Please give a thumbs up on this and any of my other documents that you used :)

Week 7 Concepts: Infection

Antibiotics

Prepare: Antibiotics

Starting Antibiotics

Which of the following actions is important before starting an antibiotic?

- Store the antibiotic in a safe place
- Monitor for side effects
- Verify patient does not have an allergy to an antibiotic
- Verify there is the correct amount of pills

Beta-lactamase

What is beta-lactamase?

- A biproduct of cellular metabolism
- A chemical that is combined with an antibiotic to assist with bacterial control
- An enzyme that destroys penicillin
- An enzyme that destroys the cell wall of a bacteria

Broad Spectrum

Which of the following accurately describes a broad spectrum antibiotic?

- An antibiotic fluoresces when exposed to an ultraviolet light source
- An antibiotic has a wide ranger of dosages available
- The antibiotic treats a wide variety of bacteria
- The antibiotic treats a specific bacteria

Self Check: Starting Antibiotics

An antibiotic is started based on which of the following factors? Select all that apply.

- What is available on the formulary
- Most likely causative bacteria
- Gram staining
- Price of the medication
- Culture grown from the source of the infection

Self Check: Penicillin Resistance

Which of the following causes penicillin resistance?

- The production of beta-lactamase by the bacterial cell
- The cell wall of a gram positive bacterial
- The presence of beta-lactam next to the bacterial cell wall
- An abnormally large dose of penicillin

Self Check: Bacteriostatic

When an antibiotic is bacteriostatic, it means which of the following?

- The antibiotic doesn't work against the bacteria.
- The antibiotic destroys the bacteria.
- The antibiotic reduces the replication of the bacteria.

The antibiotic prevents further replication of the bacteria.

Self Check: Severe Diarrhea

Lori is experiencing severe diarrhea for the last 2 weeks. She has been on an antibiotic for four weeks due to a severe kidney infection. The diarrhea is best described as which of the following?

Side effect of the antibiotic
Unrelated illness
Complication of her kidney infection
Superinfection related to antibiotic use

Self Check: Dental Cleaning

John is scheduled for a dental cleaning tomorrow. He has been diagnosed with a heart murmur in the past. His cardiologist prescribed azithromycin 500mg orally x 1 dose about 1 hour before his cleaning. Why is he being prescribed this antibiotic?

Prophylactic treatment
Treatment of a superinfection
Treatment to reduce normal bacteria flora
Empiric treatment

Reflect: Antibiotics

Potential Interactions

Match the potential interaction when giving an Antipsychotic drug with the following?

Additive effects of antibiotic	Penicillin and Non-steroidal Anti-inflammatories
Could causing arrhythmia	Azithromycin and sertraline
Reduced antibiotic absorption	Tetracycline and milk
Reduced effectiveness of contraception	Azithromycin and estradiol
Increased anticoagulation	Tetracycline with warfarin

Concerns While Taking Drugs

Joy is taking the erythromycin 500mg three times daily for 10 days. Which of the following do you need to be concerned about while she takes this drug? Select all that apply.

Nausea
GI upset
Vomiting
Headache
Allergy rash

Treatment with Antibiotic

Gloria is started on ciprofloxacin for symptoms of a urinary tract infection. She was seen by a telemedicine provider, and her urine was not collected. Which of the following is accurate about her treatment?

She is being treated based on a positive culture for Escherichia coli
The antibiotic is being used to decrease her normal bacterial flora
She is being treated prophylactically with the antibiotic
She is being treated empirically with the antibiotic

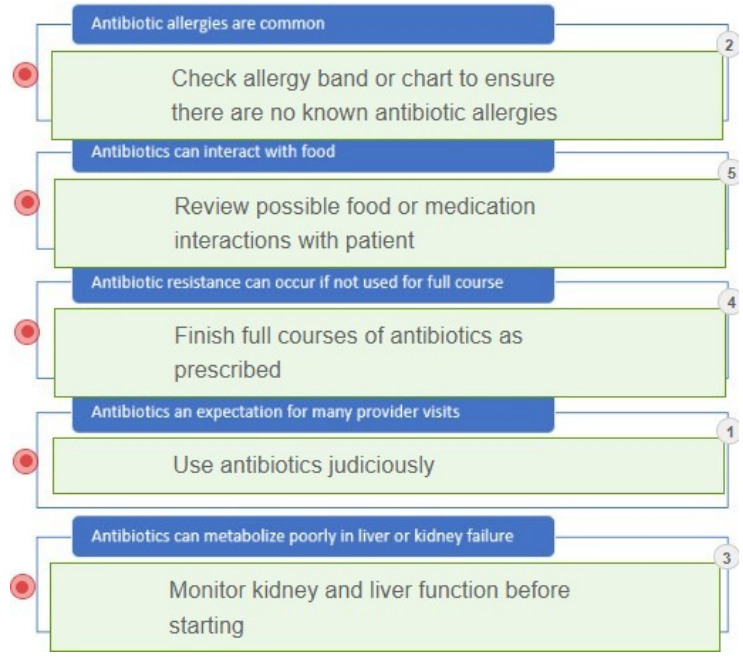
Stopping Antibiotics

Dora started an antibiotic yesterday. Which of the following assessment findings indicate an immediate need to stop her antibiotic?

Nausea

Vomiting
Vertigo
Rash
Headache

Preventative Action
Match the safety concern with the preventative action.



Treating Infection
Which of the following are ways that antibiotics treat infection?
Increase natural flora in the GI tract
Increase bacterial replication of deoxynucleic acid (DNA)
Disrupt cell metabolism
Stop bacterial cell wall creation
Stop bacteria from producing proteins

Medication Education
Amanda was prescribed azithromycin 250mg daily for 5 days. She takes estradiol for birth control, and uses warfarin 5mg daily for chronic atrial fibrillation. Which of the following suggests further education is needed?
"I should not use alcohol while taking this medication."
"My birth control will continue to be effective."
"I need to contact my cardiologist to help monitor my warfarin closely while on this antibiotic."
"I should take this medication as directed."

Antibiotic Classes
Which antibiotic class inhibits protein synthesis of the bacteria by binding to 50s ribosomal subunits in the bacteria?
Fluroquinolones
Penicillin
Macrolides
Tetracyclines
Sulfonamides

Penicillin and Cephalosporins

Prepare: Penicillin and Cephalosporins

Common Side Effects

What are common side effects of penicillin? Select all that apply.

- Diarrhea
- Anxiety
- Nausea
- Headache
- Vomiting

Skin Infection

Alice was prescribed cefalexin for a skin infection. When should she stop taking her antibiotic?

- One month
- In two days
- As long as it says to on the prescription
- When the infection goes away

Penicillin Allergy

If a patient has a penicillin allergy, what other antibiotic might they also react to?

- Aminoglycosides
- Cephalosporins
- Fluroquinolones
- Macrolides

Self Check: Penicillin and Cephalosporins

Cephalosporin Superiority

Nancy was started on Cefepime, a 4th generation cephalosporin for urinary tract infection. Which of the following makes this superior to a first generation cephalosporin for her diagnosis?

- Penetration of the blood-brain barrier
- Broad spectrum activity
- Increased activity against beta-lactamase
- It is a newer antibiotic

Cephalosporin Medications

When giving cephalosporin medications, which of the following statements is accurate?

- These are primarily metabolized through the liver so they have a lot of drug interactions to review
- These are metabolized in the stomach, so there are no drug interaction
- They do interact with seizure drugs, so monitoring of drug levels may be necessary
- They are primarily metabolized through the kidney, so dosage reductions may be needed in renal insufficiency

Cephalosporin Advantages

In reviewing the advantages to a 4th generation cephalosporin, which of the following are accurate statements?

- They have a broader spectrum
- They are more susceptible to beta-lactamase
- They destroy less gram negative bacteria
- Less likey to cross the blood-brain barrier (to treat meningitis)
- Better penetration of gram negative bacterial cell walls

Blurred Vision

Since starting Amoxicillin, Doug is experiencing blurred vision? Which of the following is accurate?

- This is not a known side effect of the amoxicillin, and patient should stop the drug
- This is probably not related to the amoxicillin, and patient should continue the drug and notify their provider
- This is probably a side effect of amoxicillin, and patient should continue the drug
- This is a known side effect of amoxicillin, and patient should continue the drug

Cephalexin

Phillip started an antibiotic for a skin infection 2 days ago. The prescription says to take cephalexin 500mg every 6

hours for 10 days. His skin infection appears to be gone. Which of the following would be appropriate for him to do?

- Continue the antibiotics for the 7 days as instructed
- Stop the antibiotic and save the rest in case the infection returns
- Continue the antibiotic for 3 more days, then stop
- Stop the antibiotic and dispose of the pills that are left

Reflect: Penicillin and Cephalosporins

Metabolism of Antibiotics

Boris will be given a dose of cefazolin prior to an abdominal surgery he is having. He has a history of liver failure. Based on knowledge of the metabolism of this antibiotic, which of the following is accurate?

- He should not receive this medication due to liver disease
- The dosage needs to be adjusted downward due to the liver failure
- The dosage can remain the same, this is primarily metabolized by the kidney
- The dosage needs to be increased as the antibiotic won't be effective

Complex Infections

Alice is prescribed a cephalosporin antibiotic for a complex infection. After being on the antibiotic for a month, she states experiencing white oral plaques and a sore throat. This is likely caused by which of the following?

- Superinfection
- Empiric infection
- Strep throat
- Sub-therapeutic does of the antibiotic

Strep Throat

Julie has been given penicillin for strep throat. Which of the following statements is true when educating Julie about penicillin therapy?

- Julie needs to take the penicillin at evenly spaced intervals
- She is taking an oral contraceptive and must be cautioned to use an alternate form of birth control while being treated with penicillin
- If she has signs of an allergic reaction, continue the medication and notify her healthcare provider
- She should save whatever is leftover medication for anyone else in the household who gets strep throat

Piggybacking Antibiotics

Wally was ordered cefazolin 100mg diluted in 0.9% NaCL 100mL to run over 60 minutes. He currently has one intravenous site with 0.9% NaCL with Potassium Chloride 20 mEq running at 100mL/hr. Which of the following is most appropriate in delivering this piggyback antibiotic? (Hint: review your drug book about IV administration)

- Infuse the antibiotic through a Y site on the current intravenous line
- Stop the main infusion to give the antibiotic through separate IV tubing
- Skip the antibiotic until the current infusion is done
- Start a new intravenous site because these medications are incompatible

Further Teaching

Sandy is prescribed cephalexin 500mg every 6 hours for 7 days for a skin infection. Which of the following statements suggest that further teaching may be required?

- "Some nausea may be expected as it is a common side effect."
- "I should call back in several days if the wound isn't improving."
- "I can stop this medication when my wound heals."
- "I should not save any leftover medication."

Penicillin Allergy

When assessing patient for a possible penicillin allergy, which of the following symptoms would be consistent with a hypersensitivity reaction? Select all that apply.

- Shortness of breath

Wheezing
Nausea
Urticaria
Rash

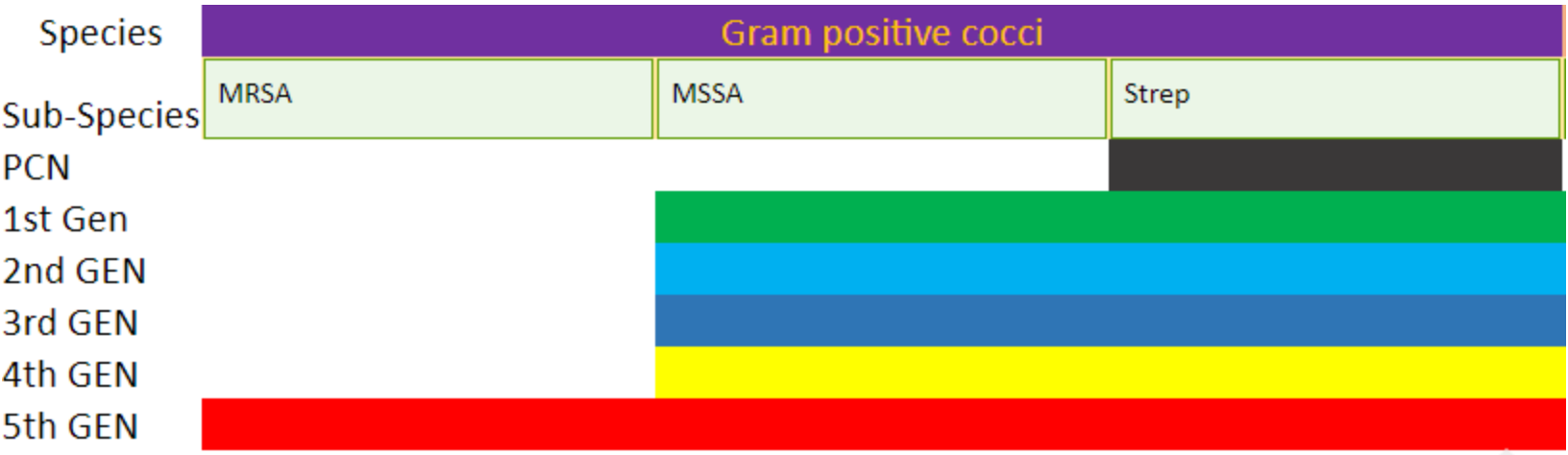
Common Side Effects

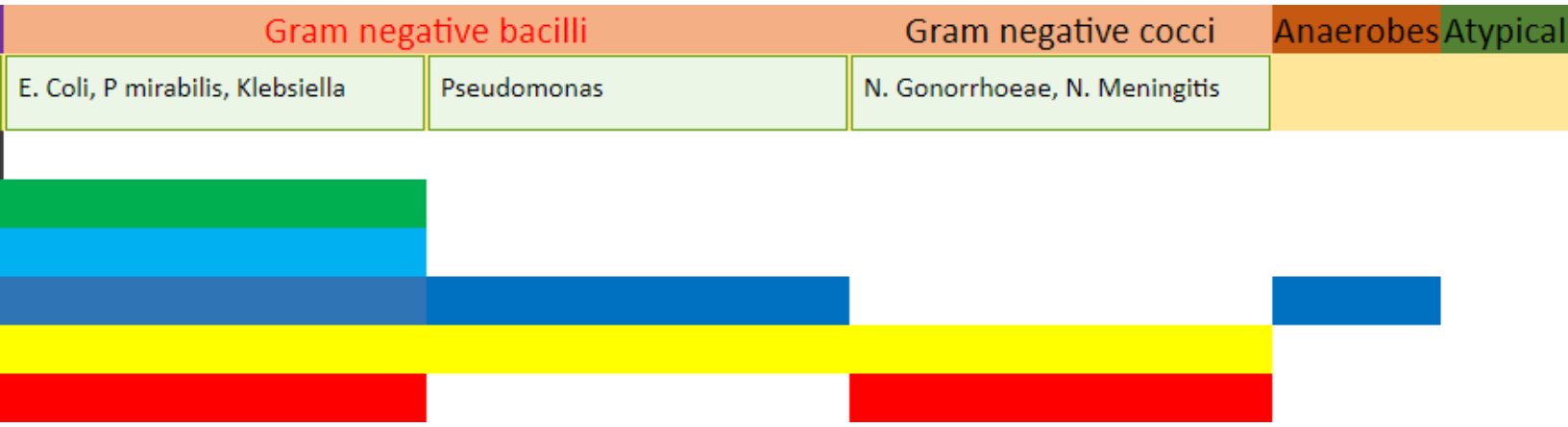
Larry has been started on cephalexin for a skin infection. In doing medication teaching, which of the following most common side effects could he expect? Select all that apply.

Vomiting
Diarrhea
Hearing changes
Nausea
Double vision
Constipation

Antibiotic Generations

Drag and drop the items to complete the table below.





Quinolones (Ciprofloxacin)

Prepare: Quinolones (Ciprofloxacin)

Stopping the Antibiotic

Alice was prescribed ciprofloxacin 500mg q12 hours for 3 days for a urinary tract. When should she stop taking her antibiotic?

In three days
In two days
One week
Just after one dose

Antibiotic Class

If a patient has a ciprofloxacin allergy, what antibiotic class might they react to?

- Cephalosporins
- Fluroquinolones
- Aminoglycosides
- Macrolides

Patient History

Which patient history finding is important before administering ciprofloxacin?

- Diagnosis of chronic obstructive pulmonary disease
- History of alcohol use
- History of tendonitis
- Allergy to penicillin

Self Check: Quinolones (Ciprofloxacin)

Ciprofloxacin

Nancy was started on ciprofloxacin for her complicated urinary tract infection? Which of the following makes this superior to other fluroquinolone antibiotics?

- Much less expensive
- Broad spectrum activity
- Strongest antibiotic in the class
- Better penetration of the genitourinary tract

Abnormalities

Ben has an automatic internal cardio-defibrillator (AICD) and is taking amiodarone for dysrhythmias. When started on ciprofloxacin, which of the following abnormalities puts him at higher risk for life threatening arrhythmia?

