leading to erosion, strictures, bleeding, Barrett's esophagus (abnormal cell growth) leading to cancer.
- PT's w/ ALARM Sx who do NOT respond to OTC products after 2 weeks should see PCP.
- Infrequent heartburn Tx w/ Antacids or H2RA's PRN

Signs & Symptoms

Heartburn
Hypersalivation
Regurgitation
Epigastric pain
Nausea
Cough
Sore throat/Hoarseness
Chest pain

Alarm Sx:
Odynophagia (pain swallowing)
Dysphagia
N/V
Hematemesis
Black bloody stools
Weight loss

Diagnosis

Sx ≥ 2x/week
Risk Factors:
- Family Hx
- Diet
- Sleep position

Invasive testing NOT required when typical Sx present.

Treatment Algorithm

Lifestyle Mods:	Weight Loss Elevation of Bed Avoid High Fat meals 2-3 hrs before bedtime. Avoid foods/beverages that trigger reflux: Caffeine, chocolate, acidic/spicy foods, carbonated beverages
Initial Tx:	PPI Once Daily for 8 weeks: May increased to BID for partial response of Nocturnal Sx. STOP Tx at 8 weeks → Sx still present → Maintenance Tx
Maintenance Tx:	1st Line: PPI at lowest effective dose. Alt Tx: H2RA if no erosive Sx & relieves Sx. NOT Recommended: Metoclopramide or Sucralfate.

Drugs w/ Decreased Absorption w/ Antacids, H2RAs, PPIs ----Separate by 2-4 hrs BEFORE or 2-6 hrs AFTER----

Anti-Retrovirals Delavirdine Rilpivirine Atazanavir	Dolutegravir Elvitegravir Raltegravir	Iron Products	FQ's
Anti-Virals Ledipasvir Velpatasvir Sofosbuvir	Bisphosphonates	Mesalamine	Sotalol
Azoles Itra, Keto, Posa	Isoniazid	Risedronate DR	Steroids + Thyroid products
Cephalosporins Cefditoren Cefpodoxime Cefuroxime	Mycophenolate	Tyrosine Kinase inhibitors	Tetracyclines

Avoid completely: Delavirdine, Dasatanib, Pazopanib, Erlotinib, Rilpivirine Velpatasvir/Sofosbuvir (Epclusa), Risedronate (Altevia), Erlot

GENERIC	BRAND	MOA	ADRs	BBW	C/I	NOTES
Calcium Carbonate	Tums	**Antacids:** Neutralize gastric acid → pH ↑ Do NOT req. Systemic Absorption Provide relief in minutes. Duration = 30 - 60 mins May req. 4-6x/day dosing.	Unpleasant Taste Constipation Bloating Belching Hypophosphatemia Loose stools	NOT recommended in CrCl < 30 Al+ & Mg+ accumulates Renally		- Pregnancy: use Ca+ products - Antacids - last 30-60 min: Mg+ = diarrhea Al+ = constipation.
Magnesium	Phillip's Milk of Magnesia (MOM)					
Magnesium & Al+/Ca+	Mylanta Supreme Gaviscon Rolaids					
Mg + Al + Simethicone	Maalox Mylanta Classic					
Sodium Bicarb + ASA	Alka-Seltzer					- Alka-Seltzer = Antacid + ASA: may cause serious bleeding.
Famotidine	Pepcid	**H2RA's:** Reversibly inhibit H2 receptors. ↓ Acid secretion. Less long-term S/E than PPI. Take 30-60 mins before meal.	Headache Vomiting in Child < 1yo Cimetidine – Gynecomastia, Impotence, SCr ↑	Confusion (Reversible) Risk Factors: Severely ill, Renal or Hepatic imp.	- AVOID use in Elderly w/ Delirium, Dementia, or Cognitive Imp. due to CNS Fx - Tachyphylaxis (Tolerance) - Decrease Dose: Cimetidine = < 30 CrCl Others = < 50 CrCl	- ECG/QT-prolong
Ranitidine	Zantac					- ↑ ALTs
Cimetidine (2C19 inhibitor)	Tagamet					- AVOID USE
Nizatidine						-
Dexlansoprazole	Dexilant	**PPI's:** Irreversible H+/K+ ATPase Pump inhibitor Blocks gastric acid secretion MOST effective agents 8-week course at Lowest Fx dose for maintenance Tx.	N/D/HA Thrombophlebitis (IV Protonix) SJS/TEN (IV Protonix)	C. Difficile (CDAD) Osteoporosis Fractures Hypomagnesemia Vitamin B12 def. Nephritis SLE GI infections Pneumonia	2C19 Inhibitors will ↓ Clopidogrel effect Do NOT use Nelfinavir ↑ Methotrexate toxicity	- Take w/o regard to meals.
Esomeprazole	Nexium					- 30-60 mins before Breakfast - Rabeprazole Capsules can be sprinkled into Apple Sauce - Pantoprazole & Esomeprazole are only PPIs available IV.
Lansoprazole	Prevacid Prevacid SoluTab: contains Aspartame - NOT use in PKU.					
Omeprazole	Prilosec					
Pantoprazole	Protonix					
Rabeprazole	Aciphex					- Can control Nocturnal sx if taken at Bedtime.
Omeprazole + Sodium Bicarb	Zegerid					
Metoclopramide (Used w/ co-existing Gastroparesis)	Reglan Metozolv ODT	**Dopamine Antagonist:** ↑ Gastric Emptying	Drowsiness Restlessness Fatigue HTN Pro-Arrhythmic Diarrhea	BBW: Tardive Dyskinesia WARNING: Depression EPS Acute Dystonia Parkinson-like Sx Neuroleptic Malignant Syndrome (NMS)	CrCl <40 = ↓ Dose 50% CNS effects are dose-related + Elderly AVOID use in Parkinson's AVOID Anti-Psychotics	- Take QID before Meals + Bedtime - Food must be in gut - do NOT use ETOH or heavy machinery.

PEPTIC ULCER DISEASE

General Information	Signs & Symptoms	H. Pylori		NSAIDs Induced Ulcers	
- Ulcerations in Duodenum & stomach. ○ H. Pylori - Ulcers: Gram (-) Spirochete ○ NSAID-induced ulcers ○ Stress ulcers (Occur in Critical illness or Mechanically ventilated) ○ Less common causes: Zollinger Ellis Sx (ZES), viral infections, radiation therapy, Crohn's Dx	Dyspepsia Gastric pain (Middle/Upper stomach) Eating lessens the pain. NSAIDs worsen pain. Heartburn Belching Bloating/Cramping Nausea Anorexia	Diagnosis: 1. Urea Breath Test (UBT) 2. Fecal Antigen test (D/C PPIs, Bismuth, Abx 2 weeks prior to tests (FN))	Treatment: 1st Line = QUADRUPLE Tx 10-14 Days Triple Tx is ONLY 1st line if Clarithromycin resistance rates are low & PT has no Hx of other Macrolide use.	Treatment: COX-2 Selective = ↓ GI Risk (↑CVD risk) Celecoxib Meloxicam Nabumetone Diclofenac Etodolac Yosprala: Combo ASA + Omeprazole	Risk Factors: Age >60 Hx of PUD NSAID high dose Using >1 NSAID Anti-Coag, Steroid, SSRI

1st line QUAD Therapy: Take 10-14 days

Therapy	Notes
PPI BID or Nexium 40mg QD	H2RA ok to sub-in if intolerant to PPI
Bismuth Subsalicylate 300mg QID	Pylera (Bismuth Subcitrate) + PPI = 3 in 1
Metronidazole 250-500mg QID	No ETOH Ok to substitute for Tinidazole
Tetracycline 500mg QID	Avoid Pregnancy + Child <8 yo

Alternative 1st Line QUAD Tx: Take 10-14 Days

PPI BID or Nexium 40mg QD	Tinidazole may be subbed for Metronidazole
Amoxicillin 1000mg BID	
Clarithromycin 500mg BID	
Metronidazole 500mg QID	

Triple Drug Tx: Take 10-14 Days (Conditional, refer above)

PPI BID or Nexium 40mg QD	If PCN allergy: replace Amoxicillin w/ Metronidazole TID or use Quadruple Tx.
Amoxicillin 1000mg BID	
Clarithromycin 500mg BID	

Prevpac – blister card containing all three medications

1. Do NOT Substitute Regimens **2. No H2RAs unless PPI intolerant.** **3. No switching ABX.**

GENERIC	BRAND	MOA	ADRs	BBW	CONTRAINDICATION	NOTES
Misoprostol (Alternative for PPI)	Cytotec	Prostaglandin E1 Analog	Diarrhea Abdominal pain	Abortifacient - Avoid in Pregnancy		
Sucralfate	Carafate	Sucrose-Sulfate-Aluminum Complex	Constipation	Caution in Renal imp.		Drink fluids + laxatives for constipation.

CONSTIPATION

General Information	Non-Pharm Tx	Treatment	Colonoscopy Prep	Drug Induced Constipation
- **AGA Guidelines** - Defined as Infrequent/No bowel movements over 3 days or straining, lumpy/hard stool, incomplete evacuation, pushing for >10 mins. - Caused by lifestyle, drugs, GI disorders, pregnancy. - Medical Condition Causes: ○ IBS-C ○ Anal disorders ○ Multiple Sclerosis ○ Cerebrovascular Accidents (CVA) ○ Parkinson's Dx ○ Spinal Cord tumors ○ Diabetes ○ Hypothyroidism - Unknown Cause = Idiopathic - Lifestyle modification is preferred for tx - IBS-C: idiopathic constipation is frequent & associated w/ chronic recurring abdominal discomfort that is relieved by defecation.	Increase Fluid intake Limit Caffeine/ETOH Physical activity Diet Avoid delaying defecation	• **1st Line** = gradually increase Fiber (Psyllium) ○ DOC for Pregnancy. • Osmotic agent (MOM or PEG) or stool softener (Docusate) ○ Avoid MOM in Renal imp. **Adults**: Fiber (Metamucil) **Opioids**: Must use Stimulants (Senna or Bisacodyl) +/- Docusate **On Fe+ or Hard Stools**: Docusate **Need Immediate Relief**: Glycerin Suppository **Children**: Glycerin Suppository	1. PEG (GoLytely) 2. Sodium Phosphates ○ Causes fluid + electrolyte abnormalities so risky for Renal or Cardiac Dx. ○ caution w/ Loop diuretics + NSAIDs	AI+ containing acids - Mg+ counteracts Anti-cholinergic - TCAs, Anti-Histamines, Phenothiazine, Anti-Spasmodic NON-DHP CCBs Bismuth Clonidine Aripiprazole Milnacipran Colesevelam Iron Opioids Sucralfate 5HT-3 (Ondansetron) Tramadol/Tapentadol Phentermine/Topiramate

