



# Pharmacology

Archer Review Crash Course



## Welcome!

- If you have a question please enter it in the chat! I will do my best to answer questions as we go, but if I miss one will always circle back to you!
- We will be taking two 10 minute breaks during the class
- Handouts & powerpoint slides are located in the 'Handouts' section of your GoToWebinar control panel. You can download and print them from here!
- Within one week of course completion you will receive an email with your OnDemand streaming link so that you may re-watch this course. You have access for 1 month!
- If you have any technical issues or questions about streaming, handouts, etc. please email [support@archerreview.com](mailto:support@archerreview.com)

# Antianxiety Agents

- Short acting
  - Midazolam (Versed)
  - Diazepam (Valium)
- Intermediate - Long acting
  - Clonazepam (Klonopin)
  - Alprazolam (Xanax)
  - Lorazepam (Ativan)

## Ativan

Therapeutic class: antianxiety agent

Indication: anxiety, sedation, seizures

Action: general CNS depression

Nursing Considerations:

- Avoid alcohol
- Monitor for respiratory depression
- Antidote - flumazenil

## NCLEX Question

The nurse is caring for a patient who is experiencing severe, acute anxiety prior to a scheduled endoscopy procedure. Which of the following medications is the healthcare provider most likely to order?

- A. Oxycodone
- B. Midazolam
- C. Clonazepam
- D. Haloperidol

## Answer: B

A is incorrect. Oxycodone is an opioid pain medication prescribed for severe pain. It is not indicated in an acute anxiety attack.

B is correct. Midazolam is a benzodiazepine used for acute anxiety attacks. Midazolam is preferred in this setting because of its rapid onset, about 2-5 minutes after IV administration, and short duration, only 3-8 hours. Midazolam would be the most useful choice for the patient experiencing an acute anxiety attack before or during a procedure.

C is incorrect. Clonazepam is a long-acting benzodiazepine used for panic disorders, PTSD, and GAD. For this patient with an acute anxiety attack prior to a procedure, a long-acting benzodiazepine is not indicated.

D is incorrect. Haloperidol is an antipsychotic used to address severe agitation and aggression associated with psychiatric disorders such as schizophrenia. It would not be useful for the patient experiencing a pre-procedural acute anxiety attack.

# Antiarrhythmics

- Amiodarone
- Adenosine
- Procainamide

## Adenosine

Therapeutic class: Antiarrhythmic

Indication: SVT

Action: Slows conduction through the AV node, interrupts re-entry pathways through AV node, restoring normal sinus rhythm

Nursing Considerations:

- There will be a period of asystole after administration
- Warn the patient - it will feel like someone kicked them in the chest!
- Warn the family - they will flatline on the monitor!
- Rapid push - or it will not work.
- Use with extreme caution in asthmatics.

# Anticoagulants

- Heparin
- Clopidogrel (Plavix)
- Warfarin
- Enoxaparin (Low-molecular weight heparin)

## Heparin

- Classification: Indirect Thrombin Inhibitor
  - Anticoagulant!
- How it works
  - Thrombin → converts fibrinogen to fibrin → Fibrin forms clots!
  - **Antithrombin III** inhibits Thrombin
  - Heparin ENHANCES **antithrombin III**
  - This stops thrombin from being activated, which therefore prevents clots from forming.
- This is the intrinsic coagulation pathway

End result? **SLOWS DOWN CLOTTING.**

# Basic Information

- Uses
  - To prevent blood clots
    - Strokes
    - Chronic a-fib
    - Post-operatively
- Administration
  - Subcutaneous
  - Intravenous
- Titration
  - Patients on a heparin drip have aPTT levels drawn q4-6 hours to titrate the drip.

# Important Nursing Considerations

- Biggest side effect to monitor for = **bleeding!**
  - Hematuria - Pink tinged urine
  - Hematemesis - bloody vomitus
  - Bruising
  - Downtrending H&H
- Antidote = protamine sulfate

## Heparin Induced Thrombocytopenia and Thrombosis (HITT)

- Complication of Heparin therapy
- Usually occurs 5-10 days after Heparin exposure
- Suspect in any patient on Heparin who has an unexplained platelet drop
- Clinical manifestations:
  - Skin lesions at heparin injection sites
  - Chills
  - Fever
  - Dyspnea
  - Chest pain
- Complications - clotting!
  - DVT
  - PE
- Treatment
  - Discontinue ALL heparin and start a different anticoagulant!

## Warfarin

Therapeutic class: Anticoagulant

Indication: venous thrombosis, pulmonary embolism, A-fib

Action: disrupts liver synthesis of Vitamin K dependent clotting factors

Nursing Considerations:

- Monitor for bleeding
- Monitor PT and INR
  - Therapeutic PT: 1.3-1.5
  - Therapeutic INR: 2.5-3.5
- Antidote: Vitamin K
- Contraindicated during pregnancy

## NCLEX Question

The nurse is caring for a pregnant client who is at 16 weeks gestation. She developed a pulmonary embolism and was initiated on heparin therapy two days ago. She is getting ready to be discharged. Which of the following medications do you expect the healthcare provider to order at discharge?