- Hypertension
- Atrial fibrillation
- Coronary artery disease
- Prolonged QT syndrome

Why Was it Prescribed?

Ciprofloxacin was selected to treat Elizabeth's complicated urinary tract infection. This antibiotic was selected due to which of the following reasons:

- Low cost alternative
- Good penetration of the genitourinary tract
- Broad spectrum activity
- Strong effect against gram positive bacteria

Elevated Temperature and Dysuria

A patient with a complicated urinary tract infection has been taking ciprofloxacin for three days. The patient continues to have an elevated temperature and dysuria. Which of the following should the healthcare professional consider?

- Continue the medication, it takes time for it to fight infection
- Notifying the healthcare provider about the lack of improvement
- Encourage Tylenol for the fever
- Stop the medication

Interactions

When giving ciprofloxacin, which medications are known to interact with this medication? Select all that apply.

- Lisinopril
- Phenytoin
- Amlodipine

Fluoxetine
Warfarin

Reflect: Quinolones (Ciprofloxacin)

Possible Interactions

When a client with chronic obstructive pulmonary disease is taking theophylline and also receives ciprofloxacin, which of the following interaction could occur?

High level of ciprofloxacin
Reduced levels of theophylline
Increased levels of theophylline
Lower levels of ciprofloxacin

Expected Interactions

Jose has a seizure disorder that is well controlled with phenytoin. He was recently prescribed ciprofloxacin for a urinary tract infection. What might the nurse expect when these two drugs are given together? Select all that apply.

There is no known interaction between these drugs
Jose may be at higher risk of seizures
Jose's infection will resolve quicker
Jose will have higher anticoagulation levels
Jose could become toxic from his phenytoin due to increased blood levels

How It Works

Belinda was prescribed ciprofloxacin for a complicated urinary tract infection. Fluroquinolones work by which of the following?

Inhibit bacterial wall synthesis
Inhibit DNA gyrase
Inhibit floic acid production for bacterial replication
Inhibit beta-lactamase

Serious Interactions

Rita was prescribed ciprofloxacin for her urinary tract infection. She is currently taking fluoxetine, ibuprofen, warfarin, and lisinopril. When giving intravenous quinolones, the nurse needs to keep in mind that these drugs may have serious interactions with which drugs?

Antihypertensive
Nonsteroidal anti-inflammatory drugs
Selective serotonin reuptake inhibitor antidepressants
Oral anticoagulants

Intravenous Ciprofloxacin

You are ordered to give ciprofloxacin intravenously through a piggyback. Currently you have another piggyback running through the same IV line. Which of the following would be incompatible in the IV line with ciprofloxacin? (Hint: refer to your drug reference guide.)

Lidocaine
Potassium chloride
Magnesium sulfate
Diltiazem

Expected Actions

Ciprofloxacin is ordered for a patient admitted with pyelonephritis. The allergy band says that the patient is allergic to all cephalosporins. The nurse verifies this. Which of the following expected actions will the nurse take next?

Notify the provider about a possible allergy to ciprofloxacin
Administer the medication as prescribed
Take the allergy wristband off as this is incorrect information
Hold the medication and request another antibiotic

Prolonged QT Interval

When giving ciprofloxacin, which medications are known to cause a prolonged QT interval with this medication?

- Fluoxetine
- Amlodipine
- Lisinopril
- Phenytoin
- Warfarin

Generic Drugs

Complete the following table by dragging and dropping the brand and half-life to the proper generic drug.

Generic	Half-Life
Ciprofloxacin	4 hours
Levofloxacin	8 hours
Moxifloxacin	12 hours
Gemifloxacin	7 hours

Nursing Application - Antibiotics

Prepare: Nursing Application - Antibiotics

Antibiotic Therapy

Doris presents to the urgent care with dysuria and insists that she has a urinary tract infection. The healthcare provider finds nothing to suggest this. During the discharge process, the patient tells the nurse that she is not leaving without a prescription for an antibiotic. Which of the following is true regarding antibiotic therapy?

- She still might have an infection and should get an antibiotic
- Over prescribing of antibiotics can lead to antibiotic resistance
- She could consider using antibiotics she has saved from a previous illness
- Antibiotics are under-prescribed and help to reduce infections everywhere

Further Analysis

The provider has prescribed amoxicillin 875mg one tablet twice daily for strep throat. Which of the following would require further analysis?

- The medication is not indicated for strep throat
- Amoxicillin doesn't come as a tablet
- The patient has an allergy to penicillin
- The dosage of 875 mg is too high

Teaching the Patient

During discharge planning, the nurse prepares to teach the patient about their amoxicillin prescription. Which of the following indicates the patient may need more instruction?

- "If I get a rash, it should go away in a day or two."
- "I should not drink alcohol while taking this medication."
- "I will take the antibiotic for 7 days as prescribed."
- "Taking it with food may help with some of the nausea."

Self Check: Assessment

Gladys's Case Study

Gladys is a 56 year old female who presented to the clinic with complaints of dysuria. A urinalysis revealed a urinary tract infection. Her urine was sent to the lab to obtain a culture and sensitivity, which should be available in about four days.

The nurse is reviewing her current medication list for possible interactions using the Drug Interaction Checker in

preparation for discharge teaching on Amoxicillin.
Which of the following information is the nurse concerned about?

Allergies

- penicillin

Medication List

- hydrochlorothiazide 12.5mg one daily
- pravastatin 40mg one daily
- vitamin D3 1000iu one daily
- warfarin 5mg one daily

Gladys's History
After identifying Glady is allergic to amoxicillin, the primary health care provider gives her a prescription for ciprofloxacin 500mg twice daily for 5 days. The nurse reviews her history in preparation for discharge teaching. Which of the following would require further analysis and possible nursing action?

Patient has an allergy to penicillin
Antibiotics generally should be given for 10 to 12 days
She has a history of Achilles tendonitis and still has problems with it
She smoke 1 pack per day of cigarettes

Self Check: Diagnosis and Assessment

Gladys's Discharge
In doing Gladys's discharge instructions, which of the following indicates she may need more information? Select all that apply.

"I should take this as directed until I finish the five-day course."
"I'll save any extra in case I get another infection."
"This should work, another provider gave me the same one about a month ago."
"I should avoid alcohol while taking this medication."

Gladys's Discharge Continued
As part of Gladys's discharge instructions, which of the following would the nurse expect to include?

Your symptoms should be gone tomorrow.
Your symptoms may take a week to
improve.
Your symptoms will get worse before they get better.
You may be on the wrong antibiotic if you are not better in a few days.
A fever could be a side effect of the medication.

Self Check: Implement and Evaluate

Gladys's Evaluation
The nurse receives Gladys's culture and sensitivity results from the lab. She has been on the ciprofloxacin for two days. She states her symptoms are unchanged. The report indicates the following:

- **Amoxicillin = Susceptible**
- **Cefazolin = Susceptible**
- **Ceftriaxone = Susceptible**
- **Ciprofloxacin = Resistant**
- **Nitrofurantoin = Resistant**
- **Piperacillin/tazobactam = Susceptible**

In evaluating Gladys's response to the antibiotic, which of the following do you consider?

Repeat the urine culture and sensitivity
Notify the healthcare provider to request a change in the antibiotic
Notify the healthcare provider to extend her current antibiotic for 5 more days
Notify the patient to continue her antibiotic

Reflect: Nursing Application - Antibiotics

Treating Pnemonia

The nurse is reviewing the orders for a patient who has been admitted for treatment of pneumonia. The patient is being started on doxycycline 500mg every 12 hours for 10 days. The nurse notes patient's allergy band says, "doxy". Asking what happens when the patient took doxycycline in the past, the patient states that they had an upset stomach. What is the nurse's first action at this time?

Call the prescriber to clarify the order because of the patient's allergy
Hold the doxycycline
Administer the drug as ordered and include a small snack ZZ
Ask the pharmacy to order a different antibiotic

George

Answer the following questions about George based on the information provided in each question.

Question 1 / 3

George is admitted to the hospital with pneumonia. His WBC count is elevated, he has a fever of 101.5, and he is short of breath. The provider immediately orders a sputum culture and sensitivity to determine which bacteria might be causing the pneumonia. The results will not be back for 3 days. Levofloxacin 750mg IV is ordered to start now. The nurse knows that the rationale for this antibiotic order is which of these?

To treat for a
superinfection To provide
empiric therapy
To treat staphylococcus aureus
To provide prophylactic
therapy

Question 2 / 3

George is discharged from the hospital and is prescribed tetracycline 500mg four times daily for continued treatment of his pneumonia. When the nurse teaches this patient about drug-related precautions, which is the most important information to convey?

The patient needs to use sunscreen or avoid exposure to sunlight, because this drug may cause photosensitivity.
The teeth should be observed closely for signs of mottling or other color changes.
When he stops coughing, the medication may be discontinued.
This medication needs to be taken with antacids to reduce GI upset.

Question 3 / 3

George develops a cellulitis from a previous intravenous site he had during hospitalization. A second-generation cephalosporin is ordered for a new skin infection. A day after starting, the patient develops a rash. Which nursing action is appropriate?

Ask the pharmacy to change the order to a first-generation cephalosporin.
Notify the prescriber about the rash and a possible change in antibiotics.
Continue the medication, and monitor for adverse effects.
Administer the drug with a nonsteroidal anti-inflammatory drug to reduce adverse effects.

History of Heart Problems

While assessing a woman who is receiving levofloxacin for pneumonia, the nurse notices that the patient has a history of heart problems. The nurse will monitor for which potential cardiac effect of fluroquinolone therapy?

Prolonged QT interval
Dysrhythmias

Bradycardia
Tachycardia

Linda

Answer the following questions about Linda based on the information provided in each question.

Question 1 / 2

Linda is prescribed erythromycin for a urinary tract infection. During patient education regarding this oral macrolide, the nurse will include which information? Select all that apply.

- The patient may take the drug with a small snack to reduce GI irritation.
- Use another form of birth control if the patient is taking oral contraceptives.
- If GI upset occurs, the drug will have to be stopped.
- The drug needs to be taken with an antacid to avoid GI problems.
- The patient needs to take each dose with a sip of water.

Question 2 / 2

Linda has been on erythromycin for almost the entire course, but calls the nurse practitioner to complain of severe vaginal itching. She has also noticed a thick, whitish vaginal discharge. The nurse practitioner suspects which of these?

- The UTI has become worse instead of better
- A superinfection has developed
- The UTI is resistant to the antibiotic
- This is an expected response to antibiotic therapy

Bacteriostatic

The nurse is reviewing the orders for a bacteriostatic antibiotic. Which statements best describes a bacteriostatic compound?

- Bactericidal antibiotics are stronger than bacteriostatic antibiotics
- Bacteriostatic antibiotics prevent bacteria from multiplying
- Bacteriostatic antibiotics destroy bacteria
- Bacteriostatic antibiotics cause bacterial growth to increase

Antivirals: Non-HIV

Prepare: Antivirals - Non-HIV

Goals of Non-HIV Antiviral Therapy

How does taking medications to treat a viral illness promote healing of the individual who is ill?

- Antivirals reduce the number of virus present to support the immune system.
- The medication destroys all viruses.
- Non-HIV antiviral drugs strengthen the host cells, stopping the virus from replicating.
- Medications treat viruses by enabling the liver to destroy them.

Broad Spectrum Antiviral

Of the available non-HIV antiviral medication which is effective across the broadest spectrum of viruses?

- sofosbuvir
- ribavirin
- acyclovir
- zanamivir

Treating with Antivirals

Drag and drop each disease to classify whether they can or cannot be treated with antivirals.

Treated by Antivirals

Not Treated by Antivirals

Diseases

Chicken Pox
Chicken Pox

Cold Sores
Cold Sores

Gastroenteritis
Gastroenteritis

Head Cold
Head Cold

Hepatitis
Hepatitis

Pneumococcal pnemonia
Pneumococcal Pnemonia

Strep Throat
Strep Throat

Syphilis
Syphilis

Self Check: Virus Mutation

The simple structure of an RNA based viral genome allows for instability during replication that leads to viral mutation and makes the virus more difficult to treat with medications.

Self Check: MOA Non-HIV Antivirals

How do non-HIV antiviral medications kill or suppress viruses? Select all that apply.

- Block the virus from getting into the host cell.
- Destroy the viral genome before it leaves the capsid layer.
- Prevent viral nucleic acid synthesis by blocking polymerase.
- Transfer ribosomes into the host cell to stop the virus from altering host DNA.
- Force the host cell nucleus to prevent the viral genome from entering.

Self Check: Dosing - sofosbuvir

Use the drop down menus to fill in the missing information related to dosing of sofosbuvir.

Route: oral
Dose: 400 mg
Frequency: once daily
Considerations: take with or without food

Self Check: Pharmacokinetics - ribavirin

Pharmacokinetics – ribavirin

Complete the pharmacokinetic information for ribavirin by dragging the missing information to the correct place on the table.

Route	Onset	Peak	Half-Life	Duration
Inhalation	Unknown	End of inhalation	1.4 - 2.5 hr	Variable
PO	Unknown	2 - 3 hr	120 - 170 hr	Unkown

Self Check: Antivirals for Hepatitis

Antiviral medications that treat hepatitis include lamivudine and simeprevir.

Reflect: Antivirals - Non-HIV

Outcomes of Non-HIV Antiviral Therapy

A patient diagnosed with a herpes simplex infection asks, "When will the virus be completely out of my body?" What is the best response by the nurse?

"You may need several courses of medication to completely rid your body of this particular virus."

"Because you are young and healthy, the virus will probably be gone by the time you stop taking the medicine. Just make sure you do finish it or it may return."

"Three weeks after you finish the medicine."

"The antiviral medications decrease amount of virus so your body can control or eliminate the virus – so it may never be completely gone."

Antivirals and Pregnancy

Ribavirin may be present in the body for six months after exposure. At least two types of reliable contraception must be used beginning with the first dose until six months after treatment ends.

sofosbuvir: Drug-Drug Interactions

An individual recently prescribed sofosbuvir asks if they can keep taking St. John's Wort before going to bed since sofosbuvir is taken in the morning. What is the best response by the health care professional?

"Unfortunately, no. Due to the long half-life, the sofosbuvir remains active within the blood stream all day."

"Why are you taking St. John's wort?"

"All herbal supplements are to be stopped during treatment with sofosbuvir."

"Sure, separating doses of two provides a safe buffer."

Side Effects of Non-HIV Antivirals

Viruses reproduce in human cells, but selective killing is difficult. Consequently many human cells that are healthy, in addition to virally infected cells, may be killed in the process. This results in more serious toxicities for these drugs.

Indications for ribavirin

During a telehealth visit after taking ribavirin to treat hepatitis C, the patient shares that her grandson is taking the same medication as a breathing treatment. She would like to know if she should be doing the same. What is the best response by the nurse?

"This medicine is used as an inhalant to treat young children with RSV infections of the lungs."

"I am sorry to hear your grandson is ill. How old is he?"

"If you would prefer that route of administration, I can place that request with your health care provider."

"Although it is the same medication, the oral form is indicated for treating hepatitis."

Viral Mutations and Patient Education

The nurse administering influenza vaccines is asked why a flu shot is needed every year. What information will the nurse include when responding?

Influenza vaccines require yearly boosters to be effective.

Repeated vaccinations for the flu help the immune system stay strong.

Viruses mutate, so each year the vaccine is for the new virus.

The immune system is unable to remember viruses.

Antiviral Medications Treat Viruses

The parent of an adolescent recently prescribed topical acyclovir to treat herpes simplex virus asks why the child is not taking an oral antibiotic like ciprofloxacin. What is the nurse's best response?

"If the acyclovir does not work, it is likely that ciprofloxacin will be prescribed next."