GENERIC	BRAND	MOA	ADRs	BBW	CONTRAINDICATION	NOTES
Psyllium Calcium Polycarbophil Methylcellulose	Metamucil FiberCon Citrucel	**Bulk-Forming Agents:** Create Gel-Matrix Soaks up fluid in loose stools	Gas/Bloating Bowel Obstruction Choking (take w/ fluid)		Fecal impaction GI obstruction	Take 2 hrs apart other Meds. Req. Adequate Fluids
Magnesium Hydroxide	Milk of Magnesia (MOM)	**Osmotics:** Retains fluid in bowel lumen Increase fluid secretion to small intestines -> Peristalsis	Electrolyte Imbalance Gas Dehydration Rectal irritation (Supp)		Anuria (Sorbitol) Low Galactose Diet (Lactulose) GI obstruction (MiraLax)	Mg+ caution w/ Renal imp. Suppository – take 30 min after meal
Polyethylene Glycol (PEG)	Miralax Gavilax Glycolax					
Glycerin	Pedia-Lax Sani-Supp Fleet					
Sorbitol						
Lactulose	Constulose Enulose Kristalose Generlac					
Senna	Ex-Lax Senokot	**Stimulants:** Stimulant Colonic Neurons → Peristalsis	Abdominal Cramping Electrolyte Imbalance Rectal Irritation (Supp)	Avoid if stomach pain, N/V, sudden change in bowel movements.	Abdominal Pain Obstruction Appendicitis (Senna) N/V (Bisacodyl) Colitis Ulcerosa	- Opioid use requires stimulants. - Oral formulations - Take at Bedtime - Suppository – take 30 min after meal
Bisacodyl	Dulcolax					
Docusate Sodium	Colace	**Emollients:** Soften Fecal mass			Abdominal Pain N/V Use w/ Mineral Oil	- Preferred to avoid Straining. - For Hard +/- Dry stools.
Mineral Oil		**Lubricant:** Coats waterproof film			Age <6 yo Pregnancy Bedridden Aspiration risk Elderly Difficulty Swallowing	Usually NOT recommended due to safety Aspiration concerns
Lubiprostone	Amitiza	**Activates Cl- channels**	N/D/HA Hypokalemia		Bowel Obstruction	
Alvimopan	Entereg	**Peripheral Mu-Opioid Antagonist: (PAMORAs)**	Hypokalemia Dyspepsia Anemia Urinary Retention	Risk of MI long-term use	PTs taking Opioids > 7 Days	

CONSTIPATION

GENERIC	BRAND	MOA	ADRs	BBW	CONTRAINDICATION	NOTES
Polyethylene Glycol (PEG)	Colyte Gavilyte GoLytley MoviPrep NuLtyely TriLyte	**Osmotics** Used for Whole Bowel Irrigation (Bowel Prep)	N/V Abdominal discomfort Bloating Electrolyte Abnormalities Arrhythmias Seizures	Nephropathy (OsmoPrep)	Ileus Obstruction/Perforation Gastric Retention Toxic Colitis Megacolon OsmoPrep: - Phosphate - Nephropathy - Gastric Bypass - Stapling surgery PrePopik: - Renal/Liver imp - CHF	- Clear Liquid diet consumed day prior to Colonoscopy. - Do NOT Consume: ○ Red/Blue/Purple coloring ○ Milk ○ Cream ○ Tomato ○ Orange ○ Grapefruit Juice ○ ETOH ○ Solid or Semi-solid Foods
Sodium Picosulfate + Magnesium Oxide + Citric Acid	Prepopik					
Sodium Phosphates	Fleet Enema OsmoPrep					
Linaclotide	Linzess	**Guanylate Cyclase-C Agonist**	Diarrhea Abdominal Distention Flatulence Headache	Death due to Dehydration AVOID in Pediatrics	Age < 6 yo GI Obstruction	
Plecanatide	Trulance					

DIARRHEA

General Information	Drug Induced Diarrhea		Irritable Bowel Syndrome (IBS)
- Most cases are due to viruses but E. coli is common bacterial cause. - Must rule out Lactose-Intolerance due to Milk products. - NON-PHARM Tx = Fluids + Electrolytes ○ Ex. Oral Rehydration Solution (ORS), PediaLyte, Gatorade. - Bismuth-Subsalicylate (Pepto-Bismol) or Loperamide for Sx relief. ○ ONLY for PTs w/ Non-infectious diarrhea.	Mg+ Antacids Clindamycin/Erythromycin Anti-Neoplastics Colchicine	Laxatives Metoclopramide Misoprostol Quinidine	Treatment options: Loperamide or Rifaximin (Xifaxan) Alosetron (Women only)

GENERIC	BRAND	MOA	ADRs	BBW	CONTRAINDICATION	NOTES
Bismuth subsalicylate	Pepto-Bismol	**Antidiarrheal**	Black Tongue/Stool Salicylate Toxicity (Sx = N/V, ↑ RR, Tinnitus, Diaphoresis)		Salicylate Allergy Other Salicylate use Black/Bloody stool Coagulopathy	Caution Child/Teen with viral infxn (Flu/Chicken Pox) due to Reye's Syndrome.
Loperamide	Imodium A-D Loperamide A-D		Abdominal Cramping Constipation Nausea QT-Prolong	Torsade's De Pointes Cardiac Arrest/Death occurs	Dysentery Colitis Abdominal pain w/o Diarrhea	4 mg PO after 1st loose stool then 2 mg after each loose stool - MAX Dose = 16 mg/day - No self-tx >48h of symp.
Diphenoxylate/Atropine (Sched = C-5)	Lomotil		Sedation Constipation Urinary Retention Blurred Vision Dry mouth Tachycardia		Diarrhea caused by Entero-Toxin bacteria Colitis	MAX Dose = 20 mg/day
Dicyclomine	Bentyl	**Anti-Spasmodic**	Dizziness Dry Mouth Nausea Blurred Vision	Anti-Cholinergic Caution Age >65	GI Obstruction Ulcerative Colitis Reflux Esophagitis Breast feeding Narrow Angle Glaucoma	
Eluxadoline (Sched: C-4)	Viberzi	**Peripheral Mu-Opioid Agonist**	Constipation Nausea/Dizzy Abdominal Pain Rash	Pancreatitis CNS Depression	Gallbladder/Biliary Duct obstruction Pancreatic Dx Alcoholism Hepatic Imp (Child-Pugh C) Hx of Severe Constipation Sphincter of Oddi Dysfxn	REMS Program

HYPERTENSION

General Information	JNC-8 Guideline	Lifestyle Modifications	Treatment	Key Drugs Increase BP
- HTN increases risks for heart, stroke, and kidney dx - Absence of sx → Non-adherence - Primary HTN - Unknown cause but related to lifestyle - Secondary HTN - caused by renal or adrenal dx, drugs, or sleep apnea. ○ Increase in SNS + RAAS.	1. BP Goal <60 yo = 140/90 2. CKD/Diabetes = 140/90 3. BP >60 yo = 150/90 4. BP >160/100 or 20/10 above goal = consider starting 2 drugs KDIGO has 130/80 for CKD + Albuminuria	1. BMI = 18.5 - 24.9 2. Women = 1 / Men = 2 drinks 3. 30-40 min exercise 4. Limit salt = <1500 mg/day 5. DASH diet PREGNANCY: 1. Tx for Chronic HTN if >160/105 2. Use Labetalol, Nifedipine XR, or Methyldopa.	1. Use ACEi/ARB/CCB/Thiazide 2. Blacks - use CCB/Thiazide 3. CKD - use ACEi/ARB 4. Max dose before adding or add 2nd before maxing 1st. 5. Most PT's req. more than 1 drug 6. Titrate dose - Not at goal 1 mon. 7. Never use ACEi+ARB+Aliskiren HTN Crisis: (>180/120) 1. Urgency - No organ damage. Use ORAL meds 2. Emergency - Organ damage. Use IV meds	- Amphetamines - Cocaine - Pseudoephedrine - EPO agents - Immunosuppressant - NSAIDs - Systemic Steroids - SNRI's - ETOH - Appetite Suppressant (Phentermine) - Caffeine, Herbals - Oral Contraceptives - Mirabegron - Cancer drugs

GENERIC	BRAND	MOA	ADRs	BBW/Warning	CONTRAINDICATION	NOTES
Chlorthalidone		**Loop Diuretics** Inhibit Na^+ reabsorption in DCT Excretion of Na, Cl, H2O, K, H^+ Take early in day before 4pm	Dizzy, Photosensitivity, Rash Hypochloremic alkalosis (rare) Ca, UA, LDL, TG, BG ↑ K, Mg, Na ↓	Hypokalemia Thiazides not effective CrCl <30 Need to supplement K+ Lithium toxicity	Sulfa Drugs Combo w/ Dofetilide (QT Prolongation)	Chlorthalidone available IV Better than HCTZ
Chlorothiazide	Diuril					
HCTZ	Microzide					Acute myopia & angle-closure glaucoma (ADR)
Indapamide						
Methyclothiazide						
Metolazone						GOOD in PTs w/ renal imp.
Nifedipine ER	Adalat CC Procardia XL	**DHP-CCBs** Inhibit Ca+ causing peripheral arteriole vasodilation Major CYP3A4 - AVOID Grapefruit	Dizzy, Flushing, HA, Fatigue Peripheral edema Reflex tachycardia Gingival hyperplasia	Hypotension (titrate dose) Worsen angina/MI Severe Hepatic imp. Caution w/ HF	Note: Protect from light + moisture, except for Amlodipine. Nifedipine IR - NOT used for HTN due to severe hypotension	Ghost tablet
Nifedipine IR	Procardia					NOT used for HTN or BP reduction in non-pregnant adults due to severe hypotension
Nicardipine IV	Cardene IV					Nicardipine + Clevidipine mostly used in HTN Crisis
Nisoldipine ER	Sular					
Amlodopine	Norvasc					Safest CCBs, must be used in PTs w/ HF + reduced EF
Felodipine ER						
Isradapine						
Clevidipine	Cleviprex (IV)			Hypotension, reflex tachycardia, TG increase, infections	Soy + Egg allergies	- Milky white color - Use strict aseptic technique - Use 12hrs after vial puncture
Diltiazem	Cardizem, Diltzac, Dilt-XR, Taztia, Tiazac	**Non-DHP CCBs** (-) Inotropic + Chronotropic effect Inhibit CYP3A4 (increase conc.) AVOID Grapefruit	Dizzy, HA, edema, gingival hyperplasia, constipation (More w/ Verapamil)	Bradycardia AV block Hypotension HF	Hypotension (SBP <90) Cardiogenic Shock AV Block Sick Sinus Syndrome	Used for Angina
Verapamil	Calan, Covera, Verelan					Covera HS leaves Ghost tab
Spironolactone	Aldactone	**K+ Sparing Diuretic** Spironolactone - Non-selective (Blocks Androgen) Epleronone - Selective aldosterone blocker (No endocrine FX)	Gynecomastia, Breast tender, impotence, amenorrhea, irregular menses.	Hyperkalemia (Amiloride & Triamterene) Tumorigenic (Spironolactone)	Hyperkalemia (>5.5) Anuria Renal imp.	- Minimal BP lowering FX - Spironolactone/Epleronone used in HF - AVOID K+ - Epleronone = Major CYP3A4 - Diuretics - lithium toxicity
Epleronone	Inspra		TG ↑			
Triamterene	Dyrenium		↑Dehydration, dizzy Metabolic acidosis Hyperkalemia Na + Cl ↓			
Amiloride						
Spironolactone	Carospir (Suspension)					
Clonidine	Catapres	**Centrally Acting α-2 agonists:** Act on the brain reducing NE	Dry mouth, somnolence, HA, fatigue, dizzy, hypotension, constipation, HR↓	Do not D/C abruptly Taper over 2-4 days to avoid Rebound HTN.	Catapres TTS: skin stuff (patch)	- Patch avail. for PT's who cannot swallow - Apply 1x/wk & remove for MRI
Guanfacine	Tenex, Intuniv					
Methyldopa					Active Liver Dx or using MAOi's	- Positive Coombs Test (Hemolytic Anemia) - Wt gain, DILE (Drug-induced Lupus)
Kapvay						- Used for ADHD
Hydralazine		**Direct Vasodilators:** Vasodilation of arterioles	HA, hypotension, palpitations, reflex tachycardia		Mitral Valve Heart DX, CAD	DILE - Lupus
Minoxidil			Fluid retention, tachycardia, hair growth	Pericardial effusion & angina	Pheochromocytoma	OTC for hair growth Use BB + Loop for HTN
Doxazosin	Cardura	**Alpha-1 Blocker:** NOT recommended by JNC8 - Only used in men with BPH	Dizzy, fatigue, HA, edema	Orthostatic Hypotension & Syncope Caution w/ PDE-5 Priapism		- CYP3A4, Liver imp. - Cardura XL - Ghost tablet
Prazosin	Minipress					
Terazosin						