- A. Warfarin
- B. Rivaroxaban
- C. Apixaban
- D. Low Molecular Weight Heparin (LMWH)

## Answer: D

A is incorrect. Warfarin is contraindicated during pregnancy. It can cause congenital disabilities, maternal bleeding, stillbirths, and miscarriages.

B and C are incorrect. Rivaroxaban and Apixaban belong to the class of Factor Xa inhibitors. These are newer anticoagulants and are not safe in pregnancy.

D is correct. Low Molecular Weight Heparin is the drug of choice for anticoagulation in pregnancy. It does not cross the placenta and therefore does not cause fetal harm.

# Anticonvulsants

- Phenytoin (Dilantin)
- Carbamazepine
- Divalproex
- Gabapentin
- Lamotrigine
- Levetiracetam (Keppra)

## Phenytoin

Therapeutic class: Anticonvulsant

Indication: Seizures

Action: blocks sustained high frequency repetitive firing of action potentials

Nursing Considerations:

- Therapeutic level: 10-20 mcg/mL
- Side effect: gingival hyperplasia
  - Regular dental check-ups
  - Use soft bristle toothbrush
- Antacids can reduce the effect of phenytoin and should be avoided.

## NCLEX Question

The nurse is educating a patient who is taking phenytoin. To make sure phenytoin does not fail, which over-the-counter medication should the nurse advise the patient not to take at the same time?

- A. Acetaminophen
- B. Ibuprofen
- C. Calcium Carbonate
- D. Ranitidine

## Answer: C

A is incorrect. Acetaminophen and Phenytoin can be taken together without any concern for therapeutic failure.

B is incorrect. Ibuprofen and Phenytoin can be taken together without any concern for therapeutic failure.

C is correct. Calcium Carbonate (Tums) should not be taken at the same time as Phenytoin because taking them together can decrease the effects of phenytoin. Antacids containing calcium carbonate reduce the bioavailability of phenytoin by reducing the rate of absorption and amount of intake. If the patient needs both phenytoin and calcium carbonate, they should be administered at least 2-3 hours apart.

D is incorrect. Ranitidine and Phenytoin can be taken together without any concern for therapeutic failure. Instead, Ranitidine can increase the effects of Phenytoin, so the patient should be monitored for any phenytoin related side effects.

# Antidepressants

- **SSRIs**
  - Fluoxetine
  - Sertraline
  - Escitalopram
  - Citalopram
- **TCAs**
  - Amitriptyline
  - Nortriptyline
  - Protriptyline
- **MAOIs**
  - Tranylcypromine
  - Isocarboxazid
  - Phenelzine
  - selegiline

## SSRIs

Examples: Fluoxetine, Sertraline, Escitalopram, Citalopram

Indication: Depression

Action: Prevent reuptake of serotonin increasing the availability of serotonin in the body.

Nursing Considerations:

- Monitor for **serotonin syndrome**
  - Hypertension, confusion, anxiety, tremors, ataxia, sweating.
- **Suicide precautions** important for 2-3 weeks
  - When the patient's mood starts to improve, they are at an increased risk for suicide
  - Why? They now have the energy to follow through with a plan.

# TCA's

Examples: Amitriptyline, Nortriptyline, Protriptyline

Indication: Depression

Action: Prevents the reuptake of norepinephrine and serotonin increasing these neurotransmitters in the body..

Nursing Considerations:

- Monitor for **anticholinergic side effects**
  - Dry mouth, constipation, urinary retention

# Monoamine Oxidase Inhibitors

Examples: tranylcypromine, isocarboxazid, phenelzine, selegiline

Indication: Depression

Action: blocks monoamine oxidase enzymes to increase the levels of ALL neurotransmitters ( dopamine, norepinephrine, epinephrine, serotonin)

Nursing Considerations:

- **Avoid foods that are high in tyramine.**
  - Aged cheeses
  - Wine
  - Pickled meats
- Side effect - **hypertensive crisis**

# Mood Stabilizers

- Lithium

## Lithium

Indication: Mania

Action: Inhibits excitatory neurotransmitters such as dopamine and glutamate, and promotes GABA-mediated neurotransmission.

Nursing Considerations:

- Do not administer with NSAIDS
- Monitor **drug levels**:
  - Therapeutic level - 0.5-1.5mEq/L
- Encourage adequate fluid intake
- Side effects:
  - Seizures, arrhythmias, fatigue, confusion, nausea, anorexia, hypothyroidism, tremors

# Antipsychotics

- Haloperidol
- Quetiapine
- Olanzapine

## Haloperidol

Therapeutic class: Antipsychotic

Indication: Schizophrenia, mania, aggressive behavior, agitation

Action: Inhibits the effects of dopamine

Nursing Considerations:

- Monitor for extrapyramidal side effects
- Tardive dyskinesia
- Neuroleptic malignant syndrome
- Can prolong the QT interval
  - Weekly EKG