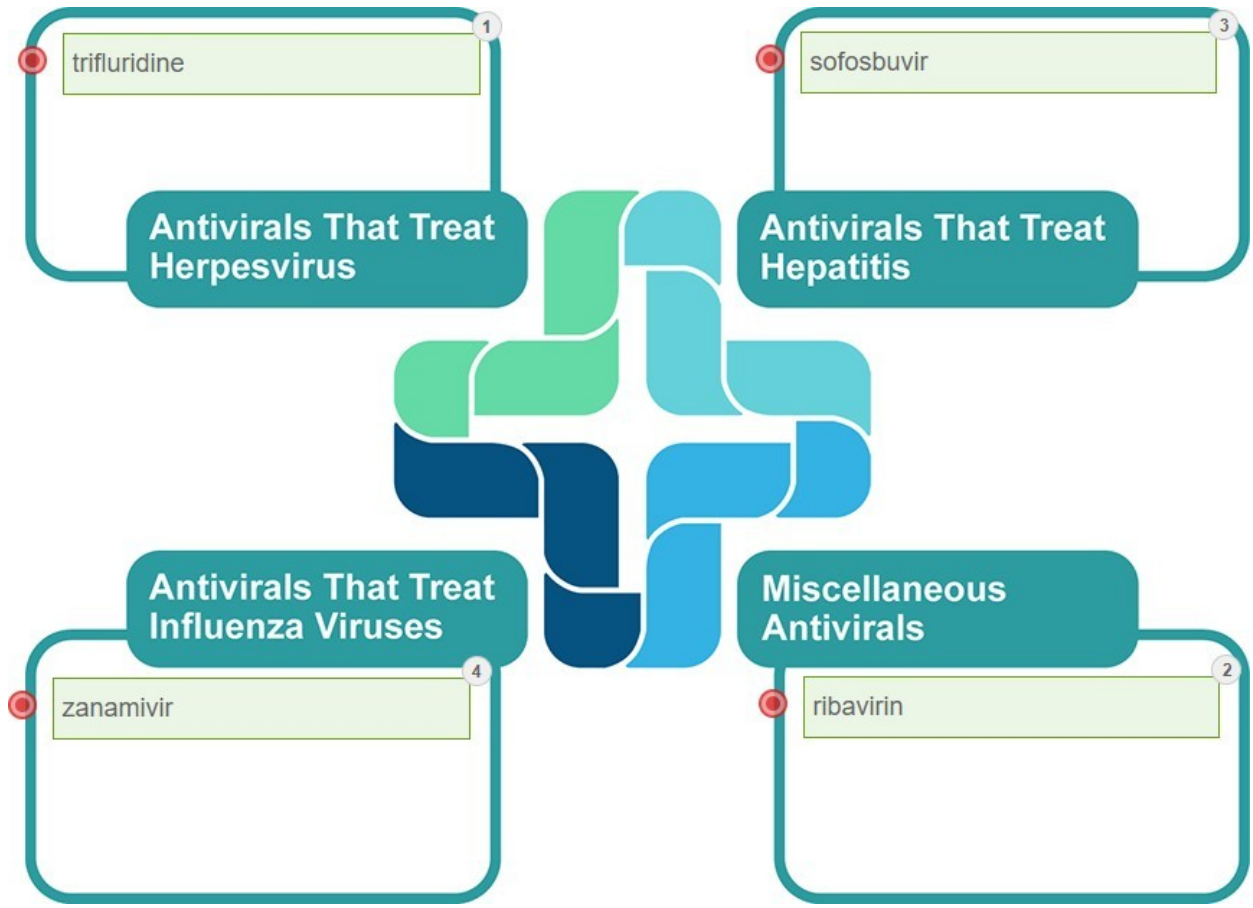
"Ciprofloxacin treats bacterial infections."

"Either one could work, it seems your health care provider just chose this one."

"Using topical acyclovir treats the viral infection effectively without the potential side effects of taking the same medicine orally."

Types of Non-HIV Antiviral Medications

Drag the medications to the classification in which each belongs.



Drugs to Treat Herpesviruses

Prepare: Drugs to Treat Herpesviruses

acyclovir: Therapeutic Effects

When teaching a patient who is taking acyclovir for genital herpes, which statements by the health care professional are accurate? Select all that apply.

- "This drug will prevent the spread of this virus to others."
- "Acyclovir will eradicate the herpes virus."
- "This drug will help the lesions to dry and crust over."
- "Acyclovir slows replication of the virus."
- "Be sure to give this drug to your partner, too."

acyclovir: Interactions

When obtaining a medication history from a client diagnosed with genital herpes, which medication is the individual most likely to be taking?

- ribavirin
- acyclovir
- zidovudine
- amantadine

Therapeutic Effects: acyclovir

Oral forms of acyclovir are most effective for initial herpes infections to decrease pain and shorten healing time.

Self Check: acyclovir

Mechanism of Action: acyclovir

What is the mechanism of action of acyclovir?

- Prevents the virus from entering hosts cells.
- Interferes with viral DNA replication.
- Engulfs and inactivates the viral genomes.

Replaces enzymes needed to cause host cell death.

Routes of Administration: acyclovir

Using a drug guide for reference, indicate which herpes infections are treated with the listed administration forms of acyclovir by placing a check in the correct cell. Each infection may be treated with more than one route of administration. Select all that apply.

	Oral	Topical	Intravenous	Buccal
Herpes Simplex Encephalitis	☐	☐	☑	☐
Chicken Pox	☑	☐	☐	☐
Herpes Labialis	☐	☑	☐	☑
Initial Genital Herpes	☑	☐	☑	☐
Herpes Zoster	☑	☐	☐	☐

Varicella Vaccination

A new varicella vaccine, zoster vaccine live, has been approved to prevent the development of what condition in adults older than the age of 60 years?

Herpes simplex
Avian influenza
Influenza A
Herpes zoster

Pharmacokinetics: acyclovir

Complete the acyclovir pharmacokinetics table by dragging the missing values to the correct cell.

Route	Onset	Peak	Half-Life	Duration
PO	1.5 – 2 hr	1.5 – 2 hr	2 – 3 hr	10 - 15 hr
IV	Variable	1 hr	3 hr	8 hr

Self Check: Patient Teaching - acyclovir Dosing

During a telehealth visit an individual taking acyclovir shares that they missed their last does and asks if they should take the missed dose now. What is the best response by the health professional?

Never take a missed dose of acyclovir.
Call the pharmacy for all medication related questions.
Take the missed dose with the last schedule dose before going to bed.
Unless it is near time for the next dose, take the missed dose.

Reflect: Drugs to Treat Herpesviruses

acyclovir: Drug-Drug Interaction

The nurse notes in the patient's medication history that the patient with a new prescription for acyclovir is currently taking theophylline. Based on this finding, what is the best action for the nurse to take?

Contact the prescribing health care provider
Remind the patient to increase daily water intake
Ask the patient if they have questions regarding the new medication
Advise the patient to stop taking the theophylline

Drug-Drug Interaction: acyclovir

The healthcare professional caring for a patient taking acyclovir seeks clarification from the healthcare provider who prescribed which new medication?

Probenecid
Aspirin

Ferrous sulfate
Alprazolam

Contraindications: acyclovir
Which conditions present a contraindication to the use of acyclovir? Select all that apply.
Allergy to shellfish
Severe allergic reaction to acyclovir
Male or female actively trying to conceive
Concurrent prescribed treatment with theophylline
Mild allergic reaction to penicillin

Patient Education: acyclovir
When teaching a patient who is taking acyclovir for genital herpes, which statements by the healthcare professional are accurate? Select all that apply.
"Be sure to give this drug to your partner, too."
"Take all of this medication as prescribed."
"acyclovir will eradicate the herpes virus."
"Do not use creams or lotions over the area."
"acyclovir slows replication of the virus."

acyclovir: Adverse Effects
During treatment with acyclovir, the nurse instructs the patient to monitor for which potential adverse effects? Select all that apply.
Seizures
Nausea
Bone marrow suspension
Dysrhythmia
Dizziness

Dosing Information: Acyclovir
Complete the acyclovir dosing information by dragging the missing values to the correct cell.

Route	Dose	Frequency	Duration
IV	5-10 mg/kg	Every 8 hr	7-10 days
PO	200-800 mg	5 times per day	7-10 days

Adverse Effects: acyclovir
An older adult taking oral acyclovir is encouraged to remain hydrated to decrease which adverse effect of the medication?
Hepatomegaly
Nephrotoxicity
Duodenal ulcers
Diarrhea

acyclovir: Expected Outcomes
Which statements made by an individual with a prescription for acyclovir to treat genital herpes indicates to the nurse they understand the expected outcomes therapy? Select all that apply.
"The medication will slow viral replication to allow my immune system the chance to work."
"As the lesions dry and heal, the amount of virus shed will get less. But I should still cover the area."
"Treatment will be a one time course of acyclovir to eliminate the virus from my body."
"Taking the medication means I can't accidentally transfer the virus and cause an infection on another area of my body."
"My break outs will heal faster with the medication."

Drugs to Treat Influenza

Prepare: Drugs that Treat Influenza

Patient Education: oseltamivir

When teaching a patient who is taking oseltamivir for influenza, which statement by the health professional is accurate?

"If you are pregnant, or planning on becoming pregnant, do not take this drug."
"You will not be contagious 24 hours after you start taking this medication."
"This will make your symptoms less severe so you can rest and heal."
"This medication needs to be taken for six weeks."

Mechanism of Action: oseltamivir

What is oseltamivir's mechanism of action?

Inhibits the enzyme neuraminidase
Prohibits RNA replication with the cytoplasm Blocks angiotensin converting enzymes
Prevents viral particles from entering the host cell

Indications for Use: oseltamivir

While admitting an individual to the hospital with pneumonia, the health professional notes that the patient began taking oseltamivir two days ago. Based on knowledge of this medication, the health professional concludes the pneumonia is a complication of which condition?

Chronic hepatitis C
Cytomegalovirus
Respiratory syncytial virus infection
Influenza A

Self Check: oseltamivir (Tamiflu)

Contraindications and Adverse Effects: oseltamivir

Choose whether each of the following is a contraindication or adverse effect of oseltamivir.

	Contraindications	Adverse Effects
Seizures	○	✓
End stage renal disease patients not receiving dialysis	✓	○
Nausea and vomiting	○	✓
Hallucinations	○	✓
Confusion	○	✓
Hypersensitivity	✓	○
Agitation	○	✓

Dosing: Antivirals for Influenza

Which antiviral medication indicated for the treatment of influenza is available as a single dose administered orally?

peramivir
oseltamivir
zanamivir
baloxavir

Decreasing Influenza A & B

When providing health education at a senior center, the health professional will include information about which

medication used to decrease the duration of influenza A and B?

simeprevir
daclatasvir
oseltamivir
ganciclovir

Pharmacokinetcs: oseltamivir
Complete the oseltamivir pharmacokinetics table by dragging the missing values to the correct cell.

Route	Onset	Peak	Half-Life	Duration
PO	Unkown	1 - 2 hr	1 - 3 hr	5 - 15 hr

Self Check: Patient Safety - oseltamivir

Medication Adherence
Click on the words or phrases below that indicate the individual speaking may be taking their prescribed influenza medication incorrectly.

Three days after beginning oseltamivir to treat influenza symptoms, Narottam is feeling better and his 7-year-old daughter has a fever, body aches, and fatigue . He is not able to make an appointment with her pediatrician until two days from now . Understanding that early treatment helps shorten influenza infection, he stops taking his oseltamivir and gives them to his daughter . She is feeling better by the time she sees her pediatrician .

- Stops taking his oseltamivir
- Gives them to his daughter

Reflect: Drugs that Treat Influenza

Antiviral Medications
A patient calls the clinic wanting to know what she can take "because I was exposed to the flu over the weekend at a family reunion and I do not want to get sick." Which antiviral medication(s) might be prescribed in this situation? Select all that apply.

baloxavir
peramivir
oseltamivir ZZ
zanamivir
simeprevir

Patient Education: oseltamivir Adverse Effects
Patients taking oseltamivir should be advised to report hallucinations or confusion to their health care provider immediately.

oseltamivir: Time to Treatment
Tonya has been tired, aching, and feverish with a sore throat and cough for the past 18 hours. She called her healthcare provider's office for an appointment, but none are available. Based on her symptoms, her provider is concerned she may have the flu and recommends going to a nearby urgent care center today. Why should Tonya be seen as soon as possible in the urgent care? Select all that apply.

To begin treatment with a broad-spectrum antibiotic
For a definitive diagnosis of the flu
To decrease the chance of Tonya spreading the virus to her family
Treatment for influenza illness should be started as quickly as possible from the onset of symptoms
Her symptoms are not severe enough to justify a trip to the emergency room

Dosing Information: oseltamivir
Complete the dosing information for oseltamivir by dragging the missing values to the correct cell.

Reason	Route	Dose (Adults)	Frequency	Duration
Treatment of Influenza	PO	75 mg	2 times per day	5 days

Prevention of Influenza	PO	75 mg	1 time per day	At least 10 days

Treatment with oseltamivir
During treatment with oseltamivir, Tonya should contact her healthcare provider if she experiences which adverse effects? Select all that apply.

- Agitation
- Hematuria
- Hallucinations
- Seizures
- Hypokalemia

Indications for Use: oseltamivir
Two days after starting oseltamivir, Tonya is admitted to the hospital with pneumonia. Based on knowledge of this medication and the pathophysiology of pneumonia, the health professional concludes Tonya is experiencing a complication of which condition?

- Aspergillosis
- Cytomegalovirus
- Influenza A
- Respiratory syncytial virus infection

oseltamivir and GI Irritation
Tonya has a new prescription for oseltamivir and asks for advice on how to take this medication to decrease potential irritation of her peptic ulcer disease. What is the best response to her inquiry?

- Take the medication on an empty stomach
- Avoid alcohol while taking this medication
- Drink a glass of milk when taking each dose
- Increase water intake to two liters per day

Administering oseltamivir
Due to her sore throat, Tonya also asks if it is safe to open the capsule and mix the medication in pudding. What is the best response by the healthcare provider?

- “No capsule should be opened before taking it.”
- ”Yes, it is safe to take this medication in that way.”
- “Try putting the capsule in bread before you take it.”
- “The capsule is scored and can be broken in half.”

Nursing Application: Antivirals: Non-HIV

Prepare: Nursing Application - Antivirals - Non-HIV

Naming Convention: Non-HIV Antiviral Medications
Many medications in the non-HIV antiviral class have names that end with the suffix -vir.

Priority Assessment and Non-HIV Antiviral Medications
Which priority assessments should be completed before administering antiviral medication? Select all that apply.

- Known allergies
- Immunization history
- Last bowel movement
- Drug-drug interactions
- Baseline vital signs

Primary Condition Treated
Drag and drop each drug into the correct class based on the primary condition treated.

	Herpes virus	**Hepatitis**	**Influenza**

Drug			
	Acyclovir Trifluridine	Sofosbuvir	Amantadine Oseltamivir

Self Check: Pre-Assessment Data: Antiviral Medications

Select the data that should be collected by the nurse prior to administering the first dose of a prescribed antiviral medication for a cold sore.

Allergies	Energy Level
Nutritional Status	Marital Status
Vital Signs	Breath Sounds
Gait	Visual Acuity

Self Check: Medication Instruction: Non-HIV Antivirals

Theo has recently been diagnosed with hepatitis C after being exposed to contaminated blood in his work as a medical researcher. When educating him about the prescribed ribavirin, what medication specific instructions does the nurse include? Select all that apply.

- Do not share this medication with others
- Remain in isolation until you have been on the medicine for two weeks
- Two forms of birth control should be used while taking this medication
- Take the medication at the times prescribed to maintain a therapeutic level in the body
- Notify the prescribing health care provider if you experience difficulty breathing

Self Check: Treating Viral Illnesses

Why are viral infections and viruses more difficult to eradicate than bacteria?

- Viruses require folic acid synthesis from the host cell
- Viruses replicate only inside host cells and medications must enter the cell to be effective
- Viruses grow as an attachment to host cells and must first be removed from the cell wall
- Viruses replicate at a faster rate than bacteria

Self Check: Patient Teaching and Evaluation

Administering Topical Medication

Order the steps the nurse lists when providing patient education on applying a topical antiviral medication. Drag the items into order from first to last.

1. Wash hands
2. Apply glove
3. Place medication on gloved hand
4. Apply medication to affected area
5. Remove gloves and perform hand hygiene

Evaluating Non-HIV Antiviral Treatment

Which statement, made by the mother of a 13-year-old being treated for a herpes simplex infection on the right forearm, indicates a need for further treatment?

- “The oozing and crusting has decreased significantly.”
- “I don’t catch him scratching his arm or trying to remove the dressing anymore.”
- “He has an area on his stomach that is starting ooze and crust.”
- “I don’t believe my son has ever washed his hands this much.”

Reflect: Nursing Application - Anitivirals - Non-HIV

Administering Non-HIV Antivirals

Before administration of non-HIV antiviral medication, what nursing actions should be completed? Select all that apply.

- Assess vital signs
- Monitor for medication adverse effects
- Perform a physical assessment
- Verification of known allergies
- Review current medication use

MOA of Non-HIV Antivirals

Match the mechanism of action on the left to the drug on the right.

Inhibits viral replication; a direct-acting antiviral (DAA)	Simeprevir
Inhibits the enzyme neuraminidase, which may alter virus particle aggregation and release	Oseltamivir
Interferes with viral DNA synthesis	Acyclovir

Patient Education

The nurse is caring for a 27-year-old patient who has been newly diagnosed with hepatitis. The following medication has been prescribed by the healthcare provider as adjunct therapy with ribavirin and pegainterferon alfa.

- **simeprevir 150 mg daily by mouth**

The nurse is charged with providing medication administration teaching. Which statement by the patient indicates further teaching is needed?

- "Before I start taking any other medication or supplement, I will check with my health care provider."
- "I will avoid sunning and tanning while taking this medication."
- "If I miss a dose and remember within 12 hours, I will take it with food and take the next dose as scheduled."
- "I will stop the ribavirin while taking this new medication."