HYPERTENSION

GENERIC	BRAND	MOA	ADRs	BBW/Warning	CONTRAINDICATION	NOTES
Benazepril	Lotensin	**Angiotensin Converting Enzyme Inhibitors** Block Ang I → Ang II Decrease vasoconstriction + Aldosterone Kidney protective	Angioedema (Esp. Blacks) Hyperkalemia Hypotension Renal imp. Dizzy HA Rash Cough	Pregnancy	Hx of Angioedema Use of Neprilysin in last 36 hours (Sacubitril/Valsartan)	- QD can be dosed BID if needed - ACEi prevent cardiac remodeling in PT's w/ HF - AVOID K+ - Lithium toxicity
Enalapril	Vasotec Epaned (Powder)					
Lisinopril	Prinivil, Zestril, Qbrelis					
Quinapril	Accupril					
Ramipril	Altace					
Captropril						
Enalaprilat	Vasotec IV					
Moexipril						
Perindopril	Aceon					
Trandolapril	Mavik					
Irbesartan	Avapro	**Angiotensin Receptor Blocker** Block Ang II binding to AT-1 Prevents vasoconstriction Kidney + Heart protective (like ACEi)	Same as ACEi w/ less cough & angioedema NO washout period with Neprilysin		Hx of Angioedema Do NOT use w/ Entresto (Sacubutril)	- Olmesartan: Sprue-like Enteropathy = severe diarrhea + Wt loss months to years after initiation - Azilsartan: Keep in original container to protect from light + moisture - AVOID K+ - Lithium toxicity
Losartan	Cozaar					
Olmesartan	Benicar					
Valsartan	Diovan					
Candesartan	Atacand					
Azilsartan	Edarbi					
Eprosartan	Teveten					
Acebutolol	Sectral	**β-1 Selective BB's** Decreases HR & contractility **AMEBBA**	HR ↓ Hypotension Fatigue Dizziness Depression Libido Impotence	Do not D/C abruptly Taper over 1-2 wks to avoid tachycardia.	Bradycardia, AV block, Sick Sinus Syndrome Esmolol – do not use in Pulmonary HTN	- Masks Sx of Hypoglycemia & Hypothyroidism - Use caution w/ Broncho problems - Take Metoprolol w/ food - Switching b/t Tartrate & Succinate must use same TDD.
Atenolol	Tenormin					
Betaxolol						
Bisoprolol	Zebeta					
Esmolol	Brevibloc					
Metoprolol Tartrate	Lopressor					
Metoprolol Succinate	Toprol XL					
Nebivolol	Bystolic	**β-1 Selective + Nitric Oxide Vasodilation**	Nausea, diarrhea, TG, HLD ↑		Severe Liver imp. (Child Pugh >B)	
Nadolol	Cogard	**Non-Selective BB: TPPN**	HR ↓, Hypotension, fatigue, dizziness, depression, libido, impotence.			- May cause Hyperglycemia in DM2 by decreasing insulin. - Propranolol has high lipid solubility so it crosses BBB to cause more CNS FX - Useful for Migraine prophylaxis
Pindolol						
Propanolol	Inderal, InnoPran					
Timolol	Timoptic					
Carvedilol	Coreg	**Non-Selective BB + α-1 Blocker**	Edema, Wt gain, TG, HDL ↑		Severe Liver imp.	- Take w/ FOOD - Coreg to Coreg CR = 3x
Labetolol						
Aliskiren	Tecturna	**Direct Renin Inhibitor** Blocks Ang → Ang-1	Angioedema, hyperkalemia, hypotension, renal imp.	Pregnancy	- CYP3A4 - AVOID Grapefruit - Decreases levels of furosemide	- Do NOT use w/ ACEi or ARB in Diabetes. - AVOID High fat foods

Key points to remember

Diuretics	ACEi's/ARBs/Aliskiren	BB's	CCBs	Clonidine
- Dose no later than 4pm. - Get up slowly (dizzy) - Supplement K+ - K+ Sparing AVOID K+ - Epleronone = CYP3A4	- Birth defects - Hyperkalemia - ACEi has most angioedema - ACEi cause cough - Slows CKD progression - Helps w/ Cardiac remodeling - Use together is C/I in Diabetes & should AVOID if eGFR >60 - Do NOT use w/ Entresto	- Take the same time QD - Dizzy, fatigue, sexual Fx - Enhance/Masks Sx of hypoglycemia - Non-selective BB's careful w/ breathing difficulty. - Coreg - Take w/ food. - Metoprolol - Take WF - 1st Line = Post MI, Heart Dx, HF - NO longer preferred for HTN - Acebutolol, Pindolol, Penbutolol - Have ISA activity do NOT use w/ Post MI. - Esmolol, Labetolol, Lopressor - used for HTN Crisis. - Use BB caution w/ other drugs that decrease HR (Non-DHP CCBs)	- Swelling of ankles, irregular heartbeat - AVOID Grapefruit - Adalat - Take on empty stomach. May leave ghost tablet - DHP CCB = "Pine" - Amlodopine + Felodopine are safest CCB & must be used in PT's w/ HF + reduced EF - Non-DHP CCB's mainly used in arrhythmias. - ALL CCB's = CYP3A4	- Do NOT stop abruptly - Patch - Change weekly, apply to hairless upper arm or chest, apply to different area each time, do not apply of broken skin, and remove for MRI.

Key Combination Drugs

Losartan/HCTZ	Hyzaar	Trandolapril/Verapamil	Tarka
Olmesartan/HCTZ	Benicar HCT	Aliskiren/HCTZ	Tekturna HCT
Valsartan/HCTZ	Diovan HCT	Clonidine/Chlorthalidone	Clorpres
Lisinopril/HCTZ	Zestoretic	Methyldopa/HCTZ	
Benazepril/HCTZ	Lotensin HCT	Atenolol/Chlorthalidone	Tenoretic
Irbesartan/HCTZ	Avalide	Bisoprolol/HCTZ	Ziac
Enalapril/HCTZ	Vaseretic	Metoprolol Tartrate/HCTZ	Lopressor HCT
Olmesartan/Amlodipine	Azor	Metoprolol Succ/HCTZ	Dutoprol
Quinapril/HCTZ	Accuretic, Quinaretic	Nadolol + Bendroflumethiazide	Corzide
Benazepril/Amlodipine	Lotrel	Nebivolol/Valsartan	Byvalson
Azilsartan + Chlorthalidone	Edarbyclor	Triamterene/HCTZ	Maxzide, Diazide
Valsartan/Amlodipine	Exforge	Spironolactone/HCTZ	Aldactazide
Telmisartan/Amlodipine	Twynsta	Olmesartan/Amlodo/HCTZ	Tribenzor
Perindopril/Amlodipine	Prestalia	Valsartan/Amlodo/HCTZ	Exforge HCTZ

SKIN

Alopecia (Hair Loss)

Male-Pattern Baldness
Hair Thinning

Finasteride - Propecia	- C/I in Pregnancy - Females should not handle - Sexual S/E
Minoxidil - Rogaine	

Eyelash Extension

Bimatoprost Sol. - Latisse	Apply nightly to skin at the base of the **upper eyelashes only**

Cold Sores

Caused by HSV-1 or HSV-2
(Natural product) Lysine: used to Tx Cold Sore.

OTC: Docosanol (Abreva)	**Rx:** Topical Acyclovir - Zovirax Acyclovir Buccal Tabs - Sitavig Topical Penciclovir - Denavir

Genital Warts: HPV

Vaccines: Gardasil, Cervarix	**Tx:** Imiquimod Cream Aldara | Zyclara

Diaper Rash

Keep skin dry if possible

Petrolatum - Desitin	Skin protectant
Miconazole, Clotrimazole	used for fungal infxn
Hydrocortisone	limit length of use over time
Butt Paste, Triple Paste	

Dandruff

Selenium Sulfide:	Dandrex Head & Shoulders Selsun
Ketoconazole Shampoo	Nizoral A-D

Eczema - Atopic Dermatitis

Skin inflammation - crusty/scaly, itchy/red skin may blister. Triggered by weather or soaps
Hydration is key - Moisturize

Hydrate Skin	Aquaphor, Petrolatum
Topical Steroids	
Antihistamines for itching	
Calcineurin Inhibitors	Tacrolimus, Pimecrolimus
Topical PDE-4 inhibitor	Crisabrorole (Eucrisa)

Hemorrhoids

Many products contain: Zinc Oxide (desiccant)
Pramoxine (anesthetic)

Phenylephrine (Preparation-H)	vasoconstrict to shrink
Hydrocortisone (Anusol-HC)	suppository for inflammation
Witch Hazel (Tucks Pads)	

Lice & Scabies

OTC DOC in Infants	Pyrethrins - Permethrin
Others	Malathion Lotion - Ovide Benzyl EOTH - Ulesfia Lindane Shampoo (No longer used – Neurotoxicity)

Minor Cuts | Abrasions | Burns

OTC: - Neosporin - Triple ABX Polymixin|Bacitracin|Neomycin - Polysporin Alone - Bacitracin Alone - Hydrocortisone - Cortisporin	**Rx:** Mupirocin (Bactroban)

Poison Ivy | Oak | Sumac

Colloidal Oatmeal - Aveeno
Calamine Lotion (anesthetic)
Aluminum Acetate = Astringent

Pinworm - Vermicularis

OTC: Pyrantel Pamoate Reese's Pinworm	**Rx:** Albendazole Mebendazole - both cause HA/Nausea - both are Hepatotoxic

Tape worms
- Give Abendazole w/ high-dose glucocorticoid + Anti-Convulsant to ↓ CNS inflammation & also take w/ High-Fat meal.

Fungal Infections

Athlete's Foot – Tinea Pedis: Fungal infxn of foot	**OTC:** Terbinafine - Lamasil Butenafine - Lotrimin Clotrimazole - Lotrimin Miconazole - Lotrimin Spray Tolnaftate - Tinactin Undecylenic Acid - Fungi-Nail **Rx:** Betamethasone/Clotrimazole (Lotrisone) Ketoconazole Luliconazole
Ringworm - Tinea Corporis: Circular flat sore Head - Tinea Capitis	
Jock Itch - Tinea Cruris: Genitals, Inner thigh, Butt	
Skin Infxn - Candida: Groin, Armpits, Skin Folds	Mupirocin (Bactroban)
Fungal Toe/Fingernails Diagnose: 20% Potassium Hydroxide - KOH Smear	Itraconazole (Sporanox) Terbinafine (Lamasil) PO Ciclopirox Tavaborole Elfinaconazole
Yeast infection	**OTC:** Butoconazole (Gynazole-1) Clotrimazole (Gyne-Lotrimin) Miconazole (Monistat) Terconazole (Terazol) **Rx:** Fluconazole - Diflucan 150 mg PO x 1 dose

SKIN

Acne

AVOID high glycemic (sugary) foods & dairy foods.