# Antihistamines

- Diphenhydramine
- Promethazine
- Cimetidine
- Famotidine
- Ranitidine

## Diphenhydramine

Therapeutic class: Antihistamine

Indication: Allergy, anaphylaxis, sedation

Action: Antagonizes effects of histamine, CNS depression

Nursing Considerations:

- Monitor for drowsiness
- Anticholinergic effects

# Antihypertensives

- ACE inhibitors
  - Captopril
  - Enalapril
  - Lisinopril
- Angiotensin II Receptor Blockers
  - Losartan
- Calcium Channel Blockers
  - Amlodipine
  - Diltiazem
  - Nifedipine
  - Verapamil
- Beta-blockers (next class)

## Enalapril

Therapeutic class: ACE inhibitor

Indication: Hypertension, CHF

Action: Blocks conversion of angiotensin I to angiotensin II, increases renin levels and decreases aldosterone leading to vasodilation

Nursing Considerations:

- Can cause a dry cough - should be discontinued if it does.
- Monitor BP
- Contraindicated during pregnancy

# Losartan

Therapeutic class: Angiotensin II receptor blocker (ARB)

Indication: hypertension, DM neuropathy, CHF

Action: inhibits vasoconstrictive properties of angiotensin II

Nursing Considerations:

- Monitor BP
- Monitor fluid levels
- Monitor renal and liver status
- Contraindicated during pregnancy

# Amlodipine

Therapeutic class: Calcium channel blocker

Indication: Hypertension, angina

Action: Blocks transport of calcium into muscle cells inhibiting excitation and contraction, causes peripheral vasodilation

Nursing Considerations:

- Avoid grapefruit
  - Blocks the enzyme involved in metabolizing calcium channel blockers, causing their levels to increase.
- Monitor BP - orthostatic hypotension
- Can cause **gingival hyperplasia**

# NCLEX Question

The nurse is providing discharge instructions to a client with accelerated hypertension who has been newly started on Nifedipine. His home medications include calcium supplements for osteoporosis, omeprazole for heartburn, furosemide, and lisinopril. Which statement(s) by the client demonstrates the need for additional teaching regarding Nifedipine? Select all that apply.

- a. "My gums may swell because of this medication."
- b. "I will avoid getting up too quickly from sitting or lying position."
- c. "I will stop taking calcium supplements since they may negate the effects of Nifedipine."
- d. "It is highly likely that I will get constipated from this drug"
- e. "If I get cough and tongue swelling, I will hold Nifedipine"

## Answer: A and B

A is correct. Gum/ gingival hyperplasia is a common side effect with extended-standing use of Nifedipine.

B is correct. The patient should avoid getting up too quickly from sitting or lying position. Because of peripheral vasodilation, Nifedipine causes postural or orthostatic hypotension. So, the client should be aware of getting up slowly from the lying/ sitting position so they do not become dizzy.

C is incorrect. The patient should not stop taking their calcium supplements. There is no evidence to say oral calcium supplements will reduce the effects of CCBs. Also, this client needs calcium supplements for his osteoporosis. Therefore, this does not reflect correct understanding by the client and needs additional teaching.

D is incorrect. There is a less than 2% chance that the person can get constipated from Nifedipine, it is not true that the client is highly likely to get constipated from Nifedipine. Therefore, this statement does not reflect correct understanding by the client and needs additional teaching.

E is incorrect. The patient should not hold Nifedipine if they get cough and tongue swelling. Cough and tongue swelling (Angioedema) are common side effects seen with ACE inhibitors, not with CCBs. The client is also on Lisinopril (ACEI), which may lead to this side effect, so the nurse will need to explain this to the client.

# Beta Blockers

- Propranolol
- Atenolol
- Metoprolol

## Propranolol

Therapeutic class: antiarrhythmic

Indication: hypertension, angina, arrhythmias, MI, cardiomyopathy, alcohol withdrawal, anxiety

Action: blocks Beta 1 and 2 adrenergic receptors slowing the heart rate

Nursing Considerations:

- Do not discontinue abruptly, discontinue them slowly,
- Can mask the signs of hypoglycemia; important to monitor blood sugars.

## NCLEX Question

The nurse is working with a patient who has been experiencing multiple episodes of chest pain. The patient has a strong family history of heart disease. The patient is prescribed a medication to prevent myocardial infarction. Which of the following medications is appropriate for this condition?

- a. Indomethacin
- b. Loperamide
- c. Ibuprofen
- d. Propranolol

## Answer

**D is correct.** Propranolol is a beta blocker that is used to treat hypertension, angina, arrhythmias, and heart attacks.

**A is incorrect.** Indomethacin is an antirheumatic medication that is used for patients with rheumatoid arthritis. It would not be used in a patient to prevent heart attacks.

**B is incorrect.** Loperamide is an anti-diarrheal. It would not be used in a patient to prevent heart attacks.

**C is incorrect.** Ibuprofen is a non-steroidal anti-inflammatory agent. It treats mild to moderate pain and inflammation. It would not be used in a patient to prevent heart attacks.