Toxicity: Non-HIV Antiviral Medications

A dose-limiting toxicity of ganciclovir treatment is bone marrow suppression. Monitoring requires close review of the patient's complete blood cell count (CBC) results.

Safety: Inhaled Antiviral Medications

The nurse is preparing to administer the aerosol form of ribavirin to an infant. The parents and grandparent are present in the room, what action will the nurse take to promote safe use of this inhalant? Select all that apply.

- The nurse will wear a mask while handling and administering the medication.
- Instruct all visitors to leave the room for the duration of the treatment.
- Ask females of reproductive potential if they are pregnant or actively trying to conceive.
- Offer everyone a mask and ask them to move to the furthest point in the room away from the crib.
- Explain that the inhaled medication may be present in the air during treatment and ask that everyone wear a mask.

Oseltamivir Critical Adverse Effects

A patient is taking oseltamivir for influenza infection. The nurse instructs the individual to seek emergency medication assistance for which known adverse reaction?

- Seizures
- Confusion
- Vertigo
- Agitation

Indications: Non-HIV Antiviral Medications

After surgery for organ transplantation, a patient is receiving ganciclovir, even though they do not have a viral infection. Which statement best explains the rationale for this medication therapy?

The drug works synergistically with antibiotics to prevent superinfections
Ganciclovir is used to prevent potential exposure to the HIV virus
Ganciclovir is given to prevent cytomegalovirus (CMV) infection
This medication is given prophylactically to prevent influenza A infection

Antivirals: HIV Infection and AIDS

Prepare: Antivirals - HIV Infection and AIDS

Goal of Antivirals or Antiretrovirals

What is the goal of antivirals or antiretrovirals related to HIV/AIDS? Select all that apply?

Prolong life by decreasing the viral load
Relieve the symptoms
Cure it
Preventing asthma complications

Proper Medication Use

Which statements are true regarding proper medication use with HIV/AIDS? Select all that apply.

Reduce occurrence of opportunistic infections.
Decrease overall viral load of HIV in the body.
Reduce risk of transmission from mother to fetus.
Eliminate a majority of HIV currently in the body.

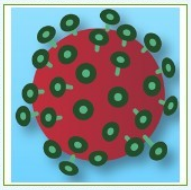
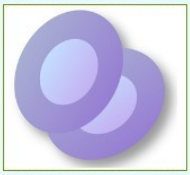
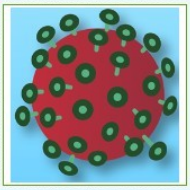
Needle Stick Injuries

Needle stick injuries can happen to healthcare workers. Risk is extremely rare. Prophylactic treatment is available to healthcare workers exposed to a needle stick injury from an HIV positive patient.

Self Check: HIV and Antiretroviral Medication

Molecules and Cells

Drag and drop the images to the description to which is best fits. Each image may be used more than once.

These molecules damage the immune system by killing CD4 cells.	The goal of medication treatment is to improve the number of these.	These cells are part of the body's immune system.	The goal of medication treatment is to decrease these.
			

Antiretroviral drugs are for active HIV infections. As the disease progresses, HIV molecules increase and CD4 cells decrease. Antiretroviral medications can slow disease progression by decreasing the HIV load and improving CD4 cell counts.

Self Check: Treatment for HIV

HIV prophylactic treatment is recommended for HIV positive pregnant women, newborn infants born to HIV positive mothers, and healthcare workers who received a needle stick injury from an HIV positive patient.

Self Check: How Does it Work?

Pharmacological Action of Antiretrovirals

The pharmacological action of antiretrovirals is decreasing the viral load. A viral load of less than 50 copies/mL is the goal of therapy.

Medication Classes and Their Actions

Drag and drop to match the medication class with the appropriate action.

Acts as a decoy to nucleosides, which is missing a component that prevents it from attaching to another nucleoside.	Nucleoside Reverse Transcriptase Inhibitors (NRTIs)
Stops the enzyme from bringing viral DNA into the nucleus.	Integrase inhibitors
Coats and blocks the proteins from entering the cell.	CCR5 Antagonists
Prevents protease from binding to the viral polyprotein which blocks it from maturing.	Protease inhibitors
Gums up the reverse transcriptase enzyme which inhibits reverse transcriptase from occurring.	Nonnucleoside Reverse Transcriptase Inhibitors (NNRTIs)
Binds to the virus proteins Gp120 or Gp41 and prevent HIV from binding to and entering CD4 cells.	Fusion inhibitors

Reflect: Antivirals - HIV Infection and AIDS

Prophylactic HIV Treatment

Prophylactic HIV treatment is recommended for which situations? Select all that apply.

- Newborn infant born to an HIV positive mother
- Healthcare worker exposed to a needle stick injury from an HIV positive patient
- HIV positive pregnant woman
- A healthcare worker who works with HIV positive patients

Adverse Effects

Antiretroviral medication adverse effects may include which undesirable changes in the body? Select all that apply.

- Pneumocystis carinii pneumonia
- Insulin resistance
- Liver Disease
- Bone demineralization

Antiretroviral Medications

How do antiretroviral medications slow the progression of HIV to AIDS. Select all that apply.

- Decreasing CD4 cells
- Increasing HIV molecules
- Increasing CD4 cells
- Decreasing HIV molecules

Reducing HIV Symptoms

Antivirals can significantly reduce viral load, thereby reducing HIV symptoms and complications and prolonging the individual's life.

Fusion Inhibitors

What is the action of Fusion Inhibitors?

- Stops the enzyme from bringing viral DNA into the nucleus.
- Coats and blocks the proteins from entering the cell.
- Binds to the virus proteins Gp120 or Gp41 and prevent HIV from binding to and entering CD4 cells.
- Prevents protease from binding to the viral polyprotein which blocks it from maturing.

Action of Drug Class

Please select the action of the drug class on the HIV Life Cycle from each drop-down menu.

1. Binds to the virus proteins Gp120 or Gp41 and prevent HIV from binding to and entering CD4 cells.
2. Coats and blocks the proteins from entering the cell.
3. Acts as a decoy to nucleosides, which is missing a component that prevents it from attaching to another nucleoside.
4. Gums up the reverse transcriptase enzyme which inhibits reverse transcriptase from occurring.
5. Stops the enzyme from bringing viral DNA into the nucleus.
6. Prevents protease from binding to the viral polyprotein which blocks it from maturing.

Action of CCR5

What is the action of CCR5?

Stops the enzyme from bringing viral DNA into the nucleus.
Prevents protease from binding to the viral polyprotein which blocks it from maturing.
Binds to the virus proteins Gp120 or Gp41 and prevent HIV from binding to and entering CD4 cells.
Coats and blocks the proteins from entering the cell.

Integrase Inhibitors

What is the action of Integrase Inhibitors?

Coats and blocks the proteins from entering the cell.
Binds to the virus proteins Gp120 or Gp41 and prevent HIV from binding to and entering CD4 cells.
Prevents protease from binding to the viral polyprotein which blocks it from maturing.
Stops the enzyme from bringing viral DNA into the nucleus.

Nursing Application: Antivirals: HIV Infection and AIDS

Prepare: Nursing Application - Antivirals - HIV Infection and AIDS

Antiretroviral Medication Administration

Which of the following are important instructions for HIV/AIDS antiretroviral medication administration? Select all that apply.

Instruct the patient to remain upright while administering the medication and for up to 30 minutes afterward to prevent esophageal ulceration
If the patient experiences trouble breathing, fever, changes in oral mucosa (opportunistic infection), notify the prescriber immediately
Administer in evenly spaced intervals around the clock to ensure steady-state levels
Give on an empty stomach

Viruses and Bacteria

4

Viruses are more challenging to treat than bacteria because replication occurs inside the host cells, so medications must enter the cell.

Antiretroviral Therapy

What is the goal of antiretroviral therapy for an HIV patient?

Cure the disease

Prevent Congestive Heart Failure (CHF)

Prolong life by decreasing the viral load

Prevent asthma complications

Self Check: Case Study, Part 1

The Best Response

What is the best response to Omar?

"You will need to return frequently to check your labs for medication success. We will monitor your viral load and CD4 counts throughout therapy to ensure the medications are working properly. I'm sorry to hear about your diagnosis, I would be devastated as well."

"You will need to return frequently to check your labs for medication success. We will monitor your viral load and CD4 counts throughout therapy to ensure the medications are working properly. I hear you are upset about the diagnosis. May I share with you the goals and benefits of treatment?"

"I'm sorry to hear about your diagnosis. Yes, we will see you back in a few years when your symptoms worsen."

Self Check: Case Study, Part 2

Responding to Patients

Using the drop-down menus, complete the phrase showing how should the nurse respond?

"Great! Patients that are treated with antiretroviral medications, that you are going to be prescribed, often do not even make it through to the last stage. Progression is drastically slowed by taking your medications."

Self Check: Case Study, Part 3

Teaching Points for Omar

The nurse is compiling a document of teaching points she wants to make to Omar and a sheet she will print out for him to take home.

Which instructions regarding antiretroviral medications will she include?

	Include	Do Not Include
Take on an empty stomach.	○	✓
Remain upright when taking medications and for 30 minutes afterward to prevent esophageal ulceration.	✓	○
Take medications exactly as indicated, around the clock, but do not interrupt sleep.	○	✓
Follow up exams, including taking blood are essential to monitor for side effects and determine if the medication regimen is working.	✓	○
Avoid taking other medications, including over the counter medications and herbal supplements, until speaking about them with your provider.	✓	○
Do not discontinue any medications without talking with your provider.	✓	○
Change positions slowly as the medications may cause dizziness and syncope.	✓	○
Take missed doses as soon as you remember, unless it is time for the next dose.	✓	○
If you miss a dose, take a double dose next time.	○	✓
Take medications with food to prevent GI upset.	✓	○

Self Check: Case Study, Part 4

Instructions for Omar

Please select "do/does" or "do not/does not" regarding the instructions the nurse explains to Omar.

"Antiretroviral therapy does not cure HIV"

"Antiretroviral therapy does decrease disease progression"

" Do wear a condom during sex"

" Do avoid sharing needles"

" Do not donate blood"

"Antiretroviral therapy does not eliminate the risk of transmission of HIV to others"

Viral Load

Omar comes back for a follow up appointment and thanks his nurse for all she has taught him. The nurse looks at Omar's chart and it shows a viral load of 33 copies/mL.

Question 1 / 2

Is the medication therapy working for Omar?

- Yes
- No

Question 2 / 2

Yes, the medication is working because the viral load is less than 50 copies/mL, which is the goal of antiretroviral therapy.

Reflect: Nursing Application - Antivirals HIV Infection and AIDS

Monitoring Labs

Why are labs monitored during various stages of HIV antiretroviral treatment?

- Monitor heart complications
- Monitor body image changes
- Monitor for Hepatitis C
- Monitor viral load

NRTIs and NNRTIs

Nucleoside Reverse Transcriptase Inhibitors (NRTIs) act as a decoy to nucleosides, which is missing a component that prevents it from attaching to another nucleoside.

Nonnucleoside Reverse Transcriptase Inhibitors (NNRTIs) gum up the reverse transcriptase enzyme which inhibits reverse transcriptase from occurring.

Most Important Intervention

Your patient is a 35-year-old pregnant woman who just received lab results that she is positive for HIV. What is the most important intervention at this time?

- Setting up a psychiatric evaluation
- Starting prophylactic antiretroviral treatment
- Educational support regarding her baby that is also HIV positive
- Starting antiemetic medications

Administering Ointments

When administering ointments to a patient that is HIV positive, what precautions should you take? Select all that apply.

3

- Wash hands before and after administration of the medication
- Avoid exposure of medication on your skin or in your eyes
- Wear gloves

Maintain droplet precautions

Inhibitors

Integrase Inhibitors stop the enzyme from bringing viral DNA into the nucleus.

Protease Inhibitors prevent protease from binding to the viral polyprotein which blocks it from maturing.

Medication Instructions

Choose whether or not you would want to include the medication instructions below to a newly diagnosed HIV patient being discharged to home.

	Include	Do Not Include
Take the medications with food.	✓	
Take medications on an empty stomach.		✓
Store medications out of sunlight and at room temperature.	✓	
If you experience trouble breathing, fever, changes in your mouth/oral mucosa, notify the prescriber immediately.	✓	
You may crush or break capsules if needed to tolerate the medication better.		✓
Remain consistent and ensure to take in evenly spaced intervals to ensure therapeutic benefits.	✓	
Lay down for 30 minutes after taking your medications to prevent dizziness.		✓
You may note changes in your mouth/oral mucosa, this is normal.		✓
Remain upright when taking your medication and for 30 minutes to prevent esophageal ulcers.	✓	

Fusion Inhibitors

Fusion inhibitors bind to the virus proteins Gp120 or Gp41 and prevent HIV from binding to and entering CD4 cells. CCR5 Antagonists coat and block the proteins from entering the cell.

Newly Diagnosed HIV Patient

What information is essential to communicate to a newly diagnosed HIV patient who is starting antiretroviral therapy? Select all that apply.

- Consult your health care provider before taking additional medications or herbal supplements
- Antiretroviral therapy does not cure HIV
- Do not donate blood
- Antiretroviral therapy eliminates the risk of transmission of HIV to others
- You do not need to wear a condom during sex
- Follow up frequently to determine progress and monitor side effects
- Avoid sharing needles

Antitubercular

Prepare: Antitubercular Drugs

Acute Versus Latent TB Treatment

The medication regimen to treat active TB is not the same regimen used to treat latent TB.

Transmission of Tuberculosis

When educating a person starting medication to treat tuberculosis which activities or actions are safe? Select all that apply.

- Sharing toothbrushes
- Touching bed linens or toilet seats Kissing
- Sharing food or drink
- Shaking someone's hand
- Sharing living space with someone infected

Symptoms of Tuberculosis

Which set of symptoms are most likely to be present in an individual with a tuberculosis infection?

nausea, vomiting, diarrhea
cough for longer than 3 weeks, anorexia, fever
shortness of breath, fatigue, generalized edema
cough for 5 days, fever, anorexia

Self Check: Response to Treatment

How long after starting treatment for tuberculosis should a patient notice an improvement in symptoms?

2 weeks
3 weeks
4 weeks
1 week

Self Check: Antituberculars

Mechanism of Action

Drag and drop each of the drugs below to the match with its mechanism of action.

	Protein Wall Synthesis	Cell Wall Synthesis Inhibitors	Other Mechanisms of Action
Drugs	• Streptomycin • Kanamycin • Capremycin • Rifampin • Rifabutin	• Cycloserine • Ethionamide • Isoniazid (INH)	• Ethambutol • Isoniazid (INH) • Para-aminosalicylic acid (PAS) • Ethionamide

Adverse Effects of INH and Rifampin

Select the correct words to complete the sentence.

INH and rifampin have adverse effects that impact the liver while ethambutol has adverse effects that impact the eyes.

Self Check: Acetylation

Select the correct words to complete the sentence.

Acetylation is a chemical reaction that happens in the body to form protein, regulate deoxyribonucleic acid (DNA) and aid the biotransformation of certain drugs.

Self Check: INH Toxicity

An individual with INH toxicity may present with which symptoms? Select all that apply.

Tingling
Burning sensation in extremities
Numbness
Fatigue
Dizziness

Reflect: Antitubercular Drugs

Drug Interactions

A woman of child-bearing age is diagnosed with an active tuberculosis infection. Which medication, if prescribed, might interfere with her oral contraceptives?

Isoniazid
Rifampin
Streptomycin
Pyrazinamide

Treatment Resistance

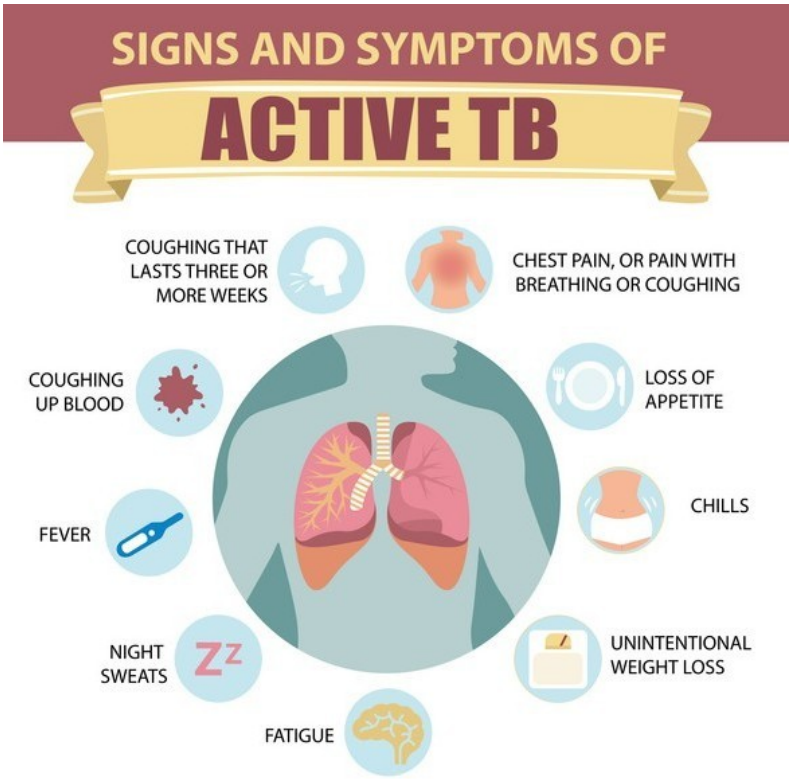
Four weeks after beginning antitubercular drug therapy on an outpatient basis, the client reports that he still

experiences hemoptysis (bloody sputum with cough). What does the health care professional identify as the main concern at this time?