OTC

Benzoyl Peroxide (BPO)	Limit Sun exposure Avoid Eye contact
Erythromycin + BPO (Benzamycin)	
Clindamycin + BPO (Acanya, BenzaClin, Duac)	
Salicylic Acid	
Adapalene - Differin	1st OTC Topical Retinoid

RX

Tretinoin cream/gel (Atralin, Renova, Retin-A Avita)	- Limit Sun exposure - Takes 1-3 months for Fx - May worsen acne initially - Mild Skin irritations - Teratogenic: Pregnancy, Breastfeeding
Isotretinoin (Claravis, Amnesteem)	Teratogenic: REMS, iPledge Reqs: - 2 forms of birth control - Signed consent of harm - 2 Neg pregnancy tests before Tx - 1-month Rx at a time - Pharmacy must be registered
Minocycline (Solodyn)	Photosensitivity Fetal Harm C/I in Child <8 yo

Topical Steroids

- Inflammation = use Topical Steroids, Antihistamine
- Topical Steroid Potency = Ointments > Creams > Lotion > Solutions > Gels > Sprays.
- Thin Skin: Face | Eyelids | Genitals - should only use LOW potency steroids. Avoid prolonged use. Use Fingertip to measure

VERY HIGH Potency	- **Clobetasol Proprionate** Clobex 0.05% Lotion|Spray|Shampoo Olux Foam 0.05% Temovate 0.05% - **Betamethasone Diproprionate** Diprolene Ointment 0.05% - **Halobetasol Proprionate** Ultravate 0.05% - **Fluocinonide** Vanos cream 0.1%
HIGH Potency	- **Betamethasone Diproprionate** Diprolene Cream AF 0.05% - **Mometasone Furoate** Elocon Ointment 0.1% - **Fluocinonide** Lidex Ointment 0.05%
HIGH-MEDIUM Potency	Fluocinonide - Lidex-E Cream 0.05%
MEDIUM Potency	- **Mometasone Furoate** Elocon Cream 0.1% - **Triamcinolone Acetonide** Kenalog Cream/Spray 0.1% - **Hydrocortisone Valerate** Westcort Ointment 0.2%
LOW Potency	- **Desonide** = DesOwen Lotion 0.05% - **Hydrocortisone Valerate** Westcort Cream 0.2%
MILD Potency	- **Fluocinonide Acetonide** Derma-Smoothe/FS Oil 0.01%
LOWEST Potency	- **Hydrocortisone** Cortaid Cream/Spray/Ointment

Drugs Causing Discolored Skin/Secretions

Brown	Levodopa Methyldopa Entacapone
Brown, Yellow	Metronidazole Tinidazole Nitrofurantoin Riboflavin (B2)
Brown, Black, Green	Methocarbamol
Yellow, Green	Propofol Flutamide
Yellow, Orange	Sulfasalazine
Red, Orange	Phenazopyridine Rifapentine Rifampin
Red, Orange, Purple	Chlorzoxazone
Red	Anthracyclines Deferasirox (urine)
Blue	Mitoxantane Methylene Blue
Blue, Gray	Chloroquine Amiodarone

INFECTIOUS DISEASE

General Information	Minimum Inhibitory Concentration (MIC)	Antibiogram
1. Look for allergies, culture & sensitivity, and medical Hx. 2. Assess hydrophilicity vs lipophilic drugs for distribution. 3. Dose Optimization: Time vs Concentration dependence. a. Time-dependent ABX: Dose MORE frequently. Extending infusion time or continuous infusion. ***Beta-Lactams*** b. Concentration-dependent ABX: Dose LESS frequently. Higher doses	- Lowest concentration w/o growth (clear) after 24 hrs = MIC - If MIC ⩽ Breakpoint = Susceptible - Breakpoint = beyond susceptible → Intermediate or Resistant	Provides susceptibility patterns at a specific hospital over a period and used to monitor resistance-patterns. Antibiograms aid in selecting empiric Tx = Look for ↑ %

Gram + Bacteria = Thick cell wall, stains purple & blue			**Gram – Bacteria** = Thin cell wall, stains pink & red				**Atypicals**
Cocci	Rods	Anaerobes	Rods	Cocci	Coccobacili	Anaerobes	
- Staphylococcus MRSA or MSSA - Streptococcus (Strep. Pneumoniae = diplococci) - Enterococcus (VRE - Vanco-resistant)	Listeria monocytogenes	- Clostridium spp. - Actinomyces spp. - Peptostreptococcus	- Pseudomonas aeruginosa - Haemphilus influenzae - Providencia spp.	- Neisseria spp	- Acinetobacter baumannii - Bordetella pertussis - Moraxella catarrhalis	- Bacteroides fragilis - Provetella spp.	Chlamydia spp. Legionella spp. Mycoplasma pneumoniae Mycobacterium tuberculosis
			Spiral Rods		Enteric Rods		
			- H. pylori - Campylobacter spp	- Treponema spp - Borrelia spp - Leptospira spp	- Proteus mirabilis - Escherichia coli - Klebsiella spp	- Serratia spp - Enterobacter Cloacae - Citrobacter spp.	

MOAs of ABX				
Cell Wall inhibitors	Cell Membrane inhibitors	Protein Synthesis inhibitors	DNA/RNA inhibitors	Folic Acid inhibitors
Beta-Lactams: Penicillins, Cephalosporins, Carbapenems **Monobactams:** Aztreonam Vancomycin Telavancin Dalbavancin Oritavancin	Telavancin Oritavancin Daptomycin Polymyxin (Colistimethate)	Aminoglycosides Macrolides Tetracyclines Clindamycin Linezolid, Tedizolid Quinupristin/Dalfopristin	FQs Rifampin Metronidazole Tinidazole	Sulfonamides Trimethoprim Dapsone

Hydrophilic Abx			Lipophilic Abx		
Beta-Lactams **Aminoglycosides** **Daptomycin** **Polymyxin** **Glycopeptides**	• Small VD • Renally eliminated • NO activity vs intracellular pathogens • Poor Bioavailability	• Poor tissue penetration • Nephrotoxic • Consider loading dose • Aggressive dose in sepsis	**FQ's** **Macrolides** **Rifampin** **Linezolid** **Tetracyclines**	• Large VD • Hepatic metabolism • Active vs intracellular pathogens • Excellent Bioavailability	• Great tissue penetration • Hepatotoxic + DDI • NO dose adj in sepsis • PO:IV ratio = 1:1

GENERIC	BRAND	INDICATION	ADRs	BBW	CONTRAINDICATION	NOTES
Penicillin	Pen-VK	- **Pen-VK:** 1st Line for strep-throat & mild-non purulent skin infection (no abscess) - **Amoxicillin:** 1st Line for otitis media DOC: infective endocarditis prophylaxis for dental procedure. - **Augmentin:** 1st Line for otitis media and sinus infection. ↓dose to ↓diarrhea - **Pen-G:** Do NOT use IV DOC: Syphilis - **Pip-Tazo:** active for Pseudomonas Covers MSSA only No renal dose adj.	GI upset Diarrhea Rash PCN allergy Rxns Seizure w/ accumulation	Pen-G Benzanthine Cardiorespiratory arrest or death if given IV	Augmentin & Unasyn Hx of Cholestatic jaundice Hepatic dysfunction CrCl <30	Covers mouth G+ anaerobe
Penicillin G Benzanthin	Bicillin L-A					
Amoxicillin	Amoxil Moxatag					Chewable tab available
Amoxicillin + Clavulanate	Augmentin					
Ampicillin						
Amipicillin + Sulbactam	Unasyn					Extended infusion > 4hrs
Piperacillin + Tazobactam	Zosyn					
Nafcillin						Covers MSSA
Oxacillin						
Dicloxacillin						

INFECTIOUS DISEASE

GENERIC	BRAND	INDICATION	ADRs	BBW	CONTRAINDICATION	NOTES
Doripenem	Doribax	Carbapenems: IV/IM only - Like other B-lactams they bind to PBP to inhibit cell wall synthesis & are time-dependent. - Common Use: ESBL-producing bacteria - NO Coverage against: Atypicals, VRE, MRSA Stenotrophomonas, C. Diff	Diarrhea Rash/Severe skin rxn (DRESS) ↑ LFTs	CNS Fx Seizure Avoid in PCN allergy Do not use Dori in HAP/VAP		
Meropenem	Merrem					
Ertapenem	Invanz					**NO Coverage against:** Pseudomonas, Acinetobacter Enterococcus Must be diluted in Normal Saline
Imipenem + Cilastatin	Primaxin					
Aztreonam	Azactam	Monobactam: OK for B-Lactam/PCN allergy	Similar to PCNs Rash N/V/D			
Cefadroxil		1st Gen: - Cephalexin PO: skin infxn (MSSA) & strep throat common use. - Cefazolin IV: Surgical prophylaxis	GI upset Diarrhea Rash Allergic Seizures w/ Accumulation	- Cross Sensitivity w/ PCN allergy - Do NOT use in PCN allergy - Cefotetan contains NMTT side chain which may ↑risk for Hypoprothrombinemia (bleeding) or Disulfiram-like Rxn w/ ETOH ingestion.	Ceftriaxone: biliary sludging in neonates (hyperbilirubinemia). Concurrent use of IV Ca+ containing products in neonates < 28 days old.	
Cefazolin	Ancef Kefzol					
Cephalexin	Keflex					
Cefuroxiime	Ceftin Zinacef	2nd Gen: - Cefuroxime (Ceftin) PO: Otitis media, CAP, Sinus infection - Cefotetan & Cefoxitin IV: B. fragilis, Surgical prophylaxis				
Cefotetan	Cefotan					
Cefoxitin	Mefoxin					
Cefaclor	Ceclor					
Cefprozil	Cefzil					
Cefdinir	Omnicef	3rd Gen: Group 1 - Cefdinir (Omnicef) PO: CAP, Sinus infxn - Ceftriaxone & Cefotaxime IV: CAP, Meningitis, Pyelonephritis Spontaneous Bacterial Peritonitis				
Ceftriaxone	Rocephin					NO Renal Adj.
Cefotaxime	Claforan					
Cefixime	Suprax					Chew-tab available
Cefpodoxime	Vantin					
Ceftibuten	Cedax					
Cefditoren	Spectracef					
Ceftazidime	Fortaz Tazicef	3rd Gen : Group 2 - Ceftazidime IV: Pseudomonas, MDR Gram Neg				
Ceftazidime + Avibactam	Avycaz					Covers some CRE
Ceftolozane + Tazobactam	Zerbaxa					
Cefepime	Maxipime	4th Gen: Pseudomonas				
Ceftaroline Fosamil	Teflaro	5th Gen: MRSA				
Gentamicin		Aminoglycosides: - Concentration - dependent - Post-ABX Fx (PAE) - Extended Interval Dosing = gram – (Achieve peak while ↓nephrotoxicity & $) - Always round ↑ on Nomogram - Underweight = ABW Obese = AJBW - Monitor: Renal Fxn, Drug levels	Nephrotoxicity Hearing loss Impaired balance (Vertigo)	Nephrotoxicity Ototoxicity Neuromuscular Blockade Respiratory Paralysis AVOID Nephrotoxic agents AVOID Neurotoxic agents Pregnancy - Fetal Harm	Nephrotoxic Drugs (avoid) - Amphotericin-B - Cisplatin - Colistimethate - Cyclosporine - Loop Diuretics - NSAIDs - Contrast Dye - Tacrolimus - Vancomycin	Peak 5-10 | Trough < 2 Gentamicin = 7 mg/kg dose
Tobramycin						Peak: 20-30 | Trough < 5
Amikacin						Peak: 20-30 | Trough < 5
Streptomycin						
Linezolid	Zyvox	Oxazolidinones: - Binds to 50s Ribosome - Coverage similar to Vancomycin BUT also covers VRE.	↓ Platelets, HgB, WBC N/V/HA	Myelosuppression Thrombocytopenia (Duration-Related)	MAOi w/i 2 weeks Caution w/ Serotonergic or Adrenergic drugs.	Do NOT shake suspension
Tedizolid	Sivextro		N/D/HTN	Neutropenia	Less GI and Myelosuppression	Approved for SSTI