# Break!

Back at 11:00 CST

## Cardiac glycosides

- Digoxin

# Digoxin

Therapeutic class: Cardiac glycoside

Indication: Heart failure, a-fib, a-flutter, CHF, cardiogenic shock

Action: Increases contractility (how strong the heart pumps), and decreases the rate (how fast the heart beats). Acts on the cellular sodium-potassium ATPase, making the heart more efficient!

Nursing Considerations:

- Monitor for toxicity
  - Vision changes, blurred vision, yellow/green vision

## Toxicity

Monitor for toxicity in any patient taking digoxin!

Narrow therapeutic range!! → Therapeutic lab level: .5-2ng/mL

- Signs/symptoms:
  - Nausea & vomiting
  - Anorexia
  - **Vision changes** - yellow/green halos
  - Bradycardia → arrhythmias

Monitor for these signs and symptoms and report them to the health care provider early!

# Risk factors for toxicity

- Patients with hypokalemia ( $K < 3.5$ )
  - **\*\*If your patient is on a loop diuretic, and digoxin, they are more likely to become toxic!\*\***
  - Licorice extract acts like aldosterone (Na/water retention & K loss) → hypokalemia → Dig Toxicity. Licorice extract is in **black licorice**.
- Patients with hypomagnesemia ( $Mg < 1.8$ )
- Patients with hypercalcemia ( $Ca > 10.5$ )
- The **elderly**!
  - These patients have decreased renal and liver function, making it harder for them to clear any drugs, so digoxin levels can build up and become toxic more quickly!

# Important Nursing Consideration

When should you HOLD your digoxin dose??

In general, **if the pulse is less than 60, you should hold digoxin**. This will be slightly different in different age groups. Always check your order!

## NCLEX Question

A nurse is caring for a client receiving digoxin. The client's most recent serum digoxin level was 2.5 ng/mL. Which of the following priority nursing actions should the nurse take? Select all that apply.

- A. Withhold the client's scheduled dose
- B. Administer the dose as prescribed
- C. Assess the client's urinary output
- D. Assess the client's most recent sodium level
- E. Assess the client's heart rate and rhythm

## Answer: A and E

The client's digitalis level of 2.5 ng/mL is indicative of toxicity. Digoxin has a narrow therapeutic index, which means it can cause significant side effects, such as cardiac arrhythmias (e.g., bradycardia, heart block, ventricular arrhythmias), even at plasma concentrations only twice the therapeutic plasma concentration range. Normal corrective serum digoxin levels range from 0.5 - 2 ng/mL. A level higher than two ng/mL is considered toxic. The nurse is correct to withhold the scheduled dose (Choice A) and assess the client's heart rate and rhythm (Choice E) as the client is likely to be experiencing bradycardia.

Choice B, C, D, and F are incorrect. It would be wrong to administer the next dose, as this would exacerbate the toxicity. An assessment of the urinary output and sodium is not relative to digitalis toxicity and is not the priority here. Calling the physician to notify regarding the toxic level is appropriate, but there is no reason to obtain a 2D echocardiogram. A 2D echocardiogram will not add any additional information at this point. Instead, an electrocardiogram must be obtained to look for any rhythm disturbances due to digoxin toxicity.

# NCLEX Question

The nurse is providing a client with discharge instructions on his newly initiated Digoxin. Which of the following statements by the client indicates he correctly understood the instructions? Select all that apply.

- a. "If I note color vision changes, I will call my doctor right away."
- b. "I will check my pulse before each dose and if the pulse is less than 100 bpm, I will hold Digoxin and call my doctor."
- c. "I will increase my calcium intake significantly."
- d. "I will make sure I get enough potassium in my daily diet."
- e. "The water pills that I am on may increase the risk of side effects with Digoxin."
- f. "I should avoid medications that have licorice extract."

## Answer: A, D, E, F

A is correct. One of the early side effects of Digoxin is visual aberrations such as yellowish-green color changes or halos. Therefore if the patient notes color vision changes, they should call the doctor right away."

B is incorrect. The first cardiac side effect of digoxin toxicity is bradycardia, but cardiac arrhythmias can follow later. It is essential to monitor for these early side effects, so the next dose of Digoxin can be held, and the physician can be notified. The patient should check their pulse before each dose and if the pulse is less than 60 bpm hold Digoxin and call the doctor.

C is incorrect. Hypercalcemia can cause digoxin toxicity, therefore the patient should not increase their calcium intake significantly.

D is correct. Because hypokalemia can cause digoxin toxicity, the patient should make sure they get enough potassium in their daily diet.

E is correct. If the patient is on a loop diuretic such as furosemide, they increase the risk of side effects with Digoxin due to losses of potassium and subsequent hypokalemia. These patients should be monitored more closely for toxicity.

F is correct. The patient should avoid medications that have licorice extract. Licorice extract acts like the hormone aldosterone - causing sodium and water retention and growing potassium loss. Hypokalemia, in turn, precipitates digoxin toxicity.