Medication dosages are not high enough.
His infection may be resistant to the drug therapy ordered.
He is not taking his medication as prescribed.
He may have another condition rather than TB.

TB Symptoms

Based on the image to the left, please click the correct symptoms from the list below that are the most concerning for active TB?



- Chest pain, or pain with breathing or coughing
- Loss of appetite
- Chills
- Unintentional weight loss
- Fatigue
- Night sweats
- Fever
- Coughing up blood
- Coughing that lasts three or more weeks

TB Test

A patient has a positive TB skin test and a negative chest x-ray for tuberculosis. How could this happen?

Their DNA carries the acetylation allele
There was a mistake processing the results
They have pulmonary tuberculosis and it just isn't showing up on the x-ray yet
They either had the infection previously or had a vaccine for tuberculosis

Response to Treatment

A client has been taking antitubercular medications for an active infection for the last 4 months. What findings indicate a therapeutic response?

There are two consecutive negative TB skin tests
There is a decrease in symptoms of tuberculosis along with improved chest x-ray and sputum cultures
There is a decreased tolerance to the medication and an increase in adverse effects
The chronic cough is gone

INH and B Vitamins

A client is receiving INH for the treatment of TB and has been taking Vitamin B12 after hearing from a friend that it would help prevent complications. The health care provider's best response is to tell the patient to change Vitamin B12 for_____.

Vitamin D

Vitamin B9
Vitamin B6
Vitamin C

Treating TB

When educating a person starting medication to treat tuberculosis which activities or actions are safe? Select the correct images.


Touching bed linens or toilet seats


Coughing without covering mouth


Sharing food or drink


Shaking someone's hand


Kissing


Sharing toothbrushes


Sharing living space with some infected

INH Side Effects

A client taking isoniazid (INH) for the last 2 weeks is reporting numbness and tingling in their fingers for the last 24-48 hours. What is the most likely cause for these symptoms?

The dose of INH is too low causing peripheral neuropathy
This patient is most likely of the phenotype that metabolizes drugs slowly, such as INH, resulting in toxicity
The patient is allergic to INH and the drug should be stopped immediately
The patient is most likely not taking their medication as prescribed resulting in paresthesia

Nursing Application: Antitubercular Drugs

Prepare: Nursing Application - Antitubercular Drugs

Treatment for Tuberculosis

Treatment for tuberculosis may last for what duration of time?

- 24 months
- 12 months
- 3 months
- 6 months

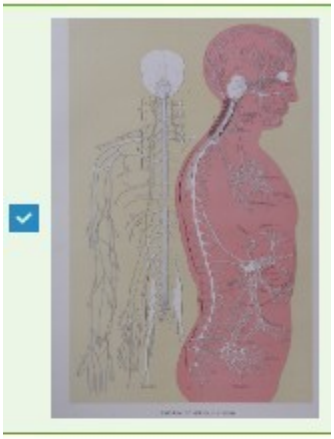
Sputum Cultures

When is the best time to collect a sputum culture?

- At bedtime
- Around dinner time
- Mid-day
- Early in the morning

Antitubercular Treatment

Which of the following body systems may be impacted by antitubercular treatment? Select all that apply.



Self Check: Cues to an Illness

Cues to an Illness

Select the words and phrases that are cues to Liliana's illness.

In October 2008, Liliana was excitedly preparing for her wedding. Throughout that year, she had been working very hard and going to the gym so she would look her best for the wedding. But shortly before her wedding date, she started coughing . Not wanting to be sick for her big event, she went to see a doctor and was told she had bronchitis . The doctor gave Liliana a shot of antibiotics and prescribed an inhaler . Liliana's symptoms went away and she quickly felt better. But in December, after her honeymoon, her cough came back even worse . Deciding it was time to see a specialist, she went to a pulmonologist. He sent Liliana to get a chest x-ray, and also prescribed an inhaler and antibiotics . Liliana says, " I was better for a while and never heard back from the doctor." In February, her cough returned . Liliana scheduled another appointment with the same pulmonologist. "This time when the nurse came in, she was wearing a mask," said Liliana. "I found out that the doctor had looked at my x-ray. He sent me to get blood work and sputum tests done. And that is when it all started."

- coughing
- cough came back even worse
- I was better for a while
- her cough returned

Self Check: Patient Education for Medications

Liliana's current medications include dicyclomine, phenytoin, an oral contraceptive, and occasional use of acetaminophen for aches and pains. Which of her medications require either further patient teaching or alternative drug dosing due to drug to drug interactions with common antitubercular treatment? Select all that apply.

Acetaminophen
Dicyclomine
Oral contraceptive
Phenytoin

Self Check: TB Skin Testing

What is the induration in relation to TB skin testing?

The red area
The raised area
The red and raised area together
The white area that forms when the PPD is injected under the skin

Explore: Teaching Liliana

Teaching Liliana

What teaching is important to provide to Liliana at this time? Select all that apply.

She should be encouraged to take care of herself by ensuring adequate nutrition, rest, and relaxation
She can expect a maximum duration of therapy to be 6 months
No alternative forms of birth control will be needed
She needs to take her medication as ordered
She should be warned not to consume alcohol because the antitubercular drugs may cause liver toxicity
Compliance with therapy is essential for achieving a cure

Self Check: Drug Therapy and Night Sweats

Six weeks after beginning antitubercular drug therapy on an outpatient basis, the patient reports that she still experiences night sweats. What does the nurse identify as the main concern at this time?

She may have contracted a different strain of TB
Her infection may be resistant to the drug therapy ordered
More time is needed to see a therapeutic response
She is not taking her medication properly

Reflect: Nursing Application - Antitubercular Drugs

Vaccine for TB

What is the vaccine for TB disease called?

Purified Protein Derivative
Mantoux Tuberculosis

Bacille Calmette-Guérin
Recombivax HB

Risk of TB Infection

Who is at risk for getting MDR TB? Select all that apply.

Develop TB disease again, after having taken TB medicine in the past
Miss scheduled appointments
Have spent time with someone known to have drug-resistant TB disease
Complete all their TB medicine as prescribed
Do not take their TB medicine regularly
Do not take all of their TB medicine as told by their doctor or nurse
Come from areas of the world where drug resistant TB is common
Do not wear a mask when in public where social distancing cannot be maintained

Lab Tests, Medicine, and Adverse Effects

Complete the table by dragging the information listed below to the corresponding cell in the table.

Lab Test	Medicine	Adverse Effect to be Monitored
CBC	Isoniazid Streptomycin Rifampin	Drug-related hematologic disorders
Creatinine clearance and BUN	Streptomycin	Nephrotoxicity
Uric acid baseline	Pyrazinamide	Hyperuricemia

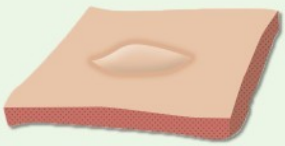
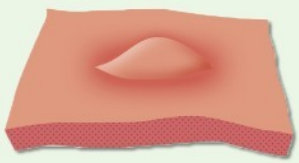
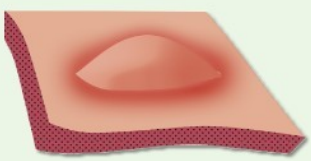
Preventing the Spread

What is the most important thing a person can do to prevent the spread of multidrug resistant tuberculosis?

Rearrange the dosing schedule to meet their work and life schedule so doses are all taken
If a dose of medicine is missed, it should be skipped since doubling it would be toxic to the liver
Take all their medications exactly as prescribed by their healthcare provider
When traveling, plan to obtain tuberculosis medications at the destination so no medicine is lost during travel

Skin Indurations

Drag each image to match with the correct factors provided below:

Negative	• HIV-infected persons • A recent contact of a person with TB disease • Persons with fibrotic changes on chest radiograph consistent with prior TB • Patients with organ transplants • Persons who are immunosuppressed for other reasons	• Recent immigrants (< 5 years) from high- prevalence countries • Injection drug users • Residents and employees of high-risk congregate settings • Mycobacteriology laboratory personnel • Persons with clinical conditions that place them at high risk • Children < 4 years of age • Infants, children, and adolescents exposed to adults in high-risk categories	Any person, including persons with no known risk factors for TB. However, targeted skin testing programs should only be conducted among high-risk groups.
An induration of 0-4 mm 	Induration of 5-9 mm 	Induration of 10-14 mm 	Induration of >= 15 mm 

Sputum Collection

A client is instructed to complete a sputum collection first thing in the morning and asks why this is necessary. Which response to the patient is the most appropriate?

"You were told wrong. The sputum should be collected at bedtime."

"Studies have shown that early morning sputum collection has a higher accuracy rate for diagnosis compared to sputum collected later in the day."

"It doesn't matter when you collect the specimen. Do it whenever it is convenient for you."

"More recent studies actually show that collecting sputum after exercise when the lungs are most active is the best time to collect sputum. Please collect a sputum specimen after at least 20 minutes of cardiovascular exercise."

Resistance to TB

Click and drag the level of resistance as it relates to the type of resistance. Not all answers will be used.

	Drug-resistant TB	Multidrug-resistant TB	Extensively Drug-resistant TB
Resistance	Resistant to at least one first-line antitubercular drug.	Resistant to more than one antitubercular drug.	Resistant to isoniazid and rifampin, plus any fluoroquinolone and least one of three injectable second-line drugs.

Labs to Monitor Drugs

Select which lab is drawn to monitor which drug. Some lab tests monitor multiple drugs.

	Baseline for all	Streptomycin	Isoniazid	Rifampin	Pyrazinamide
Liver Function Tests (bilirubin, liver enzymes)	☑	☐	☐	☐	☐
Kidney Function Tests (BUN, Creatinine)	☐	☑	☐	☐	☐
CBC	☐	☑	☑	☑	☐
Uric Acid	☐	☐	☐	☐	☑

Antifungals

Prepare: Antifungals

Fungi, Molds, and Yeast

Using the drop-down menus, select the best answer to complete the paragraph.

Fungi are a very large and diverse group of microorganisms and consist of yeasts and molds. Yeasts are single-celled fungi that may be harmful (e.g., causing infections) or helpful (e.g., aiding in baking or brewing beer). Molds are multicellular and are characterized by long, branching filaments called hyphae.

Antifungals

Antifungals are used to treat what types of fungal infections? Select all that apply.

- Topical
- Respiratory
- Opthalmic
- Systemic

Fungal Infections

Using the drop-down, select the answer that completes the statement.

There are four types of fungal infections.

Self Check: Most Common Antifungals

Which antifungals are the most commonly used or prescribed?

- Opthalmic
- Systemic
- Inhaled
- Topical

Self Check: Therapeutic Use

Drag and drop the drug to match what it is used to treat.

Drug	Used to Treat
Amphotericin B	Severe systemic fungal infections
Nystatin	Oral candidiasis
Miconazole	Vulvovaginal candidiasis
Clotrimazole	Tinea corporis, tinea pedis, tinea versicolor, cutaneous candidiasis, and vaginal yeast infections
Fluconazole	Esophageal, oropharyngeal, peritoneal, urinary tract, and vaginal candidiasis

Self Check: Drug Examples

Drag and drop each drug to match with its example.

Ketoconazole, fluconazole, itraconazole, voriconazole	Imidazoles and triazoles
Caspofungin, micafungin, and anidulafungin	Echinocandins
Amphotericin B and nystatin	Polyenes

Self Check: Adverse Effects

Of the drugs listed below, which has the more severe and concerning side effects?

- Amphotericin B
- Nystatin
- Fluconazole
- Amphotericin A

Self Check: Contraindications

Drag each contraindication to the correct box matching the antifungal medication in the row.

Drugs	Specific Contraindications
Itraconazole	Severe cardiac problems
Voricanazole	Pregnancy
Griseofulvin	Porphyria

Reflect: Antifungals

Subsequent Infections

A female who is diabetic, pregnant, and just finished a long round of antibiotics is at high risk for what subsequent infection?

- Aspergillosis
- Athlete's foot
- Strep throat
- Vaginal candidiasis

Candidiasis

Using the drop-down menus, select the word to complete the paragraph.

Candidiasis is a/an opportunistic fungal infection caused by C. albicans and occurs in patients taking broad-spectrum antibiotics, antineoplastics, or immunosuppressants, as well as in immunocompromised persons. When candidiasis occurs in the mouth, it is commonly called thrush.

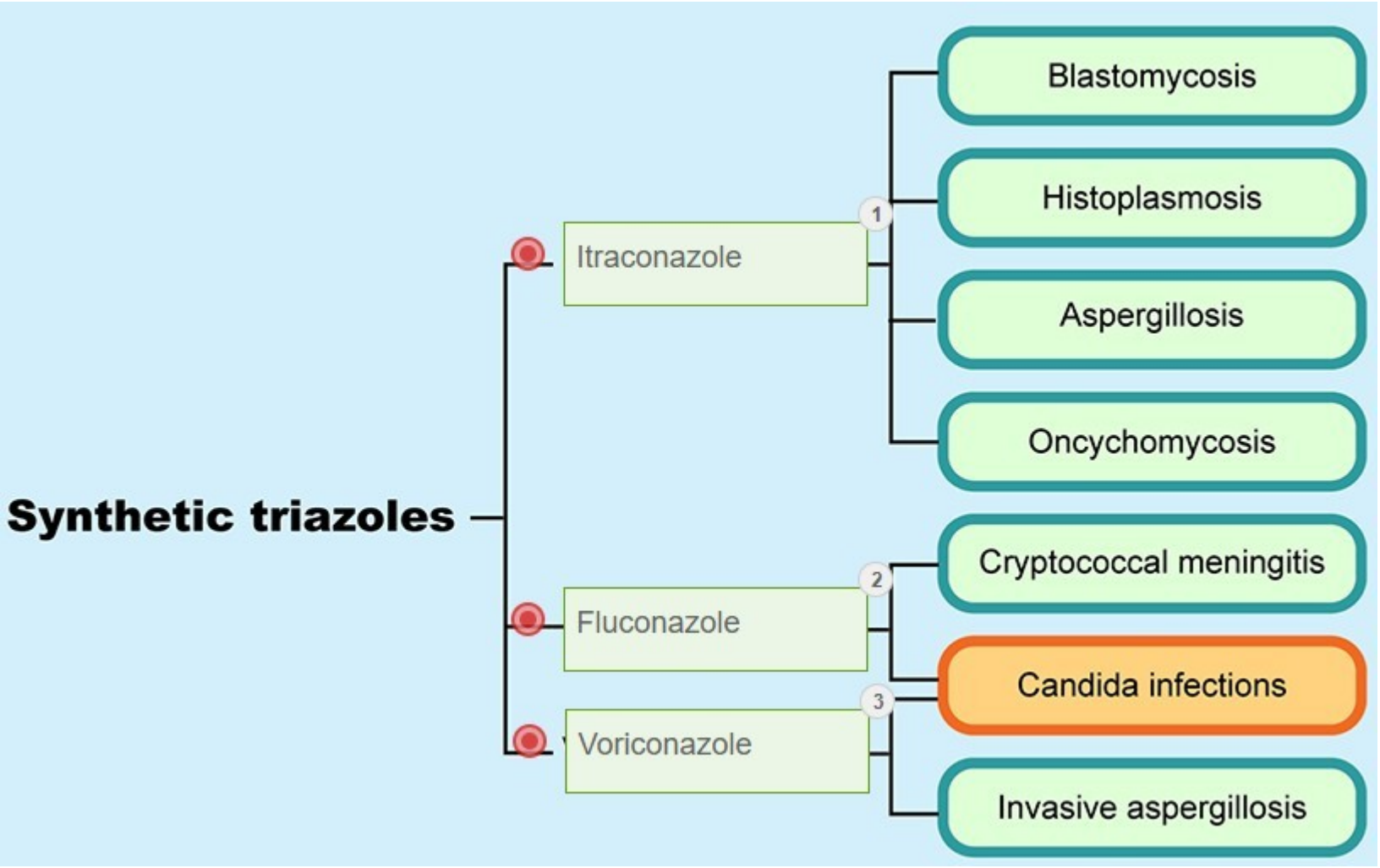
Mechanism of Action

Drag mechanism of action to the empty boxes to match each drug(s) listed below.