INFECTIOUS DISEASE

GENERIC	BRAND	INDICATION	ADRs	BBW	CONTRAINDICATION	NOTES
Ciprofloxacin	Cipro	**FQ's:** - Topoisomerase IV & DNA Gyrase - Concentration - dependent - Respiratory FQs: Levo, Moxi, Gemi - Anti-Pseudomonal FQs: Cipro, Levo - Delafloxacin: IV to PO = 1:1 - Used for Skin infxn - Active against MRSA	N/D/HA Dizziness Insomnia SJS/TEN	- Tendon inflammation/rupture - Peripheral Neuropathy - CNS Fx/Seizures	- Tizanidine + Ciprofloxacin - Chelates w/ Cations WARNING: - QT-Prolong (Moxifloxacin = highest risk) - Hypo/Hyperglycemia - Hepatotoxicity - Photosensitivity - Muscle toxicity (Avoid in Child)	Moxifloxacin = NO Renal Adj Moxi: No use in UTI's (Won't distribute to urine) Cipro Oral Susp: Never give through NG or feed tube. Cipro Tabs: Feed tube ok
Levofloxacin	Levaquin					
Moxifloxacin	Avelox					
Delafloxacin	Baxdela					
Ofloxacin						
Gatifloxacin	Zymaxid					
Gemifloxacin	Factive					
Azithromycin	Zithromax Z-Max Z-Pak	**Macrolides:** works on 50S Ribosome - Strong 3A4 inhibitors (Azithromycin = Least) - ALL used for CAP - ALT Tx for Strep Throat - Azithromycin: COPD Exacerbations Chlamydia Gonorrhea MAC prophylaxis DOC for Traveler's Diarrhea	GI upset (Erythromycin = MOST) ↑ LFTs SJS/TEN/DRESS	WARNING: QT-Prolong (Highest risk = Erythromycin) Hepatotoxicity	Do not use w/ Lovastatin, Simvastatin causes potential Muscle Toxicity (ALL except Azithromycin)	Z-Pak: 500 mg PO Day 1 250 mg PO Day 2-5 Azithromycin ER Suspension (Z-Max NOT EQ to Zithromax)
Clarithromycin	Biaxin					
Erythromycin	EES Ery-Tab EryPed Erythrocin PCE					
Doxycycline	Doryx Adoxa Monodox Oracea	**Tetracyclines**: works on 30S Ribosome - Doxy, Mino = CA-MRSA skin or acne. - Doxy = used in Lyme Dx, Rocky Spotted Fever, CAP, COPD, VRE UTI, Chlamydia, Gonorrhea - Tetracycline = H. Pylori Tx	N/V/D SJS/TEN	Photosensitivity Drug-induced Lupus (DILE) Chelation: - Antacids = Mg+, Al+, Ca+ - Iron products - Sucralfate - Bismuth Salicylate - Bile Acid Resins (Separate dose)	Pregnancy/Breastfeeding Child <8 YO	IV:PO = 1:1 Oracea = take EMPTY stomach (1 hr before or 2 hr after meal)
Minocycline	Minocin Solodyn Monolira					
Tetracycline						
Sulfamethoxazole + Trimethoprim	Bactrim Septra Sulfatrim	**Sulfonamide (SMX):** - Dose always 5:1ratio = 400/80, 800/160 - Caution w/ Warfarin ↑ INR - Tx: CA-MRSA, UTI, PCP	N/V/D Anorexia Skin Rxns Photosensitivity Crystalluria Hypoglycemia ↑ K+, ↓Folate Positive Coombs Test		Pregnancy/Breastfeeding Sulfa allergy	Dose based on TMP component SS = 400/80, DS = 800/160 Uncomplicated UTI: 1 DS Tab BID x 3 Days
Vancomycin	Vancocin	- Systemic = 15-20 mg/kg IV Q8-12H - C. Diff = 125-500mg PO QID x 10-14 days - Inhibits cell wall D-alanyl-Dalanine. - PO only for C. Diff or Enterocolitis - PO NOT for systemic infections - 1st Line = MRSA. Consider ALT if MRSA MIC ≥2	Abdominal pain Nausea Myelosuppression SJS/TEN	Nephrotoxicity Ototoxicity Infusion rxn (Red Man syndrome)		Monitor: Renal Fxn, Trough at SS - Goal Trough = 15-20 - Pneumonia, Endocarditis Osteomyelitis, Meningitis, Sepsis - Goal Trough 10-15 Any other infection
Daptomycin	Cubicin	- Concentration - dependent - Covers MRSA | VRE - Do NOT use to Tx Pneumonia	↑ CPK	Myopathy | Rhabdomyolysis False ↑ PT/INR	Monitor: CPK level weekly	Compatible w/ NS (no dextrose)
Telavancin	Vibativ	**Lipoglycopeptides:** Concentration - dependent	N/V Metallic Taste	Fetal risk Nephrotoxicity ↑ Mortality	QT prolongation False ↑ PT/INR	Red Man Syndrome: must give IV over ≥60 min --REMS--
Oritavancin	Orbactiv		Red Man syndrome Infusion Rxn	False ↑ PT/INR up to 12 hrs False ↑ aPTT up to 120 hrs	Oritavancin = IV use of Heparin > 120 hrs. Interferes w/ aPTT	Extreme Long Half-Life Single-dose regimen
Dalbavancin	Dalvance					

INFECTIOUS DISEASE

GENERIC	BRAND	INDICATION	ADRs	BBW	CONTRAINDICATION	NOTES
Quinupristin/Dalfopristin	Synercid	**Streptogramin:** - Bind to 50s Ribosome - NOT active vs E. Faecalis - NOT well tolerated - Use is limited to VRE infection	Arthralgia, Myalgia Infusion Rxn, Phlebitis Edema, Pain Hyperbilirubinemia ↑ CPK			
Tigecycline	Tygacil	Related to Tetracyclines: - AVOID use in Blood infections - Reconstituted is Yellow-Orange color Discard if not this color	N/V/D	↑Death risk		NO Renal Adj NO activity vs 3-P's: Pseudomonas, Proteus, Providencia
Colitimethate | Colistin	Coly-Mycin M	Polymixins: - AUC:MIC Dependent - Main use MDR Gram-Neg infxn - Always use combo w/ other ABX	Nephrotoxicity (dose-dep.) Neurologic Disturbance			Dose carefully Inhalation Solution must be mixed 1st
Polymixin B Sulfate						
Chloramphenicol		50s Ribosome	Myelosuppression	Blood dyscrasias	Gray Syndrome Circulatory Collapse or Cyanosis	Monitor: CBC
Clindamycin	Cleocin	Lincosamide	N/V/D Rash	Colitis C. Diff	SJS, TEN skin rxn	D-Test req for Staph Aureus
Metronidazole	Flagyl Metro	Helical DNA structure: - Use for anaerobes, Protozoal Infxns Vaginosis, Trichomonas, C. Diff	Metallic Taste Rash (SJS/TEN) Dark Urine Furry Tongue	Carcinogenic	Pregnancy, Breastfeeding ETOH use (3 days after D/C) Propylene Glycol products (3 days) Disulfuram Rxn: Stomach cramp, N/V/HA, Flushing	Mild-Mod C. Diff: 500mg IV/PO TID x 10-14 days
Tinidazole	Tindamax					
Fidaxomicin	Dificid					
Rifaximin	Xifaxan					
Fosfomycin	Monurol					
Nitrofurantoin	Macrodantin Macrobid					
Mupirocin Nasal	Bactroban Nasal					

PAIN

General Information	Treatment	NSAID Drug Interaction	Ketorolac Spary (Sprix)	Diclofenac Gel
- Nociceptive: sensory nerves sense tissue damage. - Visceral: Internal organ pain. - Somatic: musculoskeletal pain. - Pathophysiologic: damage or malfunctioning nervous system, aka "Neuropathic" pin. - Acute: sudden & sharp pain. - Chronic: persisting beyond normal time. - Pain is the "5th Vital Sign" & pain scales are used to treat the severity of pain and required by hospital care.	- Use lowest dose & medicines w/ multiple MOA's gives additive healing effect - Non-Opioid drugs can be added to opioid treatment to lower opioid dosing & provide superior analgesia. - Severe (7-10) = Opioid +/- other - Moderate (4-6) = Opioid +/- other - Mild (1-3) = Non-opioid +/- adjuvant	- Steroids = ↑ bleeding risk - Ototoxic = AG's/Loops - If using ASA + Ibuprofen for cardio protection take ASA 1-hr before or 8 hrs after Ibuprofen. - AVOID Prednisone or blood thinners.	- Each bottle is 1-day supply - Throw away after 24 hrs - Must prime 5x before use - Closed = Fridge - Open = Room temp	1. Use dosing card in package. 2. Do NOT use >32 g/day 3. Dose for hands, wrists, elbows = 2 g each application. MAX 8 g/day. 4. Dose feet, ankles, knees = 4 g/day MAX = 16 g/day 5. Cover affected area fully no open wounds. 6. Do NOT wash/shower for 1 hour

GENERIC	BRAND	MOA	ADRs	BBW	CONTRAINDICATION	NOTES
Acetaminophen	Tylenol/FeverAll Ofirmev	Inhibits PG synthesis in CNS Reduces pain & fever but NOT anti-inflammatory.	Skin rash, SJS, TEN. (Stop & seek medical) Overdose antidote: NAC, Mucomyst, Cetylev, Adetadote by restoring Glutathione.	Hepatotoxicity = >4g/day	- AVOID "APAP" Abbreviation - Order in mg NOT mL. - ALL IV formulation should be prepped in the pharmacy. - AVOID ETOH	- Ofirmev = injection - MAX dose = 4,000 mg/day - Max 325 mg per Rx combo product - 325mg Tabs = Max 3,250/day - 500mg Tabs = Max 3000/day - Peds: 10-15 mg/kg Q4-6h
w/ Hydrocodone	Norco					
w/ Oxycodone	Percocet/Endocet					
w/ Codeine	Tylenol #2,3,4					
w/ Tramadol	Ultracet					
w/ Diphenhydramine	Tylenol PM					
Ibuprofen	Motrin/Advil Caldolor/Neoprofen	**Non-Selective COX-1/2 NSAIDs:** Convert Arachidonic acid to PG's & TXA2 to decrease inflammation, pain, fever. Blocking TXA2 ↑clotting risk.	- MED-GUIDE required for ALL - Nausea - Take w/ food or enteric coated if needed. - Photosensitivity - Kidney clearance - Increase BP (Caution w/ HTN) - AVOID in uncontrolled HTN	- GI bleed, CV, & Post-Op CABG risks (Use ASA). - Toradol: Max 5 days - Acute renal/liver failure - Steroids, SSRI's, SNRI's are high risk for GI events. - CV risks even 1st weeks use.	Warning: AVOID in renal failure AVOID in 3rd Trimester	- Neoprofen = Injection - Ped Dose = 5-10 mg/kg Q6-8H
Indomethacin	Indocin/Tivorbex					High CNS side effect (Avoid Psych PT)
Naproxen	Aleve/Naprelan Naprosyn/Anaprox					Preferred for BID dosing
Ketorolac	Sprix/Toradol					- Used after surgery, NEVER before - 1 Spray in each Nostril Q6-8H
Piroxicam	Feldene					High GI toxicity, SJS/TEN skin rxns
Sulindac	Clinoril					
Celecoxib	Celebrex	**COX-2 Selective NSAIDs:** Less gastric bleeding Fx More MI/Stroke risk - AVOID in CVD		AVOID in women of child-bearing potential	Sulfonamide allergy	AVOID in pregnancy
Diclofenac	Voltaren/Diloject			Arthrotec AVOID in pregnancy (Misoprostol)		- Not bioequivalent formulation - Misoprostol promotes uterine contractions – pregnancy warning - Flector = place patch over most painful area
Meloxicam	Mobic					
Etodoloac	Lodine					
Nabumetone	Relafen					
Aspirin (ASA)	Bufferin/Ecotrin/ Durlaza/Bayer/ Excedrin	**Salicylate NSAID:** - Irreversible COX-1 inhibitor - Cardio-protective dose = 81-162 - Durlaza = 162.5 mg QD - Analgesic = 350-650 Q4-6H	Dyspepsia, nausea, heartburn, bleeding, BP↑, renal imp. CNS Fx, photosensitivity, edema, hyperkalemia, blurred vision.	Severe skin rash SJS/TEN Increase bleeding risk GI ulceration/bleed AVOID 3rd Tri pregnancy	AVOID ASA in child/teens who have viral infxn due to Reyes Syndrome.	- EC or food to decrease nausea - Salicylate overdose causes Tinnitus - PPI's may help protect gut - Do NOT use Durlaza or Yosprala when immediate effect is needed.
Salsalate						