# Anti-Infectives

- Aminoglycosides
  - Gentamicin
- Fluoroquinolones
  - Ciprofloxacin
  - Levofloxacin
- Macrolides
  - Erythromycin
  - Azithromycin
- Vancomycin
- Penicillins & Cephalosporins
  - Amoxicillin
  - Ampicillin
  - Ancef
- Anti-viral
  - Acyclovir
- Antifungal
  - Amphotericin B
  - Metronidazole
  - Nystatin

## Gentamycin

Therapeutic class: Anti-infective; aminoglycoside

Indication: Gram negative infections

Action: Inhibition of bacterial protein synthesis

Nursing Considerations:

- Monitor for tinnitus
- Do not administer with penicillin

# Ciprofloxacin

Therapeutic class: Anti-infective; fluoroquinolone

Indication: Infection

Action: Inhibits synthesis of bacterial DNA

Nursing Considerations:

- Can cause QT prolongation
- Decreases effects of phenytoin

# Vancomycin

Therapeutic class: Anti-infective; glycopeptide antibiotics

Indication: Infection; sepsis

Action: kills bacteria in the intestines

Nursing Considerations:

- Monitor for ototoxicity and nephrotoxicity
- Red-man syndrome
- Administer over at least 60 minutes; central line preferred.

# Amoxicillin

Therapeutic class: Anti-infectives; aminopenicillin

Indication: Infections; skin, respiratory, endocarditis

Action: Inhibits synthesis of bacterial cell wall leading to cell death

Nursing Considerations:

- Monitor for rash
- Monitor kidney function
  - BUN, Cr

## NCLEX Question

While caring for a patient on a general medicine floor, the nurse prepares to administer a cephalosporin antibiotic for a sinus infection. Which of the following side effects does the nurse monitor for while administering this medication? Select all that apply.

- A. Diarrhea
- B. Hypoactive bowel sounds
- C. Nephrotoxicity
- D. Tinnitus

## Answer: A and C

A is correct. Diarrhea is a side effect of cephalosporin antibiotics. This antibiotic will kill off a large amount of the good bacteria in the gut, which often leads to hyperactive bowel sounds, abdominal cramping, and diarrhea.

B is incorrect. The patient taking a cephalosporin antibiotic is more likely to have hyperactive bowel sounds.

C is correct. Nephrotoxicity is a known potential side effect of cephalosporins. The nurse should monitor the patient's BUN and Cr closely to evaluate kidney function.

D is incorrect. Tinnitus is a side effect of aminoglycosides, not cephalosporins.

## NCLEX Question

The nurse is doing admission documentation on a new patient. While reviewing his allergies, he states he has a reaction called "red man's syndrome", but he doesn't know which drug it is that he's allergic to. The nurse documents which of the following medications as the patient's allergy?

- a. Ciprofloxacin
- b. Vancomycin
- c. Gentamicin
- d. Amoxicillin

# Answer: B

**A is incorrect.** Ciprofloxacin does not cause 'red man's syndrome'. Ciprofloxacin is a fluoroquinolone antibiotic. It can cause QT prolongation and decrease the effects of some medications, such as phenytoin.

**B is correct.** Vancomycin is the drug that causes the reaction known as 'red man's syndrome'. This is a very serious allergic reaction which the entire body itches and a red rash appears on the face, neck, and torso. It commonly occurs if the infusion is run too quickly; vancomycin should always go over at least one hour.

**C is incorrect.** Gentamicin does not cause 'red man's syndrome'. Gentamicin is an aminoglycoside antibiotic. Important side effects to monitor for include tinnitus.

**D is incorrect.** Amoxicillin does not cause 'red man's syndrome'. Amoxicillin is a penicillin antibiotic. While it can cause a rash, it is not similar to the red man syndrome rash vancomycin can cause. The nurse should also know to monitor kidney function labs while the patient is taking amoxicillin.

## Autonomic Nervous System Medications

- Dobutamine
- Dopamine
- Atropine
- Benztropine

# Atropine

Therapeutic class: Antiarrhythmic; anticholinergic

Indication: excessive secretions, sinus bradycardia, heart block

Action: Inhibition of acetylcholine, increasing the HR, causing bronchodilation, and decreasing secretions.

Nursing Considerations:

- Monitor for urinary retention and constipation
- Avoid in patients with glaucoma

# Respiratory Medications

- Rescue meds
  - Albuterol
  - Ipratropium
- Long-term control meds
  - Guaifenesin → Expectorant
  - Montelukast → Leukotriene modifier
  - Theophylline → Phosphodiesterase Enzyme Inhibitor

# Albuterol

Therapeutic class: Bronchodilator; short acting beta 2 agonist

Indication: Asthma, COPD

Action: Binds to Beta2 adrenergic receptors in the airway leading to relaxation of the smooth muscles in the airways

Nursing Considerations:

- Be very cautious when using in patients with heart disease, diabetes, glaucoma, or seizures.
- Causes tachycardia

## NCLEX Question

Which of the following medication classes are considered 'quick-relief' or rescue medications for a child having an acute asthma attack? Select all that apply.