Drug Names	Mechanism of Action
Flucytosine	Taken up by fungal cells and interferes with DNA synthesis
Griseofulvin	Disrupts cell division
Polyenes: amphotericin B and nystatin	Bind to sterols in cell membrane lining
Imidazoles and triazoles: ketoconazole, fluconazole, itraconazole, voriconazole	Inhibit fungal cell cytochrome P-450 enzymes, resulting in cell membrane leaking
Echinocandins: caspofungin, micafungin, and anidulafungin	Prevent the synthesis of glucans (essential components of fungal cell walls)

List of Infections

Drag the drug name to the correct corresponding list of infections it is used to treat.



Safety

Before taking an antifungal medication, which of the following criteria should be considered? Select all that apply.

- Interactions with other drugs
- Drug allergies
- Interactions with herbal medications or compounds
- Food allergies
- Environmental allergies

Infection Types

Which of the infection types below that can be fungal? Select all that apply.

- Cutaneous
- Systemic

Muscular
Subcutaneous
Superficial

Yeast and Fungi
Drag each descriptor into the correct box to differentiate between yeast and fungi.

	Yeast	Fungi
Descriptors	• Single celled fungi • May be helpful • May be harmful	• Some exist in and on body naturally • Multicellular • Long, branching filaments

Antifungals
Antifungals may be administered via multiple routes, including systemically. Some of the most common systemic antifungals are amphotericin B and fluconazole; an example of a topical antifungal is nystatin.

Nursing Application: Antifungals

Prepare: Nursing Application - Antifungals

Aspergillosis Infection
What organ is infected when someone has a aspergillosis infection?
Skin
Blood
Nails
Lungs

Treating Candidiasis
Which medication is used to treat oral candidasis?
Terbinafine
Clotrimazole
Amphotericin
Nystatin

Griseofulvin
Griseofulvin is a/an oral medication used to treat systemic fungal infections.

Self Check: Oral Candidiasis

Of the medications listed below, which two can be used to treat oral candidiasis?
omeprazole
fluvastatin
fluconazole
nystatin

Self Check: Jessica's Teaching Points

Jessica's Teaching Points
Which of the following are main teaching points to focus on for children like four-year-old Jessica? Select all that apply.
Shake the oral suspension (liquid) before you measure a dose. Use the dosing syringe provided, or use a medicine dose-measuring device (not a kitchen spoon).
Store at room temperature away from moisture, heat, and light.
Griseofulvin could make you sunburn more easily. Avoid sunlight. Wear protective clothing and use sunscreen (SPF 30 or higher) when you are outdoors.
Taking griseofulvin during the first 3 months of pregnancy may cause birth defects. Do not take this medicine if you are

pregnant. Use effective birth control to prevent pregnancy while you are using this medicine.

If you use this medicine long-term, you may need frequent medical tests.

Take with a fatty meal to aid absorption and lessen stomach upset.

You should not breastfeed while using griseofulvin.

Use this medicine for the full prescribed length of time, even if your symptoms quickly improve. Skipping doses can increase your risk of infection that is resistant to medication.

Self Check: Macronutrients

What macronutrient is it important to consume when taking griseofulvin?

Carbohydrates

Water

Fat

Protein

Self Check: Lung Infections

Why is Charles susceptible to lung infections? Select all that apply.

He has COPD which makes him more susceptible to lung infections

His age creates a weaker immune system

He is a male which contributes to a weaker immune system as men age

He has a chronic condition which weakens the immune system

Self Check: Side Effects

Match the drug category to the unpleasant symptom it is used to treat or prevent.

Fever	Antipyretics
Hyperactive response	Corticosteroids
Nausea and vomiting	Antiemetics
Allergic type reactions, but not anaphylaxis	Anthihistamines

Reflect: Nursing Application - Antifungals

Instruction from Nurses

A patient is taking nystatin (Mycostatin) oral lozenges to treat an oral candidiasis infection resulting from inhaled corticosteroid therapy for asthma. Which instruction by the nurse is appropriate?

“Rinse your mouth with water before taking the inhaler.”

“Rinse your mouth with mouthwash after taking the inhaler.”

“Let the lozenge dissolve slowly and completely in your mouth without chewing it.”

“Chew the lozenges until they are completely dissolved.”

Patient Teaching

A patient is taking nystatin (Mycostatin) in an oral troche form for oral candidiasis. Which instruction is correct?

Chew the troche thoroughly to activate the medication.

Allow the troche to dissolve slowly in the mouth.

Swish the medication in the mouth and then swallow it.

Swallow the troche whole without chewing.

Side Effects and Priority Response

Fifteen minutes after an infusion of amphotericin B was started, the patient begins to complain of fever, chills, muscle pain, and nausea. His heart rate has increased slightly, but his blood pressure is down to 100/68 mm Hg. What is the nurse’s priority?

Slow the infusion to reduce these adverse effects.

Recognize an impending anaphylactic reaction and stop the infusion.

Assess for other symptoms of this expected infusion-related reaction.

Notify the prescriber immediately.

Monitoring Criteria and Look/Sound Alike Drugs

Match the drugs by dragging them to the group of monitoring criteria and look/sound alike drugs. Answers may be used more than once.

	Nystatin	Fluconozale	Griseofulvin	Amphotericin B
Monitoring Criteria	No routine tests recommended	Creatinine at baseline, Liver Function Tests (LFTs)	No routine tests recommended	BUN, Creatinine at baseline, then frequently; CBC; electrolytes; Liver Function Tests
ook/Soud d Alike Drugs	Dilantin, naftifine, niacin, nitrogylcerin, phenytoin	Flucytosine, fluoxetine, furosemide, itraconazole, metronidazole	Gastrografin	amphotericin B liposomal confused with: amphotericin B deoxycholate; amphotericin B; amphotericin B lipid complex

Adverse Effects

During therapy with amphotericin B, the nurse will monitor the patient for known adverse effects that would be reflected by which laboratory result?

Serum potassium level of 5.8 mEq/L
White blood cell count of 7000 cells/mm3
Platelet count of 300,000/microliter
Serum potassium level of 2.7 mEq/L

Patient Teaching

The nurse is reviewing instructions for vaginal antifungal drugs with a patient. Which statement by the nurse is an appropriate instruction regarding these drugs?

"Abstain from sexual intercourse until the treatment has been completed and the infection has resolved."
"Discontinue this medication if menstruation begins."
"Daily douching is part of the treatment for vaginal fungal infections."
"The medication can be stopped when your symptoms are relieved."

Lipid Formulation of Amphotericin B

The nurse is administering one of the lipid formulations of amphotericin B. When giving this drug, which concept is important to remember?

The lipid formulations are associated with fewer adverse effects than the older drugs.
There is no difference in cost between the newer and older forms.
The lipid formulations may be given in oral form.
The doses are much lower than the doses of the older drugs.

Infusion of Amphotericin B

The nurse is preparing an infusion of amphotericin B for a patient who has a severe fungal infection. Which intervention is appropriate regarding the potential adverse effects of amphotericin B?

Discontinuing the infusion immediately if fever, chills, or nausea occur
Gradually increasing the infusion rate until the expected adverse effects occur
If fever, chills, or nausea occur during the infusion, administering medications to treat the symptoms
Before beginning the infusion, administering an antipyretic and an antiemetic drug

Week 7 Concepts: Anti-inflammatory

Steroidal Antiinflammatory Drugs

Prepare: Steroidal Anti-Inflammatory Drugs

Addison's Disease

Use the drop-down menus to select word(s) to complete the sentence.

Addison's disease is caused by the under-secretion of adrenocortical hormone, causing symptoms such as weight loss, for which steroidal anti-inflammatory drugs are used for treatment.

Corticosteroids
Use the drop-down menus to select the word(s) to complete the sentence.
Unlike other hormones, corticosteroids are synthesized as needed.

The Adrenal Cortex
The adrenal cortex (outer layer) secretes steroids which are responsible for which biological function?

- Increases urinary output
- Hypoglycemic actions
- Maintenance of body temperature
- Anti-inflammatory actions

Self Check: Adrenal Glands

Use the drop-down menus to select the correct word(s) to complete these sentences.
The adrenal gland is part of the endocrine system (pituitary and hypothalamus). Hormones secreted by the adrenal cortex are steroidal hormones called corticosteroids.
Cortisol is a type of corticosteroid called a glucocorticoid, mainly used for its anti-inflammatory effects.
Aldosterone is a type of corticosteroid called mineralocorticoid mainly used for its fluid-electrolyte balancing effects.

Self Check: Corticosteroid Imbalance

Use the drop-down menus to select the correct word(s) to complete these sentences.
Considering the actions of glucocorticoids, the hypersecretion secretion of cortisol will lead to a(n) increase in blood pressure and stress effects.
Considering the actions of mineralocorticoids, the hypersecretion of aldosterone will lead to a(n) increase in water & sodium retention along with a(n) decrease in potassium.

Self Check: Mechanism of Action

Use the drop-down menus to select the correct word(s) to complete these sentences.
Mineralocorticoids impact fluid and electrolyte balance indirectly by promoting sodium resorption from nephrons into the blood, pulling water and fluid with it. This causes fluid and water retention leading to edema, hypertension and increased excretion of potassium and hydrogen in the urine.
Glucocorticoids inhibit the inflammatory response indirectly by stabilizing inflammatory cell membranes, decreasing capillary permeability to the inflammatory cells, and decreasing white blood cell migration into the inflamed areas.

Self Check: Systemic Interactions

Use the drop-down menus to select the correct word(s) to complete these sentences.
Systemically administered corticosteroids can interact with many drugs. Based on your knowledge of a corticosteroids' mechanism of action, caution should used when a patient is also taking a non-potassium-sparing loop diuretic because both drug classes can result in an increase in the excretion of potassium and other electrolytes in the urine and can lead to severe hypo-kalemia.

Self Check: Adverse Effects

Adverse effects associated with corticosteroid administration are widespread and can occur in every body system.
The most commonly seen adverse effect in hospitalized patients is:

- Increase bleeding
- Hypotension
- Hyperglycemia
- Weight loss

Reflect: Steroidal Anti-Inflammatory Drugs

Corticosteroid Function

Based on your knowledge of corticosteroid function, determine if each of the following are or are not indications for use?

	Indication for Use	Not an Indication for Use
Adrenocortical deficiency	✓	
Type II diatbetes		✓
Gastrointestinal (GI) diseases (such as ulcerative colitis)	✓	
Parkinson's disease		✓
Decrease immune response following organ transplantation	✓	
Cerebral edema	✓	
High cholesterol		✓
Exacerbations of chronic respiratory illnesses (such as asthma)	✓	
Treatment of proteinuria	✓	
Chemotherapy-induced nausea and vomiting (CINV)	✓	

Systemic Administration

Systemically administered glucocorticoids have a wide range of indications. How do these medications differ from one another? Select all that apply.

Anatomical origin within the adrenal gland (cortex or medulla)
Potency
Degree of salt and water retention they cause
Duration of action (short-, intermediate-, and long-acting)

Corticosteroid Imbalance

Corticosteroid imbalance is treated with steroidal anti-inflammatory drugs. The most significant examples of corticosteroid imbalance are Cushing's Syndrome, Primary Aldosteronism, and Addison's Disease. Use the drop-down menus to select the correct word(s) to complete the statements below.

Mineralocorticoids impact fluid and electrolyte balance and the maintenance of normal blood pressure. A hyper-secretion of aldosterone, as in Primary Aldosteronism, results in hypertension, as well as water and sodium retention which leads to hypokalemia, which then leads to muscle weakness.

Glucocorticoids inhibit the inflammatory response and also impact the maintenance of normal blood pressure. A hyper-secretion cortisol, as in Cushing's Syndrome, results in hypertension, as well as hypernatremia and hypokalemia which can then lead to muscle atrophy.

Hypo- secretion of cortisol and aldosterone, as in Addison's Disease, results in hyponatremia, hyperkalemia and therefore dehydration and weight loss.

Adrenal Hormones

Adrenal hormones are necessary for various bodily functions. Based on your knowledge of the actions of cortisol (the major glucocorticoid) and aldosterone (the most important mineralocorticoid), match the corticosteroid to its associated bodily function. Some answers may apply to both columns (hint: cortisol and aldosterone both have functions that affect one of the bodily functions).

	Cortisol	Aldosterone
Bodily Functions	• Carbohydrate and protein metabolism • Stress effects • Fat metabolism • Anti-inflammatory actions	• Maintenance of serum potassium levels • Maintenance of serum sodium levels • Sodium and water resorption • Maintenance of serum pH levels

Synthetic Corticosteroid

Which medication is most commonly used oral systemic synthetic corticosteroid?

Dexamethasone
Hydrocortisone
Prednisone
Betamethasone

Adrenal Suppression

Which statements about adrenal suppression are correct? Select all that apply.

Can result when the adrenal glands stop producing endogenous hormone because of long-term corticosteroid supplementation
Can result in hypoadrenal crisis if long-term corticosteroid administration is slowly tapered
Can result when the adrenal glands produce too much endogenous steroid in addition to the steroid being administered
Possible complication of long-term corticosteroid treatment

Adverse Effects

Adverse Effects associated with corticosteroid administration are widespread and can occur in every body system. Based on your knowledge of the actions of corticosteroids, which of these are the most common adverse effects of corticosteroid drugs?

- Hyperglycemia or hypoglycemia
- Adrenal suppression or stimulation
- Fluid retention or diuresis
- Hypotension or hypertension
- Gastric ulcers or diarrhea
- Weight gain or weight loss
- Increased ocular pressure or decreased ocular pressure
- Loss of muscle mass or gain or muscle mass
- Convulsions or fatigue
- Hirsutism or hair loss
- Petechiae or rash

Corticosteroids

Corticosteroids should be used cautiously in the following situations. Use the drop-down menus to select the correct word(s) to complete these sentences.

Use corticosteroids cautiously in patients with diabetes mellitus as they may increase blood glucose levels.

Use of corticosteroids is often avoided in the presence of serious infection such as septicemia, systemic fungal infections, and varicella because these drugs have immunosuppressant properties.

Use corticosteroids cautiously when treating patients with gastritis, reflux disease, or ulcer disease because these drugs can potentially cause gastric perforation.

Use corticosteroids cautiously in patients with cardiac, renal, and/or liver dysfunction because these drugs can potentially cause fluid retention and alterations in elimination.

Use corticosteroids cautiously in combination with non-potassium-sparing diuretics because this may cause severe hypocalcemia and hypokalemia.

Use corticosteroids cautiously in combination with nonsteroidal anti-inflammatory drugs (NSAIDs, such as Aspirin) because both create an increased risk of gastric ulcers.

Glucocorticoid (prednisone)

Prepare: Glucocorticoid (Prednisone)

Glucocorticoids

Unlike other glucocorticoids, prednisone has minimal impacts on fluid-electrolyte balance.

About Prednisone

Prednisone is a(n) intermediate- acting systemic glucocorticoid with a half life of 18-36 hours.

Type of Corticosteroid

Prednisone is the most commonly prescribed oral corticosteroid.

Self Check: Characteristics of Prednisone

Half-Life

Like the other intermediate-acting glucocorticoids, the half-life of prednisone is_____giving it a longer duration of action than short-acting corticosteroids.

- 72 hours
- 18 – 36 hours
- 8 hours
- 2 – 5 hours

Prednisone Descriptions

Which terms describe prednisone? Select all that apply.

- Systemic glucocorticoid
- Systemic long-acting mineralocorticoid
- Synthetic glucocorticoid
- Natural mineralocorticoid
- Intermediate-acting glucocorticoid
- Short-acting glucocorticoid

Self Check: Prednisone vs. Prednisolone

Prednisone is a solid corticosteroid.

Prednisolone is the liquid form of prednisone, converted by the liver.

Self Check: Prednisone and Immunocompromised Patients

Why should prednisone be used cautiously with immunocompromised individuals?

- Prednisone is an immunosuppressant
- Prednisone may decrease blood glucose levels which inhibits healing
- Prednisone causes an inflammatory response
- Prednisone has significant effects on fluid/electrolyte balance

Self Check: Tapering the Dosage

Tapering the Dosage

Why is it important to taper the daily dosage of prednisone with long-term use? Select all that apply.

If stopped abruptly, endogenous corticosteroid production will quickly begin

hypersecreting This allows the HPA axis time to resume stimulation of endogenous hormone production If stopped abruptly, adrenal suppression can result

This allows the adrenal gland time to decrease the production of endogenous hormone

Reflect: Glucocorticoid (Prednisone)

Characteristics of Prednisone

Choose the correct word(s) to complete these sentences regarding prednisone.

Prednisone is a synthetic corticosteroid.

Prednisone is a glucocorticcoid, one type of corticosteroid.

Prednisone is only administered systemically.

Prednisone is only administered orally.

Prednisone is a(n) intermediate-acting medication, which refers to its duration of action.