OPIOIDS

General Information

- Mu-receptor Agonists in CNS for pain relief, but causes euphoria & respiratory depression.
- Tx Mod-Sev or Chronic pain.
- Naloxone = to reverse respiratory depression.
- Naltrexone = given w/ opioid to block other opioids taken at the same time.
- REMS Program = for all ER/LA opioids & Methadone. Requires prescriber education.

CHRONIC (Non- Cancer) Pain Tx

1. Opioids NOT 1st Line should not be routinely used.
2. Reach LOW pain rather than no pain is the GOAL.
3. Start low go slow.
4. Check PDMP for high doses & multiple prescribers.
5. Use Adj. meds to lower Opioid dose.
6. AVOID Benzos - 4x risk of overdose death.
7. Follow-up, taper, and then D/C.

Fentanyl Patch Counseling

1. Do not heat patch or skin when applying.
2. Do not cover w/ heat pad or bandage.
3. Call PCP if you experience fever.
4. ONLY use H20 to clean transdermal gel on skin.
5. Dispose patch in toilet.
6. Keep away from Children/Animals.

Opioid Counseling

1. Do NOT crush, chew, break CR forms
2. Avoid ETOH
3. Causes drowsiness/fatigue
4. Take w/ H20 + Food
5. OPANA take on empty stomach
6. Causes constipation

Opioid Dosing

1. Use lowest dose to provide pain relief.
2. Do not increase dose but instead increase frequency
3. Only increase dose if medication is not effective.
4. Always round DOWN when opioid conversions.

Fentanyl Conversion:

1. Find TDD
2. Convert to Mcg (x1000)
3. Divide by 24 for patch
4. Patch is mcg/hr
   Morphine 60 mg TDD = 25 mcg/hr Fentanyl patch.
   --Find TDD then follow the chart--

Opioid Conversions: **(1)** Calculate total 24hr dose. **(2)** Calculate total 24hr dose of new drug. **(3)** Reduce new drug dose by at least 25%, on exam only do so if the Q asks to reduce dose. **(4)** Divide dose to attain appropriate dosing interval. **(5)** Always have Breakthrough pain medication available while making changes (5-17%) of TDD of baseline opioid dose.

Drug	IV/IM (mg)	Oral (mg)
Hydrocodone	-	30
Oxycodone	-	20
Fentanyl	0.1	-
Oxymorphone	1	10
Hydromorphone	1.5	7.5
Morphine	10	30
Meperidine	75	300

EXAMPLE: 30 mg PO Morphine/1.5 mg IV Hydromorphone
= X mg PO Morphine/12 mg IV Hydromorphone
X = 240 mg PO Morphine

Opioid ADR Management

- ALL opioid side effects lessen over time except Constipation.
  - Stimulant Laxatives (Bisacodyl) w/ or w/o stool softener should be given.
  - Methylnaltrexone (Relistor), Naloxegol (Movantik), Naldemadine (Symproic)
    - Indicated for OIC.
    - Block opioid receptors in the gut to reduce OIC w/o affecting analgesia aka (PAMORAs)
    - Peripherally acting
    - Typically only given if PTs fail OTC laxatives.
    - Lubiprostone (Amitiza) - also used (Cl^- activator)
- Opioid allergies:
  - True opioid allergy is rare.
  - Itching and rash are not allergy.
  - True = Breathing, low BP, swelling of tongue, lips.
  - Use different chemical class for true opioid allergy.

Opioid Abuse

- Suboxone is an opioid combo product w/ Naltrexone or Naloxone to deter abuse.
- OxyContin/Hysingla uses technology to deter crushing, dissolving.
- Opioid Overdose Sx:
  - Extreme sleepy, slow breathing, lips/fingers turning blue, pinpoint pupils, slow heartbeat, or low BP.

Buprenorphine: Butrans (Patch), Belbuca (Buccal film), Zubsolv (SL tablet)
- Rx for Opioid dependence.
- Partial Mu-opioid agonist at low dose & antagonist at high dose.
- Low dose = Tx Pain, High dose = Tx Addiction
- Patch upper chest, outer arm, back, change WEEKLY.
- Caution Respiratory depression & fatal accidental ingestion.
- ADR: Sedation

Naloxone: (Narcan)
- Opioid antagonist used for overdose.
- Given if suspected respiratory depression.
- Repeat dosing may be req. due to opioid lasting longer than Naloxone
- Causes acute withdrawal & pain
- Evzio (injector) - comes w/ voice & visual instructions. Narcan (nasal spray)

GENERIC	BRAND	DOSING	ADRs	BBW	CONTRAINDICATION	NOTES
Codeine + Acetaminophen	Tyelonol #2,3,4		CNS depression - Do NOT drive or operate machinery. (Tolerance may develop) OIC - Constipation Codeine = High N/V/D	1. Addiction, abuse, misuse w/ ER forms may lead to OD/Death. 2. Respiratory depression 3. Crushing, dissolving, chewing of LA form may lead to fatal dose. 4. Kadian/Embeda/ Zohydro/ Nucynta do NOT take w/ ETOH - leads to levels ↑ & fatal dose. 5. Benzo use - sedation, resp. depression, coma, death.	C/I = Child < 12 yo	Children = Rapid 2D6 polymorphism leads to respiratory depression. Codeine = C-II, Combo product Tab/Cap = C-III, Oral solution = C-V
Fentanyl	Duragesic/Sublimaze Remifentanil = IV ONLY	NEVER more than 1 patch Apply 1 patch Q72H Remove before MRI Dispose in the toilet			Ionsys = Transdermal ONLY use in Hospital Must wear gloves and remove device before D/C.	Potential Med Errors Caution w/ CYP3A4 inhibitors Out-PT = Chronic pain ONLY PT on Morphine 60 mg/day for 7 days, can switch to Fentanyl patch
Hydrocodone IR + Acetaminophen	Norco/Lorcet/ Lortab/Vicodin					
Hydrocodone ER	Zohydro/Vantrela ER	REMS Drugs			BBW: CYP3A4 inhibitor	Zohydro = 10mg Q12H Hysingla = 20mg Q4-6H
Hydromorphone	Dilaudid	Oral = 2-4mg Q4-6H				Potent - start slow (High risk for Overdose)
Methadone	Dolophine/Methandone Intensol/Methadose	REMS Drug			BBW: QT-Prolong, Arrhythmias	- Variable Half-Life - Hard to dose - AVOID Serotonergic drugs (Serotonin Syndrome) - Decrease Testosterone/Sexual Dysfxn - Major CYP3A4 substrate
Meperidine	Demerol	Normeperidine metabolite causing seizures			Renal imp/Elderly at risk for CNS toxicity - Avoid MAOi	- NOT used for analgesic anymore - AVOID for chronic pain, Short duration - Risk of Serotonin Syndrome
Morphine	MS Contin/Kadian Arymo ER/Roxanol (IR)	Roxanol = Q4H Prn ER = Q8-12H IV = Q3-4H				ADR: N/V, dizzy, anti-histamine, pruritis Renally imp = Start at low dose
OxyCODONE	IR = RoxyBond/Roxicodone CR = OxyContin + Acetaminophen = Endocet/Percocet/Roxicet				BBW: 3A4 inhibitors	Renally imp = Start low dose
OxyMORphone	Opana					Take on EMPTY stomach
TraMADol	Ultram/Conzip + Acetaminophen = Ultracet	**Centrally-Acting Analgesics:** Mu-Opioid agonist + NE inhibitor	Less GI side effects	Same as Opioids	Warning: Seizure risk, Serotonin syndrome, 2D6/3A4 inhibitors. AVOID in Breastfeeding, Child <12 yo, or Child< 18 yo following Tonsillectomy or Adenoidectomy surgery	Inhibits Serotonin reuptake
Tapentadol	Nucynta					C/I: MAOi in 14 days Seizure risk/Serotonin syndrome

COMMON PAIN ADJUVANTS

General Information	Muscle Relaxants	Lidoderm PT Counseling	Capsaicin PT Counseling
- Adjuvants = Muscle relaxants, anti-epileptics, anti-depressants, topical anesthetics may be used for pain management but not classed as analgesics. - Mostly used for Neuropathy, fibromyalgia, or Neuralgia. - Muscle relaxants = for pain which MOA is not known.	- Caution w/ other CNS depressants (Somnolence, dizzy, confusion) - Counsel: Somnolence, fatigue, & avoid ETOH.	1. May cut patch into smaller pieces w/ scissors. 2. Fold inward & discard away from kids & pets. 3. Apply up to 3 patches at once (12hr on, 12hrs off) 4. Do not use on open wounds or damaged skin	1. Apply thin layer gently rub in. 2. Use 3-4x daily 3. Best results after 2-4 weeks of use so do NOT use PRN. 4. Wash hands after use 5. Never cover w/ bandage or heat pad. 6. Don't touch genitals, eyes, nose, or mouth.