- a. Corticosteroids
- b. Leukotriene modifiers
- c. Short-acting beta 2 agonists
- d. Anticholinergics

# Answer: C and D

C is correct. Short-acting beta-2 agonists are "rescue" medications used for bronchodilation in an acute asthma attack. Examples include albuterol and salbutamol. A "rescue" medication is the one that can provide relief even after bronchospasm is triggered.

D is correct. Anticholinergics are rescue medications used for the relief of acute bronchospasm. Examples include Ipratropium and Tiotropium.

A is incorrect. Corticosteroids are long term control medications used to reduce inflammation. They are not immediately useful as "rescue" medications but are useful in long term management of persistent asthma.

B is incorrect. Leukotriene modifiers are long term control medications used to prevent bronchospasm and inflammatory cell infiltration. They are often used as prophylactic agents before a triggering event, for example, in exercise-induced asthma. They are not useful as a "rescue" once bronchospasm occurs. For example, Montelukast is indicated to be used "as needed" before exercising in patients who do not require daily bronchodilator. Montelukast is taken at least two hours before the initiation of exercise.

## Diuretics

- Loop diuretics
  - Bumetanide
  - Furosemide
  - Torsemide
- Potassium sparing diuretics
  - Triamterene
  - Amiloride
  - Spironolactone
- Thiazide diuretics
  - Chlorothiazide
  - Chlorthalidone
  - Hydrochlorothiazide
  - Indapamide

# Loop Diuretics

- Examples:
  - Bumetanide, **Furosemide**, Torsemide
- Mechanism of action:
  - Act on the **loop** of Henle to increase urine output by affecting sodium reabsorption within the nephron.
  - Inhibits the sodium potassium chloride cotransporter causing sodium to be excreted in the urine therefore increasing diuresis.
- Uses:
  - Increase urinary output, edema, CHF, blood pressure management.
- Nursing considerations:
  - Monitor **potassium levels**
- These are the most effective of all diuretics.

# Potassium Sparing Diuretics

- Examples:
  - Triamterene, Amiloride, **Spironolactone**, Eplerenone
- Mechanism of action:
  - Inhibit sodium and potassium exchange via sodium channels in the distal parts of the nephron.
  - This 'saves' potassium!!
- Uses:
  - Hypertension, edema, swelling, hypokalemia.
- Nursing considerations:
  - Monitor **potassium levels**
- These medications are not as strong as other diuretics, so are often combined with a loop or thiazide diuretic!

# Thiazide Diuretics

- Examples: Chlorothiazide, Chlorthalidone, **Hydrochlorothiazide**, Indapamide, Metolazone.
- Mechanism of action:
  - These diuretics act on the distal convoluted tubule to inhibit the sodium-chloride cotransporter.
  - This increases sodium in the filtrate causing an increased amount of water reabsorption and therefore increased urinary output.
- Uses:
  - Hypertension, CHF
- Nursing Considerations:
  - Monitor electrolyte levels
  - Monitor BP

# GI Medications

- Bisacodyl
- Lactulose
- Metoclopramide
- **Ondansetron**
- **Omeprazol**
- Pantoprazole

# Ondansetron

Therapeutic class: Antiemetic

Indication: Nausea/vomiting

Action: blocks effects of serotonin on vagal nerve and CNS

Nursing Considerations:

- Administer slowly. Fast push can cause QT prolongation and VT.

# Omeprazole

Therapeutic class: Proton-pump inhibitor

Indication: GERD, ulcers

Action: prevents the transport of H ions into the gastric lumen by binding to gastric parietal cells to decrease gastric acid production

Nursing Considerations:

- Administer 30-60 minutes before meal
- Report black, tarry stools

# Dose Calc

Pull up your cheat sheet to learn the basics, and then work through the worksheet! We will review it together at 12:00 CST.

## Non-opioid Analgesics

- Acetaminophen
- NSAIDS
  - Aspirin
  - Ibuprofen
  - Naproxen

# Acetaminophen

Therapeutic class: antipyretic, non-opioid analgesic

Indication: Pain, fever

Action: Inhibit the synthesis of prostaglandins which play a role in transmission of pain signals and fever response

Nursing Considerations:

- Max daily dose = 4g
- Monitor liver function
- Antidote = n-acetylcysteine

## NSAIDS - Non-steroidal anti-inflammatory drugs

Examples: Aspirin, ibuprofen, ketoprofen, naproxen

Indication: Pain, inflammation, fever

Action: Block prostaglandin which causes inflammation, pain, and fever.

Nursing Considerations:

- Can cause prolonged bleeding
  - Typically avoided in trauma and surgical patients
- Can cause peptic ulcers

## NCLEX Question

Your patient is receiving a nonsteroidal anti-inflammatory medication in addition to a narcotic analgesic. The client asks you why they are getting an NSAID when the narcotic analgesic works so much better. Which of the following responses are appropriate?

- A. I don't know why. I suggest you ask your doctor the next time you see her.
- B. You are getting the NSAID because we are trying to wean you off of the narcotic analgesic for your moderate to severe pain.
- C. You are getting the NSAID so the effect of the narcotic analgesic is more effective.
- D. You are getting the NSAID as a placebo to help with your severe pain.