Common Medication Names

What are some other names for prednisone?

fluoroquinolones, prednisone intensol, triamcinolone, and deltasone

prednisolone, fluoroquinolones, deltasone, and rayos

prednisolone, triamcinolone, methylprednisolone, and hydrocortisone

methylprednisolone, prednisolone, triamcinolone, and fluoroquinolones

Action of Glucocorticoids

Considering the action of glucocorticoids, choose the types of medications that should be used cautiously with prednisone and match them to the associated reason for this caution.

Using in combination with glucocorticoids can result in excessive anticoagulation	Blood thinners/anticoagulants
Prednisone, as with all corticosteroids, has immunosuppressant effects. This makes it easier to get an infection or for a current infection to worsen, so prednisone should be used cautiously in patients who are already immunosuppressed	Immunosuppressants
Increase the half-life of adrenal drugs	Oral contraceptives
Reduction in hypoglycemic effects, elevated blood glucose levelsthyroid hormones and antifungal drugs - can decrease renal clearance of the adrenal drug	Antidiabetic drugs
Additive GI effects and an increased chance for gastric ulcer development	NSAIDs and other ulcerogenic drugs

Pregnancy Category C

Prednisone, as with all corticosteroids, is classified as a pregnancy category C drug. What does this mean?

It can be secreted in breast milk and should be used cautiously

It is safe to use in pregnancy but is contraindicated with breastfeeding

It is safe to use in pregnancy and with breastfeeding and no precautions are necessary

It is contraindicated in pregnancy and with breastfeeding

Differences with Prednisone

How does prednisone differ from the other three intermediate-acting glucocorticoids?

Has a greater impact on fluid-electrolyte balance

Has minimal impact on fluid-electrolyte balance

Has minimal immunosuppressant effects

Has minimal anti-inflammatory effects

Adrenal Suppression

Which of the following patients is the MOST at risk for developing adrenal suppression and subsequent hypoadrenal crisis if this dose is stopped abruptly?

A patient taking prednisone 10 mg/day for the last 2 weeks

A patient taking prednisone 50 mg/day for the last 3 months

A patient taking prednisone 5 mg/day for the last 4 days

A patient taking prednisone 10 mg/day for the last 4 days

Indications of Use

Which statement is true regarding the indications of prednisone use?

Prednisone, unlike other corticosteroids, has only minimal mineralocorticoid effects (in addition to glucocorticoid effects) and therefore it is used in conjunction with a mineralocorticoid to treat chronic respiratory illnesses such as asthma

Prednisone, as with all corticosteroids, results in an increased immune system response and is therefore used primarily to treat chronic respiratory illnesses such as asthma

Prednisone, as with all corticosteroids, results in a decrease in inflammatory response and is therefore used primarily to treat chronic respiratory illnesses such as asthma

Prednisone, unlike other corticosteroids, has both glucocorticosteroids and mineralocorticoid effects and therefore it is used alone to treat chronic respiratory illnesses such as asthma

Long-Term Use

Which statements are true regarding long-term use of prednisone (corticosteroids)? Select all that apply.

The presence of corticosteroid drugs over a long period of time causes the body's own (endogenous) corticosteroid production to increase

Patients taking 10mg/day or more of prednisone long-term who undergo increased stress, such as surgery or trauma, will likely require replacement doses of steroids

At times of increased stress, such as surgery or trauma, a patient is at increased risk for developing hypoadrenal crisis if long-term prednisone use is stopped abruptly

Daily dosing of prednisone should be tapered in order to allow the HPA (hypothalamus, pituitary, adrenal) axis time to resume stimulation of endogenous hormone production

After as little as 3 months of use, abrupt discontinuation of prednisone can result in adrenal suppression

Nursing Application: Steroidal Antiinflammatory Drugs

Prepare: Nursing Application - Steroidal Anti-Inflammatory Drugs

Glucocorticoid Medications

Use the drop-down menus to select the correct word(s) to complete the statement.

You are the nurse caring for a patient taking a glucocorticoid medication and you know that to minimize the risk of adrenal insufficiency, it is best to administer this medication early in the morning during peak hormone production time.

Production of Exogenous Hormones

Use the drop-down menus to select the correct word(s) to complete the statement.

When exogenous glucocorticoids are administered, the body stops producing exogenous hormone. Therefore, if the exogenous hormone is stopped abruptly, adrenal suppression will result.

Cortisol Levels

The nurse knows that which of the following cause cortisol levels to increase as part of a negative feedback system. Select all that apply.

Physiologic stress

Trauma
Surgery
Emotional stress

Self Check: Take as Prescribed

As the nurse, you instruct your patient to take the prescribed glucocorticoid as directed and not to stop taking it abruptly. You explain to the patient that this is because of which of the following? Select all that apply.

This can result in life-threatening adrenal suppression and/or crisis
Their body needs time to begin producing its own glucocorticoid
The glucocorticoid medication is causing their body not to produce its own glucocorticoid
This may result in GI upset

Self Check: Side Effects

You are caring for a patient who was recently prescribed a glucocorticoid medication. As you complete your nursing assessment, identify which of the following serum levels are possible side effects of glucocorticoids. Select all that apply.

Potassium
Uric acid
Creatinine
WBC
Sodium
T4
Calcium

Self Check: Patient Advice

Use the drop-down menu to select the correct word(s) to complete the statement.

As the nurse caring for a patient who has just been administered a glucocorticoid inhaler, you advise your patient to rinse out their mouth.

Self Check: Nursing Diagnoses

Use the drop-down to select the correct word(s) to complete the statement.

You are the nurse caring for a patient on long-term glucocorticoid therapy. During your nursing assessment, you note that the patient is exhibiting a side effect known as a “moon face” appearance. One of your nursing diagnoses is disturbed body image and your desired outcome as a result would be the patient verbalizes improved body image.

Self Check: Patient Teaching

Which of the following should a nurse caring for a patient on adrenal drug therapy include in patient teaching?

Take the medication before bed and double to dose if you forget to take it
Follow the prescriber’s administration instructions strictly
It is acceptable to be around family members who are sick provided you do not have a fever
Adjust the timing of administration based on your symptoms

Reflect: Nursing Application - Steroidal Anti-Inflammatory Drugs

Side Effects of Glucocorticoids

You are caring for a patient who was recently prescribed a glucocorticoid medication. As you complete your nursing assessment, identify which of the following serum levels are possible side effects of glucocorticoids and match them with the proper laboratory result.

Glucose	Hyperglycemia (especially with diabetic patients)
Calcium	Hypocalcernia
Sodium	Hypernatremia

Potassium	Hypokalemia
LDL	Hyperlipidemia

Teaching Plans

The nurse is preparing to discharge a patient prescribed prednisone for treatment of asthma. Which of the following statements should be included in the teaching plan?

- Will have its therapeutic effect within 2 hours of administration
- Prednisone is the same as prednisolone
- Patient will be taking prednisone along with a mineralocorticoid (such as methylprednisolone)
- Patient will be administering their prednisone at home by injection

Potential Drug Interactions

You are caring for a patient who has been prescribed prednisone for treatment of his adrenal insufficiency. He has also been prescribed a non-potassium sparing diuretic for edema. Based on your knowledge of prednisone, you monitor him for which of these potential drug interactions?

- Hyperthyroidism
- GI bleeding
- Severe hypercalcemia and hyperkalemia
- Severe hypocalcemia and hypokalemia
- Weight gain

Prednisone Administration

As part of your patient education regarding prednisone administration upon discharge, you explain to the patient the symptoms of adrenal insufficiency (Addison's disease) which result from abruptly discontinuing their long-term adrenal medication. These include which of the following? Select all that apply.

- Hypertension
- Dyspnea
- Nausea
- Hypoglycemia
- Weakness
- Fatigue
- Hyperglycemia
- Irritability
- Anorexia

Prednisone and Patient Education

You are the nurse caring for a patient who has been prescribed prednisone and is ready to be discharged. You are educating the patient regarding administration guidelines which are crucial to safe therapy. You explain to the patient that in order to minimize the risk of adrenal insufficiency, it is best to follow which instructions? Select all of the true statements.

- Avoid taking aspirin while on prednisone to minimize GI upset
- Take prednisone with food to minimize GI upset
- Do not ever take a double dose of prednisone
- Do not ever stop taking prednisone without the prescriber's guidance and treatment
- Take your daily dose of prednisone before doing to bed which is during peak hormone production time
- Take a double dose of prednisone as soon as you realize you have forgotten your daily dose
- Take your daily dose of prednisone between 0600-0900 which is during peak hormone production time
- Avoid contact with people who have known or suspected infections (such as a fever)

Increased Risk with Prednisone

You are caring for an elderly patient who has been on long-term prednisone therapy. You know that this may result in an increased risk for which condition?

- Oral fungal infection

Hyperthyroidism
Diverticulitis
Adrenal suppression

Prednisone Effects
You are caring for a patient taking prednisone. You have never administered this medication before and therefore you research prednisone to help you recall what time of medication it is in order to understand the effects it will have on your patient's various body systems. You recall that prednisone is/has:

A corticosteroid, similar to the type of hormone also produced by the adrenal cortex (outer layer of the adrenal gland)
A mineralocorticoid (a glucocorticoid with mainly fluid & electrolyte balance effects)
Is administered orally
Administered topically, orally, and inhaled
Has minimal fluid & electrolyte balance effects (mineralocorticoid activity)
A glucocorticoid (a type of corticosteroid) with mainly anti-inflammatory and immunosuppressant effects
Like all systemic glucocorticoids, it is administered both orally and parenterally
Has systemic effects
A pituitary hormone

Effects of Prednisone
The nurse caring for a patient taking prednisone knows that it can exacerbate, worsen or precipitate which conditions? Select all that apply.

Infection
Peptic ulcer disease
Fibromyalgia
Glaucoma
Asthma
Cardiac disease

Nonsteroidal Antiinflammatory Drugs (NSAIDS)

Prepare: Nonsteroidal Antiinflammatory Drugs (NSAIDs)

Antiplatelet Properties
Aspirin may also be used for it's antiplatelet properties.

NSAIDs
Nonsteroidal Antiinflammatory Drugs (NSAIDs) are one of the most commonly prescribed drugs on the market.

NSAID Properties
Nonsteroidal Antiinflammatory Drugs (NSAIDs) have all three of the following properties - antipyretic, analgesic and antiflammatory properties.

Self Check: NSAID Primary Indications

NSAIDs primary indications for use are as an analgesic, anti-inflammatory and antipyretic. Aspirin may also be used for platelet inhibition, but this is only true of aspirin and not other NSAIDs. NSAIDs are also used for headaches, myalgia, neuralgia, arthralgia, rheumatoid arthritis, juvenile arthritis, osteoarthritis, ankylosing spondylitis, gout, hyperuricemia and postoperative pain.

Self Check: Analgesic and Anti-Inflammatory Effects

NSAIDs analgesic and anti-inflammatory effects are caused by inhibition of the leukotriene pathway of prostaglandin synthesis. The antipyretic action is caused by vasodilation and inhibition of prostaglandin synthesis as well.

Self Check: Pharmacological Action

What is the pharmacological action of aspirin related to its antiplatelet action?

Inhibition of COX-2 receptors
Inhibition of COX-1 receptors
Promotion of COX-1 receptors
Promotion of COX-2 receptors

Self Check: COX-2 Inhibitors

Celecoxib is the only COX-2 inhibitor under the NSAID class of medications.

Self Check: Prolonged Bleeding Times

NSAIDs should be avoided with which of the following medications due to prolonged bleeding times?

Antiplatelet agents
Antihypertensives
Warfarin
Antihistamines
Diuretics

Reflect: Nonsteroidal Antiinflammatory Drugs (NSAIDs)

NSAID Properties

What are the three properties that all nonsteroidal anti-inflammatory drugs share? Select all that apply.

Anticoagulant
Analgesic
Antipyretic
Antiflammatory

Low-Dose Aspirin

Low-dose aspirin is indicated to be used for which of the following?

Pain management
Thromboprevention
Anti-inflammatory
Fever reduction

Medication Interactions

Match the correct interaction reaction with the medication. Some reactions may be used in more than one column.

	Prolonged Bleeding Time	Prolonged Use with Aspirin	Diuretics and Antihypertensives
Medications	• Warfarin • Cephalosporinn • Thrombolytic agents • Valproates • Antiplatelet agents	• Decreased medication effectiveness • Increased GI side effects	• Decreased medication effectiveness

Contraindicated Sensitivity

Which of the following is a contraindicated sensitivity for all NSAID use?

Aspirin
Antihypertensives
Antidiarrheals
Antihistamines

NSAID Conditions and Symptoms

Which of the following conditions/symptoms are NSAIDs contraindicated or to be used with caution? Select all that apply.

Constipation

Rheumatoid arthritis
Migraines
Second half of pregnancy
GI bleeding
Aspirin sensitivity

Antiplatelet Properties
Which NSAID may be used for its antiplatelet properties to protect against cardiovascular events?
Ibuprofen
Aspirin
Naproxen
Celecoxib

Adverse Effects of NSAIDs
Many adverse effects of NSAIDs are secondary to inactivation of protective prostaglandins that maintain the normal integrity of the stomach lining.

NSAID Indications
Select all of the indications for use of NSAIDs from the list below.
anti-inflammatory and antipyretic
ankylosing spondylitis
myalgia
osteoarthritis
arthralgia
ulcers
juvenile arthritis
nausea
headaches
vomiting
postoperative pain
Analgesic
gout
diarrhea
rheumatoid arthritis
neuralgia
hyperuricemia

Salicylates (aspirin)

Prepare: Salicylates (Aspirin)

Salicylates Usage
Salicylates (aspirin) are used as which of the following? Select all that apply.
Anti-inflammatory
Anti-nausea
Analgesic
Antipyretic
Antipsychotic

Salicylates Class
To which class of medications do salicylates belong?
Antiemetic
Nonsteroidal antiinflamatory (NSAIDs)
Laxative
Corticosteroid

Preventing Myocardial Infarctions
Aspirin is commonly used to prevent myocardial infarctions and transient ischemic attacks.

Self Check: Mechanisms of Action

Preventative Uses of Aspirin
Aspirin is commonly used to prevent which of the following conditions? Select all that apply.

- Irritable Bowel Syndrome (IBS)
- GI bleeding
- Myocardial Infarction (MI)
- Transient Ischemic Attacks (TIA)

Aspirin
Aspirin is a(n) irreversible inhibitor of COX-1 receptors within the platelets themselves. It causes a(n) reduction in the formation of thromboxane A2, a substance that normally promotes platelet aggregation.

Self Check: Salicylates

Routes of Administration
Routes of administration for salicylates (aspirin) include which of the following? Select all that apply.

- Oral
- Subcutaneous
- Intramuscular
- Rectal

Contraindications of Aspirin
Which of the following is a contraindication for use of aspirin?

- Bleeding disorders
- Arthritic conditions
- Headache
- Fever

Self Check: Reye's Syndrome

Reye's syndrome is a(n) acute and potentially life-threatening condition that can cause progressive and possibly permanent neurologic damage.

Reflect: Salicylates (Aspirin)

Contraindication for Aspirin
Which of the following is a contraindication for aspirin due to the risk of Reye's syndrome?

- 8 year old with influenza
- 15 year old with a history of anorexia
- 40 year old with high cholesterol
- 80 year old with frequent GI bleed episodes

Adverse Effects of Salicylates
Which of the following are adverse effects of salicylates (aspirin)? Select all that apply.

- Tinnitus
- CNS depression
- GI bleeding
- Diarrhea

Aspirin and Myocardial Infarction
When administering aspirin for myocardial infarction (MI), which of the following are true? Select all that apply.

Aspirin is shown to always prevent cardiac death following MI

Administer aspirin one hour and each hour following an MI
Administer aspirin at the first sign of MI
Aspirin is shown to reduce cardiac death following MI

Aspirin Half-Life
Please complete the chart with the correct half-life for low-dose and high-dose aspirin:

	Half-Life
Low-dose	2-3 hours
High-dose	15-30 hours

Salicylate Toxicity
A patient is admitted with salicylate toxicity. Upon assessment, which manifestation is associated with salicylate toxicity?

Constipation
Hypoventilation
Bradycardia
Hyperglycemia

Aspirin Absorption and Distribution
Aspirin is absorbed from the upper small intestine. It is distributed quickly and does cross the placenta in pregnant women. Aspirin is metabolized by the liver and excreted by the kidneys.

Actions of Salicylates
Which of the following are actions of salicylates (aspirin)? Select all that apply.

Inhibits prostaglandin production
Promoter of prostaglandin production
Irreversible inhibitor of COX-1 receptors within platelets
Reduces of thromboxane A2 formation
Increases thromboxane A2 formation

Aspirin PO Route
Please complete the chart with the onset, peak and duration for Aspirin via PO route:

Route	Onset	Peak	Duration
PO	5-30 minutes	1-3 hours	3-6 hours

Propionic acid derivatives (ibuprofen)

Prepare:
Ibuprofen

The therapeutic effect of ibuprofen include analgesia, anti-inflammatory, and antipyretic.