GENERIC	BRAND	MOA	ADRs	BBW	CONTRAINDICATION	NOTES
Gabapentin	Neurontin Horizant/Gralise	Anti-Epileptic	Somnolence, ataxia, dizzy, dry mouth, edema, weight gain.	Angioedema, anaphylaxis, increase suicide (all AEDs)		C-IV: Req Med Guide Take w/ FOOD
Pregabalin	Lyrica					C-V
Carbamazepine	Tegetrol/Cabatrol					
Baclofen	Lioresal	Anti-Spasmodic	Sedation, dizzy, confusion (All muscle relaxants)	Do not D/C abruptly	Exert effect thru analgesia	
Cyclobenzaprine	Fexmid/Flexeril/Amrix					Dry mouth
Tizandine	Zanaflex					Hypotension, dry mouth, weakness, QT prolongation
Carisoprodol	Soma			Exert effect through Sedation		Increase conc. w/ Poor 2C19 metabolizers
Metaxalone	Skelaxin					Hepatotoxic
Methocarbamol	Robaxin					Hypotension
Milnacipran	Savella	SNRI (see depression chapter)	N/HA/Constipation Increase suicidal thoughts MAOi 14 days			IND: Fibromyalgia ONLY
Amitriptyline	Elavil					Take QHS
Desipramine	Norpramin					
Duloxetine	Cymbalta					
Lidocaine 5% Patch	Lidoderm	Topical Anesthetics	Burning, itching, rash on skin			May cut into smaller pieces Do NOT apply >3 patches at once Approved for Shingles
Methyl Salicylate Topical OTC	BenGay, IcyHOT, SalonPas					Contact PCP if skin rash > 7 days
Capsaicin 0.025%	Zostrix		Burning lessens over time	Decreases Substance-P		

ONCOLOGY

General Information

- Tx GOAL = Achieve remission w/ curative intent OR to reduce tumor size & symptoms.
- If PT remains cancer-free for 5 years = unlikely cancer will recur.
- Primary Tx = Surgery if cancer is resectable.
- Neoadjuvant Tx = Radiation/Chemo Tx prior to surgery to shrink tumor.
- Adjuvant Tx = Radiation/Chemo Tx after surgery to Px recurrence.

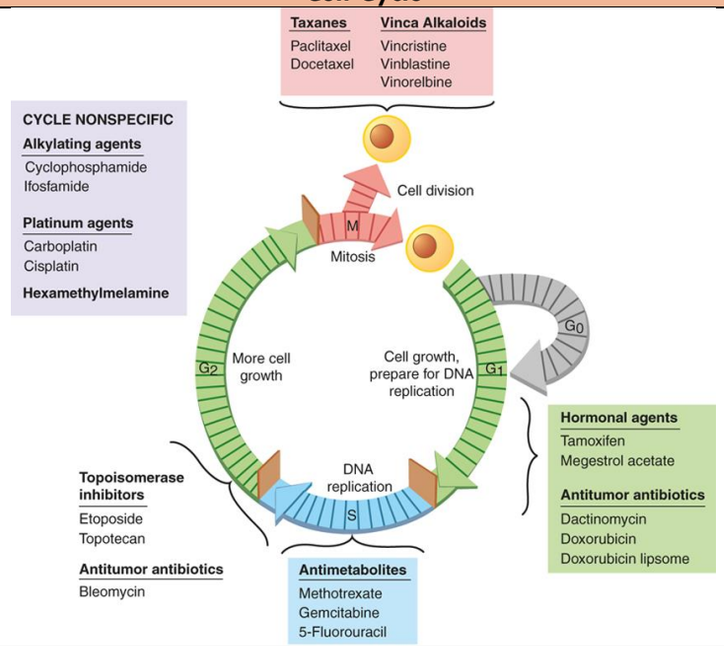
7 Warning Signs = CAUTION

- **C** = Change in bowel/bladder habits
- **A** = A sore that does not heal
- **U** = Unusual bleeding or discharge
- **T** = Thickening lump
- **I** = Indigestion or difficult swallowing
- **O** = Obvious change in wart/mole
- **N** = Nagging cough or hoarseness

Karnofsky & ECOG Score

Physical functioning test to assess PT's for severe common S/E of Chemo Tx agents:
1. Diarrhea
2. Alopecia
3. Myelosuppression

Cell Cycle



Common ADRs of Cancer/Chemo

Oral Mucositis

Occur several days after Chemo. Practice good oral hygiene.
- Tx = Mucosal Spray (Lidocaine 2% topical solution)
- Xerostomia:
  Tx = Pilocarpine (Salagen)
  Caution hepatic impairment

Hand-Foot Syndrome

Palmar-Plantar Erythrodysesthesia
Tx = Emollients

Pregnancy & Breastfeeding

AVOID chemo Tx as it is teratogenic & avoid handling chemo drugs as it may cause sterility.

Myelosuppression

Nadir definition = WBC's & Platelets reaching lowest levels. Occurs 7-14 days after Chemo Tx. Recovers 3-4 wks after D/C.

Neutropenia

- Low Neutrophils = ↑ Infxn Risk
- Neutropenia = <1000 ANC
- Severe = <500 ANC
- Profound = <100 ANC
- CSF agents: Tx neutropenia to ↓ mortality of infections & given prophylactically for PTs at high risk of Febrile Neutropenia.

Hypercalcemia of Malignancy

- Tx = Bisphophonates, Denosumab, Calictonin (Miacalcin), Zolendronic Acid (Zometa)
- Do NOT use w/Reclast, Denosumab (Xgeva) or Prolia

Thrombocytopenia

Platelet transfusions are indicated when count falls <10,000.

Febrile Neutropenia

- ANC < 500 or expected w/I 48 hrs + Oral Temp = >38.3 C (101 F)
  OR Oral Temp = >38.0 C (100.4 F) sustained for > 1 hour.
- Tx = Empirical Tx must include coverage for P. Aeruginosa
- Low Risk = ANC <500 x 7 days = PO Abx [Cipro + Augmentin, Cipro +/- Clindamycin, Levofloxacin]
- High Risk = ANC <100 or >7 days = IV Abx [Cefepime, Ceftazidime, Meropenem, Imipenem-Cilastin, Pip-Tazo]

Anemia

- ESA shortens survival & ↑ tumor progression/recurrence in PTs w/ breast, small-cell lung, head & neck, lymphoid, & cervical cancers.
- Only initiate if Hgb < 10 g/dL + use lowest effective dose.
- Serum Ferritin, TSAT, TIBC may be used to assess Iron storage.
- ESA's may NOT work if Fe+ levels are low.

Filgrastim	Neupogen Zarxio	CSF: Tx Anemia	Bone pain Fever Arthralgia Myalgia Rash	1st Dose = Given NO sooner than 24 hrs after chemo tx. Monitor: CBC
Tbo-Filgrastim	Granix			
Peg-Filgrastim	Neulasta			
Sargramostim	Leukine			

Dosing Considerations for Chemo Tx Agents

Drug	Max Dose	Reason
Bleomycin	Lifetime Dose = 400U	Pulmonary Toxicity
Doxorubicin	Lifetime Dose = 450-550mg	Cardiotoxicity
Cisplatin	Dose per cycle = <100 mg	Nephrotoxicity
Vincristine	Single Dose = 2mg	Neuropathy

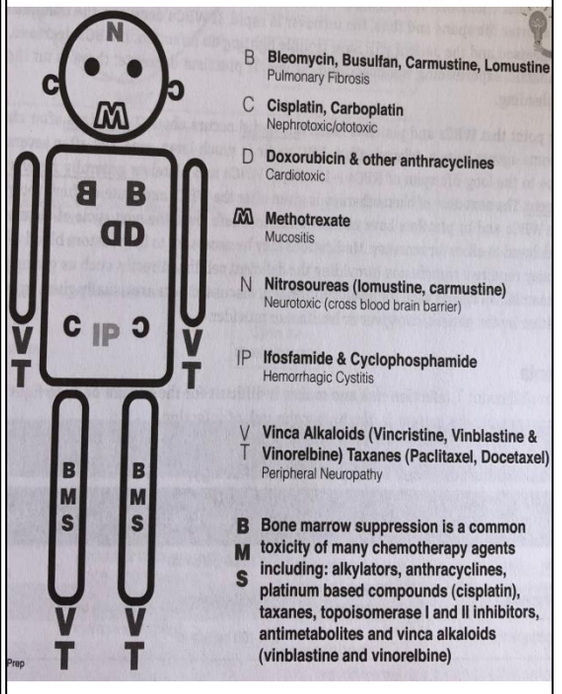
Chemo Adjunctive Meds

Cisplatin - Nephrotoxic	Amifostine
Doxorubicin - Cardiomyopathy	Dexrazoxane
Fluorouracil - Efficacy	Leucovorin
Ifosfamide - Hemorrhagic Cystitis	Mesna
Irinotecan - Diarrhea	Atropine Loperamide
MTX - Myelosuppression	Leucovorin Glucarpidase
Fluorouracil OR Capecitabine Toxicity Antidote	Uridine Triacetate

Common Toxicities

Myelosuppression	Almost ALL
N/V	Cisplatin
Mucositis	Fluorouracil Capecitabine Irinotecan MTX
Diarrhea	Fluorouracil Capecitabine Irinotecan TKI's
Constipation	Vincristine Thalidomide Pomalidomide
Xerostomia	Radiation
Clotting	SERMs Aromatase Inhibitors
Cardiotoxicity	Anthracyclines TKI's
Hepatotoxicity	MABs, TKI's, MTX
Pulmonary Toxicity	Bleomycin Busulfan Carmustine Iomustine
Nephrotoxicity	Cisplatin, MTX
Neuropathy	Vinca Alkaloids Platinums Taxanes
Hemorrhagic Cystitis	Cyclophosphamide Ifosfamide

Chemo Man



ONCOLOGY

GENERIC	BRAND	MOA	ADRs	BBW	CONTRAINDICATION	NOTES
Cyclophosphamide	Cytoxan	**Alkylating Agents:** NON-Specific Agents (DNA disruption)	Pulmonary Toxicity (Busulfan, Carmustine, Lomustine)		**ALL have BBW:** Myelosuppression WARNING: SJS | TEN Skin Rxns Reactivation of Viral Infxns	Hemorrhagic Cystitis - Must prevent w/ MESNA (Mesnex) & Hydration
Ifosfamide	Ifex			Neurotoxicity		
Carmustine	BiCNU					Pulmonary Toxicity
Bendamustine	Bendeka, Treanda					
Busulfan	Myleran, Busulfex					
Melphalan	Alkeran, Evomela					
Cisplatin		**Platinum-Based:** Non-Specific Agents (DNA disruption)	Peripheral Neuropathy Ototoxicity Nephrotoxicity	Myelosuppression Anaphylaxis Rxn - ↑ risk w/ repeated exposure - Caution > 6 cycles	Nephrotoxicity, Ototoxicity Amifostine (Ethyol) for prophylaxis	Highest Nephrotoxicity & CINV
Carboplatin					Calvert Formula used for dosing	
Oxaliplatin					Acute Sensory Neuropathy Exacerbated by COLD weather	
Doxorubicin		**Anthracyclines:** NON-Specific Agents	RED-Urine Discoloration Hand-Foot Syndrome CINV	Myelosuppression Myocardial Toxicity Vessicant		Cardiotoxicity = related to TOTAL cumulative anthracycline dose received over LIFETIME - MAX Dose = 450-550 - prophylaxis = Dexrazoxane (Zinecard) Totect - Extravasation Antidote
Mitoxantrone			BLUE-Urine Discoloration			
Vincristine		**Vinca Alkaloids:** M-Phase	Neuropathy (Paresthesia) Gastroparesis Constipation	IV Only - NO Intrathecal	NOT Myelosuppressive	MAX DOSE = 2 mg/Dose Dose in small IV bag (Piggy Back) MOST CNS Toxicity Intrathecal Administration: DEATH + PARALYSIS
Vinblastine					Myelosuppressive	B = Bone Marrow Suppression
Vincorelbine						
Paclitaxel	- Infusion Hypersensitive Rxns = pre-Medicate w/ Benadryl, Steroid, or H2RA	**Taxanes:** M-Phase	Neuropathy Myalgia Arthralgia	Myelosuppression Hypersensitivity Rxns Fatal Anaphylaxis	Give Taxanes BEFORE Platinums	
Docetaxel						Fluid Retention
Paclitaxel						
Irinotecan	Cholinergic Sx: Flushing, Sweat, Cramps Delayed Diarrhea Homo UGT1A1*28: causes neutropenia	**Topoisomerase 1 inhibitor:** S-Phase	N/V/D Diarrhea Abdominal Pain Alopecia	Myelosuppression		Delayed Diarrhea (Early + Late)
Toptecan						
Etoposide IV		**Topoisomerase 2 inhibitor:** G2-Phase	Hypersensitivity Anaphylaxis	Myelosuppression		Infusion Rate-Hypotension Use Non-PVC IV Bag + Tubing Refrigerate Capsules
Etoposide Capsules	VePesid					
Fluoruracil	5-FU	**Pyrimidine Analogs:** S-Phase	Hand-Foot Syndrome Cardiotoxicity Photosensitivity Diarrhea Mucositis	↑ INR	CrCl <30	Leucovorin = Efficacy DPD Deficiency = Toxicity
Capecitabine	Xeloda					Pro-Drug of 5-FU DPD Deficiency = Toxicity
Cytarabine	ARA-C					
Gemcitabine						
Methotrexate		**Folate Anti-Metabolites:** S-Phase	Nephrotoxicity Hepatotoxicity Mucositis	Myelosuppression Mucositis Diarrhea	NSAID, Salicylate = DDI	Give Folic Acid, Vit-B12 for S/E Intrathecal should ONLY be given if Preservative-Free formulation Dose >500 mg req. Leucovorin Must Hydrate + IV Sodium Bicarb to ☐ Nephrotoxicity
Pemetrexed						
Everolimus	Zortress	**MTOR inhibitor:** indication = Transplant	DLD, Stomatitis, Rash, Interstitial Lung Dx			
Temsirolimus INJ	Torisel		DLD, Hyperglycemia, Myelosuppression, Interstitial Lung Dx			Use NON-PVC Bag