## Answer: C

**A is incorrect.** It would not be appropriate to say "I don't know why. I suggest you ask your doctor the next time you see her." This response is not appropriate because the nurse should know why the NSAID is being given, and be able to address the patient's question.

**B is incorrect.** It would not be appropriate to say "You are getting the NSAID because we are trying to wean you off of the narcotic analgesic for your moderate to severe pain." The NSAID is being given for another reason, so this response is incorrect.

**C is correct.** Telling the patient they are getting the NSAID so the effect of the narcotic analgesic is more effective is appropriate. The NSAID is an adjuvant medication that is used in combination with narcotic analgesics to treat moderate to severe pain.

**D is incorrect.** It would not be appropriate to say "You are getting the NSAID as a placebo to help with your severe pain." This statement is not true or accurate.

# Acetylsalicylic Acid (Aspirin)

Therapeutic class: Antipyretic, non-opioid analgesic

Indication: Pain - arthritis. Stroke and MI prophylaxis

Action: Inhibits the production of prostaglandins which leads to a reduction of fever and inflammation, **decreases platelet aggregation leading to a decrease in ischemic diseases**

Nursing Considerations:

- Risk of bleeding
  - Don't administer with other anticoagulants
  - D/c 5-7 days prior to surgery
- **Caution with pediatric patients**
  - **Reye's syndrome** can occur with viral infections

## NCLEX Question

A nurse is conducting preoperative teaching to a client who will undergo surgery in 1 week. Which response by the client would prompt the nurse to give additional teaching?

- "Aspirin can possibly cause bleeding even after surgery"
- "Aspirin can adversely affect my clotting ability"
- "I should stop Aspirin one day prior to my surgery"
- "It is important that I talk to my physician about the possibility of stopping aspirin before the surgery."

## Answer: C

**A is incorrect.** The statement "Aspirin can possibly cause bleeding even after surgery" reflects accurate understanding by the patient about Aspirin and does not require additional teaching.

**B is incorrect.** The statement "Aspirin can adversely affect my clotting ability" reflects accurate understanding by the patient about Aspirin and does not require additional teaching.

**C is correct.** The statement "I should stop Aspirin one day prior to my surgery" requires further teaching. Aspirin alters the platelet's ability to aggregate and therefore impairs clotting. The effects of aspirin last for 5-7 days. Aspirin therapy should be stopped 5 to 7 days before the surgery.

**D is incorrect.** The statement "It is important that I talk to my physician about the possibility of stopping aspirin before the surgery." reflects accurate understanding by the patient about Aspirin and does not require additional teaching.

## Opioids

- **Morphine**
- Fentanyl
- Hydromorphone
- Methadone
- Oxycodone

# Morphine

Therapeutic class: Opioid analgesic

Indication: Pain

Action: Binds to opiate receptors in the CNS and alters perception of pain while producing a general depression of the CNS.

Nursing Considerations:

- Common side effect: constipation
- CNS depressant
  - Decreased respiration, decreased heart rate, etc.
  - Monitor respiratory rate
- Antidote = naloxone

## NCLEX Question

The nurse is caring for a client receiving Morphine sulfate for severe pain. The nurse should implement all of the following actions except:

- Administer Morphine only when the client complains of pain
- Ensure Naloxone is always available
- Check the client's respirations before giving Morphine
- Provide a high fiber diet

## Answer: A

**A is correct.** Morphine should be given at times prescribed by the doctor to ensure adequate serum levels for optimum pain relief. Waiting to give it until the client experiences pain may lead to sub-optimal pain control. The doctor may additionally order PRN doses of morphine for breakthrough pain on top of scheduled doses.

**B is incorrect.** Naloxone should always be available as the antidote to morphine in case of overdose and respiratory depression.

**C is incorrect.** One of the significant side effects of morphine is respiratory depression. Checking the client's respirations before giving Morphine should always be done.

**D is incorrect.** Morphine results in constipation for most clients. A high fiber diet should be given to prevent illness.

## Obstetric Medications

- Tocolytics - slow contractions
  - Terbutaline
  - Magnesium-sulfate
  - Indomethacin (prostaglandin inhibitor)
  - Nifedipine (CCB)
- Oxytocics - stimulate contractions
  - Oxytocin
  - Ergometrine (Methergine)
  - Misoprostol

# Magnesium-sulfate

Therapeutic class: Electrolyte

Indication: Hypomagnesemia, torsade de point, **pre-eclampsia**, **preterm** labor, seizures, asthma exacerbation

Nursing Considerations:

- Monitor for hypermagnesemia
  - Confusion, dizziness, weakness, **decreased reflexes**
- **Give IV slowly**

# Terbutaline

Therapeutic class: Tocolytic & beta-agonist

Indication: Preterm labor

Nursing Considerations:

- Monitor the client's blood sugar levels; increases BG.
- Monitor for **hypotension**
- Monitor for **tachycardia**
- Monitor for hypokalemia

# Oxytocin

Therapeutic class: Hormones; tocolytic

Indication: Induction of labor; PPH

Action: Stimulates uterine smooth muscle causing it to contract

Nursing Considerations:

- Monitor contractions
- Monitor fetus
- Warn mother contractions will be more painful
- Monitor BP, HR, glucose, and K

# Steroids

- Betamethasone
- Dexamethasone
- Cortisone
- Fluticasone
- Methylprednisolone

# Methylprednisolone

Therapeutic class: Corticosteroids

Indication: Inflammation, allergy, autoimmune disorders

Action: Suppress inflammation and normal immune response

Nursing Considerations:

- Monitor for too much steroids
  - Cushing's symptoms; buffalo hump
- Side effects
  - Immunosuppression
  - Hyperglycemia
  - Osteoporosis
  - Delayed wound healing

Wrap up  
Questions

## NCLEX Question

While working in a pediatric intensive care unit, the nurse receives orders to administer aspirin to a 12-month-old child who is febrile. The nurse knows to question this order due to the high risk of \_\_\_\_\_'s syndrome when aspirin is administered to a child.

## Answer: Reye's

Reye's syndrome is a very serious illness that has been associated with aspirin administration in children. It is a viral encephalopathy and usually follows a virus infection. It causes cerebral edema as well as liver disease and can be fatal. Aspirin administration should always be avoided in the pediatric population.

# NCLEX Question

The nurse is answering phones in the general practice clinic and receives a call from a patient who is experiencing leg pain after starting atorvastatin. Which of the following instructions, when given by the nurse, is the best course of action?

- a. Continue taking the medication as this is an expected side effect
- b. Discontinue the medication and schedule an appointment for the next week
- c. Stretch for 20 minutes or take a warm shower
- d. Discontinue the medication and visit the clinic as soon as possible

## Answer: D

**The correct answer is D.** Leg pain, and muscle aches, which occur after taking atorvastatin, may indicate a severe muscular myopathy known as rhabdomyolysis. The nurse would be most accurate to have this patient discontinue their medication and come to the clinic as soon as possible.

**Choice A is incorrect.** This patient should be seen in the clinic to rule out potentially fatal health problems like rhabdomyolysis.

**Choice B is incorrect.** While this medication should be discontinued, waiting for treatment could delay necessary treatment.

**Choice C is incorrect.** Stretching for 20 minutes or taking a warm shower could delay necessary treatment.

# NCLEX Question

The nurse is preparing to administer a prescribed dose of lactulose 20 grams orally QID to a client with portal-systemic encephalopathy. The medication is available at 3.33 grams per 5ml oral solution. She plans to administer 30 ml per dose to the client QID. When the nurse approaches the client, the client states, I understand that I can not take other laxatives with lactulose. After checking, the nurse should:

- a. Withhold the lactulose.
- b. Give only 3 ml lactulose instead of 30 ml.
- c. Give 30 ml lactulose with juice and monitor blood ammonia.
- d. Give 30ml lactulose and correct the client that he may take additional laxatives.

## Answer: C

**Choice C is correct.** The client has been prescribed Lactulose for portal-systemic encephalopathy, not for constipation. The prescribed dose is 20 grams every 4 hours. Since each 5 ml has 3.33 grams in it, the accurate dosage to be administered is 30 ml every 4 hours. Lactulose does not have a palatable taste; therefore, it can be mixed with fruit juice, water, or milk to improve flavor. The nurse should monitor blood ammonia levels and watch for any side effects. Side effects include belching, flatulence, or abdominal cramping. Lactulose belongs to the class of "Osmotic Laxatives" and may be used to treat constipation. Being an osmotic laxative, it draws water into the colonic lumen and softens the stool. Lactulose is also used in hepatic (portal-systemic) encephalopathy because it inhibits intestinal ammonia production. Lactulose is metabolized by intestinal bacteria and converted to lactic acid. Because of lactic acid, the pH in the colonic lumen is reduced (acidified), and this promotes the conversion of ammonia (NH<sub>3</sub>) to ammonium (NH<sub>4</sub><sup>+</sup>). This ionized form of the ammonia is unable to diffuse across the gut membrane into the blood, and thereby, blood ammonia levels decrease. Decreasing blood ammonia levels results in improved mental status in PSE. When used in hepatic encephalopathy, the Lactulose dose needs to be carefully adjusted so the client averages 2 to 3 loose stools per day. If other laxatives are used in conjunction, it gets challenging to determine the optimal dose of Lactulose using the above definition of 2-3 loose stools/ day. Therefore, the client should be educated not to use additional laxatives.

**Choice A is incorrect.** The client needs his prescribed dose Lactulose for his portal-systemic encephalopathy.

**Choice B is incorrect.** The prescribed dose is 20 grams, which is equivalent to 30 ml as per the calculation above. Administering 3ml instead of 30ml is inappropriate.

**Choice D is incorrect.** The client has correct understanding already. It is inappropriate to tell the client with hepatic encephalopathy to take additional laxatives while on Lactulose. Lactulose dose needs to be carefully adjusted, so the client averages 2 to 3 loose bowel movements per day. If other laxatives are used in conjunction, it gets challenging to determine the optimal dose of Lactulose.

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