ONCOLOGY

GENERIC	BRAND	MOA	ADRs	BBW	CONTRAINDICATION	NOTES
Tretinoin	Retinoic Acid	**Miscellaneous Agents**	RA-APL Differentiation Syndrome			
Arsenic Trioxide			QT-Prolong RA-APL Differentiation Syndrome			
Asparaginase			Hypersensitivity, Pancreatitis			
Pegaspargase			Prolong Pro-Thrombin/INR Time			
Bleomycin			Pulmonary Fibrosis			No Myelosuppression MAX LIFE Dose = 400 units
Mitomycin						
Lenalidomide	Revlimid	**Immunomodulator**	Neutropenia Thrombocytopenia	Fetal Risk Pregnancy DVT, PE risk	Pregnancy	REMS Drug - Pregnancy
Pomalidomide						
Thalidomide	Thalomid					
Bortezomib	Velcade	**Proteasome Inhibitor**	Peripheral Neuropathy Neutropenia Thrombocytopenia			Give Acyclovir, valacyclovir to prevent Herpes reactivation
Carfilzomib	Kyprolis		Peripheral Neuropathy			

MONOCLONAL ANTIBODIES (MAB)

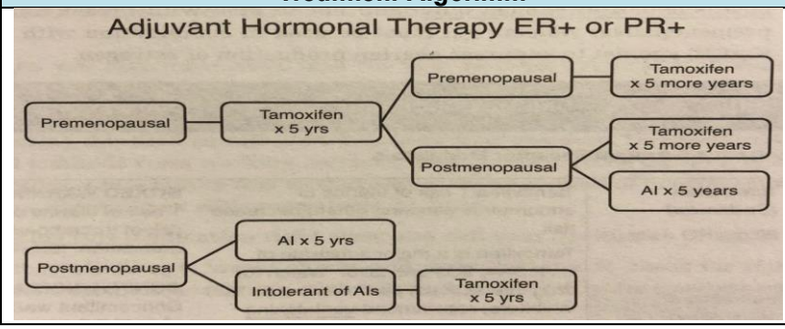
GENERIC	BRAND	MOA	ADRs	BBW	CONTRAINDICATION	NOTES
Beva**ci**zumab	Avastin	**VEGF**	HTN Poor clotting	Fatal Bleeding GI Perforation	Poor Wound Heal = AVOID 28 days before/after SURGERY	Affects circulatory system
Ramu**ci**rumab	Cyramza					
Tras**tu**zuab	Herceptin	**HER-2**	Cardiotoxicity Fetal Toxicity			MONITOR: LVEF w/ ECG or MUGA Scan @ Baseline & During Tx Trastuzumabs NOT Interchangeable
Ado-Trastuzumab Emtansine	Kadcyla					
Per**tu**zumab						
Ce**tu**ximab	Erbitux	**EGFR**	Skin rashes			EGFR + Gene Expression = BETTER Response in NSCLC - Must be KRAS-Wild Type to use.
Pani**tu**mumab	Vectibix					
Ipi**li**mumab	Yervoy	**CTLA inhibitor**				MED GUIDE - REMS Drug
Ri**tu**ximab	Rituxan	**CD-Antigen**	Myelosuppression Viral infections Colitis Hepatotoxicity Thyroid Dsyfxn Myocarditis			Must be CD20 + to use
Blinatumomab	Blincyto					
Pembro**li**zumab	Keytruda					MED GUIDE Required
Nivolumab	Opdivo					

TYROSINE KINASE INHIBITORS (TKI)

GENERIC	BRAND	MOA	ADRs	BBW	C/I	NOTES
Imatinib	Gleevec	**BCR-ABL - Tx CML**	QT-Prolong Fluid Retention	TYROSINE-KINASE Toxicities: Hypothyroidism Hepatotoxicity Diarrhea QT-Prolong Rash (EGFR) HTN (VEGF) Hand-Foot (VEGF)		Must be Philadelphia BCR-ABL +
Dasatinib	- ALL are PO - Req Genomic Testing - Food alters Bioavailability					
Vemurafenib		**BRAF - Tx Melanoma**	New Malignancies			Must be BRAF V600E or V600K +
Dabrafenib						
Afatinib		**EGFR - Tx NSCLC**	Acneiform Rash Dry Skin			Must be EGFR +
Erlotinib						
Gefitinib						
Crizotinib		**ALK**				Must be ALK +
Ceritinib						
Alectinib						
Lapatinib		**Other**	QT-Prolong ↓ LVEF			Must have HER-2 Overexpression

ONCOLOGY

BREAST CANCER

GENERIC	BRAND	MOA	ADRs	BBW	C/I	NOTES	General Information
Tamoxifen	Soltamox	**SERMs**	DVT | PE Menopause Sx | Hot Flash Flushing Edema Weight Gain HTN Mood changes Amenorrhea Vaginal Bleed/Discharge	Med Guide Endometrial Cancer Blood Clot Cataracts	Warfarin DVT/PE Hx Pregnancy Breastfeeding QT-Prolong	Use Venlafaxine for hot flashes	- HER-2+ OR Metastatic = Tx Trastuzumab +/- Pertuzumab - ER/PR+ = Tx SERMs (Tx both Pre/Post Meno) - Pre-Menopausal = Tamoxifen x 5 yrs → Reassess & change. - Post-Menopausal = Aromatase Inhibitor or Tamoxifen x 5 yrs.
Raloxifene	Evista						
Fulvestrant	Faslodex						
Toremifene	Fareston						
Anastrozole	Arimidex	**Aromatase Inhibitors**	DVT | PE Menopause Sx | Hot Flash N/V | Rash Edema Osteoporosis HTN Lethargy | Fatigue Hepatotoxicity HTN | DLD	High Risk of: - Osteoporosis - CVD - Arthralgia - Myalgia	AVOID: Tamoxifen or Estrogen		**Treatment Algorithm** 
Letrozole	Femara						
Exemestane	Aromasin						
Palbociclib	Ibrance	**Cyclin-Kinase Inhibitor**				Must use w/ Letrozole or Fulvestrant	

PROSTATE CANCER

GENERIC	BRAND	MOA	ADRs	BBW	C/I	NOTES	General Information
Leuprolide	Lupron Depot Eligard	**GnRH Agonist: Luteinizing (LHRH) agonists**	Hot Flashes Gynecomastia Impotence Peripheral Edema Bone pain Injection site pain QT Prolong DLD | BG ↑	Osteoporosis Risk Tumor Flares	Pregnancy Breastfeeding	SC | IM	ADT Tx = ↓ the concentration of Testosterone. S/E of ADT Tx: - Hypogonadism - Hot Flashes - Libido | Impotence - Gynecomastia - Hair Thinning - Peripheral Edema Tumor Flare Sx = Bone pain or problems w/ urination. - Prophylaxis = Give Anti-Androgens for several weeks in conjunction w/ GnRH agonist initiation
Goserelin	Zoladex						
Histrelin	Supprelin						
Triptorelin	Trelstar						
Degarelix	Firmagon			Osteoporosis Risk	Hypersensitivity Rxns	SC	
Bicalumatide	Casodex	**Anti-Androgens**	Hot Flash Gynecomastia Peripheral Edema CVD N/V/D	Hepatotoxicity	Pregnancy Breastfeeding	ONLY used Combo w/ GnRH agonist PO	
Flutamide							
Nilutamide							
Enzalutamide	Xtandi					Mono Tx OK	
Abiraterone	Zytiga	**Androgen Biosynthesis Inhibitor**	Edema | HTN | K+ ↓				

ONCOLOGY

CHEMO INDUCED NAUSEA/VOMITING (CINV)

General Information

- MUST administer at least 30 mins prior to Chemo Tx.
- MUST provide take-home meds for break through N/V:
- First Line: Ondansetron, Prochlorperazine Metoclopramide
- 2nd LINE = Cannabinoids

Treatment Algorithm

ACUTE	w/I 24 hrs	5HT-3 antagonists
DELAYED	1 - 7 days after	NK-1 antagonist Corticosteroids Palonosetron
ANTICIPATORY	Before chemo	Benzos

Treatment

High Emetic Risk > 90% (3 Drug Tx)	- NK-1 + 5HT-3 + Dexamethasone - Netupitant/Palonosetron (Akynzeo) + Dexamethasone - Olanzapine + Palonosetron + Dexamethasone - 5HT-3 + Dexamethasone (Tx Mod-risk only)
Mod Risk 30 - 90% (2-3 Drug Tx)	
Low Risk 10 - 30% (Any 1 except NK-1)	5HT-3, Dexamethasone, Prochlorperazine, Metoclopramide

GENERIC	BRAND	MOA	ADRs	BBW	C/I	NOTES
Aprepirtant	Emend	**Substance-P, NK-1 Antagonist**	Dizziness Fatigue Constipation Weakness Hiccups			
Fosaprepitant IV	Emend					
Netupitant + Palonosetron	Akynzeo					
Rolapitant	Varubi					
Ondansetron	Zofran Zuplenz Film	**5HT-3 Antagonist**	Headache Fatigue Dizziness Constipation		Apomorphine	Dolasetron IV has NO indication for CINV due to QT Prolong. ODT: Must dry hands 1st
Granisetron	Kytril Sancuso Sustol					
Dolasetron	Anzemet					
Palonosetron	Aloxi					
Prochlorperazine	Compazine Compro	**Dopamine Antagonist**	Sedation Lethargy EPS ↓ Seizure threshold			Droperidol: QT prolong + Arrhythmias
Promethazine	Phenergan Phenadoz Promethegan					
Metoclopramide	Reglan					
Droperidol						
Dexamethasone	Decadron	**Corticosteroid**	See Steroids			
Dronabinol - C3	Marinol	**Cannabinoids**	Somnolence Euphoria ↑ Appetite			Must refrigerate
Nabilone - C2	Cesamet					