Ibuprofen Indications
Choose whether the following items are either an indiciation for use or a contradindication for Ibuprofen.

	Indications	Contraindications
Ibuprofen	• Analgesic effects • Rheumatoid arthritis • Dysmenorrhea • Osteoarthritis • Pain related to dental issues • Gout	• Coronary artery bypass graft surgery • Congenital heart disease • Active GI bleed or ulcer • Phenylketonuria • Severe heart failure • Recent MI

	• Musculoskeletal disorders • Antipyretic action	

Propionic Acid Derivatives

To which class of medications do propionic acid derivatives belong?

- Nonsteroidal anti-inflammatory (NSAIDS)
- Antiemetic
- Corticosteroid
- Laxative

Self Check: Prostaglandin Synthesis, Effects, and Routes of Administration

Ibuprofen Therapeutic Effect

The therapeutic effect of Ibuprofen includes which of the following? Select all that apply.

- Antacid
- Antipyretic
- Analgesia
- Anti-inflammatory
- Antidiarrheal

Routes of Administration for Ibuprofen

What are the available routes of administration for ibuprofen? Select all that apply.

- Subcutaneous
- Oral
- Intravenous
- Rectal

Prostaglandin Synthesis

Ibuprofen works by inhibiting prostaglandin synthesis thereby reducing pain, inflammation and fever.

Self Check: Ibuprofen and Aspirin

Taking Ibuprofen with aspirin, oral potassium, other NSAIDs, corticosteroids or alcohol will increase GI effects.

Self Check: Ibuprofen Absorption

Absorption of ibuprofen is 80% and is absorbed in the GI tract. IV administration of ibuprofen allows for 100% absorption. Ibuprofen is mainly absorbed by the liver and excreted by the kidneys.

Reflect: Ibuprofen

Half-Life for Ibuprofen

Please complete the chart with the correct half-life for Ibuprofen in neonates, children and adults.

	Half-Life
Neonates	26 - 43 hours
Children	1 - 2 hours
Adults	2 - 4 hours

Alcohol and Ibuprofen

A patient taking Ibuprofen for Osteoarthritis mentions that he has several alcoholic drinks per day. What is this patient at risk for?

- Increase risk of CNS depression
- Increase risk of nephrotoxic effects
- Increase risk of GI bleed

Decrease of anti-inflammatory effect of the ibuprofen

Ibuprofen Action

What is the main action of Ibuprofen?

Increasing prostaglandin synthesis
Decreasing heart rate
Inhibiting prostaglandin synthesis
Inhibiting protein synthesis

Ibuprofen Routes

Please complete the chart with the onset, peak and duration for Ibuprofen PO and IV routes:

Route	Onset	Peak	Duration
PO	0.5 - 2.5 hours	1 - 4 hours	4 - 8 hours
IV	0 - 2 hours	10 - 12 hours	4 - 6 hours

Ibuprofen Doses

A 90 year old patient is taking high doses of Ibuprofen daily to help with symptoms of Rheumatoid arthritis. The patient does not have any other health issues or conditions. What should be monitored for this patient?

Blood sugar levels
Respiratory system
Renal function studies
Liver function studies

Drug-to-Drug Interactions

Drug to drug interactions of ibuprofen may decrease the effects of which of the following medications? Select all that apply.

Serum lithium levels
Hypoglycemic medication
ACE inhibitors
Antihypertensives
Diuretics
Hematologic reactions
Anti-platelet effect of low-dose aspirin

Adverse Effects of Ibuprofen

Which of the following are adverse effects of ibuprofen? Select all that apply.

GI bleeding
MI
CNS depression
Diarrhea
Stroke

Ibuprofen Contraindications

Ibuprofen is contraindicated along with which of the following conditions? Select all that apply.

Ulcer
Rheumatoid arthritis
Active GI bleed
30 weeks gestation and after (pregnancy)
Osteoarthritis
Recent MI
Dysmenorrhea

Nursing Application: Nonsteroidal Antiinflammatory Drugs

Prepare: Nursing Application - Nonsteroidal Anti-inflammatory Drugs (NSAIDs)

Therapeutic Uses of Ibuprofen

A patient is prescribed ibuprofen, a nonsteroidal anti-inflammatory drug (NSAID). Which of the following are the therapeutic actions of NSAIDs, including ibuprofen? Select all that apply.

- Antidiarrheal
- Antipyretic
- Anti-inflammatory
- Antihistamine
- Analgesic

Platelet Inhibition

A patient is prescribed an NSAID to help prevent heart attack and stoke. Which of the following prescriptions would the nurse anticipate?

- Aspirin
- Ketorolac
- Naproxen
- Ibuprofen

Drug-to-Drug Interaction

A patient is prescribed Naproxen to be taken three times per day for Rheumatoid Arthritis. The nurse is concerned about a prolonged bleeding time drug-to-drug interaction with which other medication the patient is already taking?

- Diphenhydramine
- Acetaminophen
- Probiotic
- Warfarin

Self Check: Assessment

Patient History

A patient is prescribed Celecoxib. Which of the following from the patient's history should raise a concern to the nurse? Click to select the correct answer(s) from the sentences below.

Melissa is a 78 year old female admitted with pneumonia. She has a history of COPD and has been a smoker for 25 years. She has allergies to sulfa, codeine and pollen.

- Sulfa

NSAID Therapy Assessment

Before starting NSAID therapy the nurse must assess several things. Match the correct assessment item with the rationale.

All NSAIDs will then be contraindicated	Assess for an allergy to aspirinZ
Celecoxib (Celebrex) should be avoided in these patients	Assess for a sulfa allergy
Increased risk for hypersensitivity reactions	Assess for asthma
Contraindicated with NSAID therapy due to risk of increased bleeding	Assess for GI lesions, peptic ulcer disease and bleeding disorders

Self Check: Interventions

Patient Discharge

Drag and drop the appropriate patient discharge teaching related to NSAIDs.

	Correct	Incorrect
Discharge Teaching	Take after or with food to help alleviate GI irritation Take NSAIDs with a full glass of water and remain upright	GI pain may occur, but that is normal

for 30 minutes after administration Therapeutic effects may take 3-4 weeks Do not crush or chew enteric-coated tablets Notify your prescriber if severe bleeding or GI pain occur Monitor for bleeding in stool or any other unusual bleeding	Take on an empty stomach

NSAID Activation Time

The patient asks the nurse how long it will take for the prescribed NSAID to work for her systemic inflammation from rheumatoid arthritis. What should be the nurse's response?

4 - 6 months
3 - 4 weeks
Immediately
6 - 8 weeks

Self Check: Evaluation

Assessment of Medication

A patient received a prescription for an NSAID for relief of a pain level of 7/10 associated with osteoarthritis. How will the nurse assess if the medication is working? Select all that apply.

Reported epigastric pain
Decreased joint tenderness
No fever
Reported pain level of 7/10
Reported pain level of 4/10

Reflect: Nursing Application - Nonsteroidal Anti-inflammatory Drugs (NSAIDs)

Patient History

A patient is prescribed low-dose aspirin to prevent heart attacks and strokes. The nurse checks the patient for a history of which conditions to ensure there is not an increased risk for bleeding? Select all that apply.

Fungal infection
Frequent constipation
Use of antihypertensives
Vitamin K deficiency
Ulcer

Side Effects of NSAIDs

The nurse is providing patient teaching for the side effects of NSAIDs. Which of the following should be included? Select all that apply.

CNS depression
Increased risk of MI and stroke
Shock
Hepatotoxicity
Severe GI bleeding

Ibuprofen Uses

Which of the following patients have an indication of use for ibuprofen? Select all that apply.

9 year old patient with juvenile arthritis
25 year old patient with a headache
3 year old with a fever
72 year old patient with osteoarthritis
40 year old with a peptic ulcer
26 year old patient in her 3rd trimester with frequent hormone headaches

Ketorolac

A 39-year old patient presents to the walk-in clinic for lower back pain, rating it 7 out of 10 on the pain scale. The patient is 82 kg, has a history of headaches, chronic bronchitis and is allergic to aspirin. The physician prescribes ketorolac 60mg IM as a single dose. Select the item(s) that would be a safety concern to the nurse regarding this prescription?

- Allergic to aspirin

Toradol

A patient is prescribed ketorolac (Toradol) for 5 days for lower back pain. What is the rationale for the prescribed length of time?

Lower back pain only lasts for 5 days
Addiction is an adverse effect of Ketorolac
Ketorolac may only be prescribed for 5 days due to renal and GI adverse effects
Ketorolac can cause severe respiratory depression

Ibuprofen and Alcohol

A patient is taking ibuprofen 800 mg three times a day by mouth for rheumatoid arthritis. The patient mentions that on weekends he tends to have 3 or 4 beers. What is of highest concern to the nurse at this time?

Alcohol may decrease the anti-inflammatory effects of the ibuprofen
Risk of alcoholism in the patient
Increased chance for GI bleed from Ibuprofen and alcohol interactions
Increased risk of nephrotoxic effects form Ibuprofen and alcohol interactions

NSAID Contraindications

In which of the following patients are NSAIDs contraindicated? Select all that apply.

Patient pregnant in her 3rd trimester
Patient with rheumatoid arthritis
Patient with active GI bleed
Patient with acute kidney failure
Patient with a fever

NSAID Medications

Please match the medication with the correct fact.

The most commonly used NSAID.	Ibuprofen
The second most commonly used NSAID.	Naproxen
The only NSAID medication with antiplatelet action.	Aspirin
The only COX-2 inhibitor under the NSAID class of medications.	Celecoxib

Antigout Drugs

Prepare: Antigout Drugs

Treatment of Gout

Which of the following drug class is the first line of drugs used to treat gout?

Colchicine
Allopurinol
Probenecid
Febuxostat
NSAIDs

Metabolism Process

Uric acid is produced as part of the metabolism process of purines.

Excessive Uric Acid

Too much uric acid in the blood is known as hyperuricemia.

Self Check: NSAIDs as the Primary Medication

While NSAIDs are the primary medications used for gout, they do not impact the defect itself.

Self Check: Maximum Dose of Allopurinol

What is the maximum daily dose of allopurinol?

- 200 mg
- 400 mg
- 800 mg
- 600 mg

Self Check: Allopurinol Versus Febuxostat

Why is allopurinol considered safer than febuxostat?

- Allopurinol has more route options.
- There is no max dose.
- Allopurinol is more selective for xanthine oxidase.
- Allopurinol has a lower risk for serious cardiovascular effects.

Self Check: Colchicine

Colchicine is thought to inhibit the metabolism, mobility, and chemotaxis of polymorphonuclear leukocytes.

Reflect: Antigout Drugs

Dosages

Drag and drop to match the drug to its correct dosage.

It is dosed as 40 to 80 mg/day, with a maximum dose of 120 mg/day.	Febuxostat
Recommended adult dosage is 200 to 600 mg/day, and the maximum dosage is 800 mg/ day.	Allopurinol
The usual adult dosage is 250 mg twice a day with food, milk, or antacids for 1 week, followed by 500 mg twice daily thereafter.	Probenecid
For acute gout, colchicine is given in an initial dose of 0.6 to 1.2 mg, followed by 0.6 mg/hr until pain is relieved, the patient develops severe nausea and diarrhea, or a total of 3-6 mg has been administered depending on the maximum dose chosen by the prescriber.	Colchicine

Contraindications

What happens with uric acid to result in gout? Select all that apply.

- Too much uric acid is produced
- A combination of two of these
- Not enough uric acid is produced
- Not enough uric acid is secreted

Indications

Drag and drop to match the drug to its indication.

Treatment and prophylaxis of acute attacks.	Colchicine
Overproduction of uric acid (hyperuricemia).	Allopurinol
Patients who do not excrete uric acid effectively.	Probenecid

Mechanism of Action

Drag and drop to match the drug to the mechanism of action.

Inhibits the reabsorption of uric acid in the kidney and thus increases the excretion of uric acid.	Probenecid
Inhibits the enzyme xanthine oxidase which prevents uric acid production but is more selective for xanthine oxidase than allopurinol.	Febuxostat
Inhibits the enzyme xanthine oxidase which prevents uric acid production.	Allopurinol
Not clearly defined, but it is thought to inhibit the metabolism, mobility, and chemotaxis of polymorphonuclear leukocytes.	Colchicine

High and Low Purine Levels

Drag and drop to sort the foods into high purine and low purine categories.

	High Purine Levels	Low Purine Levels
Foods	• Bacon • All alcoholic beverages • Organ meats • Turkey • Shellfish	• Oils • Fresh fruit • Low-fat dairy • Grains • Fresh vegetables

Contraindications

Drag and drop to match the contraindication to the correct drug.

	Allopurinol	Colchicine	Febuxostat	Probenecid
Contraindication	Only in those with a known hypersensitivity to the drug.	Known hypersensitivity to it and in those with severe renal, gastrointestinal, hepatic, or cardiac disorders, and blood dyscrasias.	Only in those with a known hypersensitivity to the drug.	Peptic ulcer disease and blood dyscrasias. Not to be used in patients with renal impairment.

Adverse Effects

What are the goals of gout treatment? Select all that apply.

Increase purine levels in the blood
Prevent recurrent attacks
Eliminate uric acid from the body
Decrease the symptoms of an acute attack

Mechanism of Action and Drug Effects

What is involved in the pathophysiology of gout?

A reduction of uric acid, which allows calcium to precipitate
The formation of tophi in the kidneys, which impairs excretion of uric acid
Inflammation resulting from intraarticular deposition of urate crystals
A thinning articular cartilage, leading to splitting and fragmentation

Nursing Application: Antigout Drugs

Prepare: Nursing Application - Antigout Drugs

Lab Values

What lab values are needed before beginning gout treatment? Select all that apply.

Hepatic
Renal
Pancreatic
Hematologic

Oral Dosages

If aspirin is used as an antigout drug, the oral dosage forms are given with food, milk, or meals.

Gout Therapy

What information is included in a complete medication history needed prior to beginning gout therapy? Select all that apply.

- Over-the-counter drugs
- Food allergies
- Supplements
- Prescription drugs
- Drug allergies
- Herbal medications

Self Check: OLD CARTS

Match the letter to the word for the OLD CARTS pain assessment.

Characteristics	C
Location	L
Severity	S
Onset	O
Relieving Factors	R
Duration	D
Timing	T
Aggravating or Alleviating Factors	A

Self Check: Pain Assessment & Nursing Diagnoses

Pain Assessment

One method to a thorough and consistent pain assessment is the use of what mnemonic?

- NEW WIVES
- NEW CARTS
- OLD WIVES
- OLD CARTS

Nursing Diagnoses

Match the nursing diagnosis to the corresponding related to statement.

Drug therapy for treatment of a disease process.	Deficient Knowledge (actual or risk for)
The effects of the disease and its treatment on mobility and performance of ADL.	Risk of Injury
The disease process or injury to joints and other disease-affected areas.	Acute Pain

Self Check: Colchicine

Colchicine is best taken without food to aid absorption, but is best tolerated with food.

Self Check: NSAIDs and Gout

NSAIDS used to treat gout can effect multiple systems within the body. Which of the following systems can it effect? Select all that apply.

- Hematologic
- Neurological
- Gastrointestinal

Renal
Cardiovascular

Reflect: Nursing Application - Antigout Drugs

Medical Conditions

Medical conditions that increase an individual's risk for developing gout include which of the following? Select all that apply.

Insulin resistance
Congestive heart failure
Neurological disorders
Metabolic syndrome
Hypotension
Diabetes

Where Gout Starts

The nurse is performing a head-to-toe assessment on a patient with a history of gout. Which of the following sites does gout most often start?

Elbow
Knees
Thumb or index finger
Big toe

Allopurinol for Gout

A patient has been prescribed allopurinol (Zyloprim). Which statement made by the patient requires follow-up from the health care provider?

"This medication will help relieve the inflammation and pain during an acute attack."
"I will not take large doses of vitamin C supplements while taking this medication."
"Allopurinol decreases the production of uric acid."
"It is important I have regular eye exams while taking this medication."

Highest Risk

Which of the following patients is at highest risk for developing gout?

A 56 year old male who reports consuming foods low in purines
A 27 year old female with ulcerative colitis
A 39 year old female hospitalized with bulimia that has a BMI of 24
A 45 year old male with a BMI of 40 who reports taking hydrochlorothiazide and aspirin

Risk for Gout

Which of the following are risk factors for developing gout? Select all that apply.

Obesity
Female gender
Eating foods high in fructose
Male gender
Eating foods high in purines
Drinking alcohol
Eating foods high in salt

Antigout Medication

Clients taking antigout medications should be instructed to do which of the following?

Increase their intake of turkey and organ meats
Drink alcoholic beverages to increase absorption of the medication
Continue to take the medication even if diarrhea occurs
Increase their fluid intake to at least 2000mL per day

Outcome Statements

Identify the correct outcome statements for gout treatment. Select all that apply.

- The patient should also remain free from injury.
- The patient should be able to verbalize or demonstrate knowledge of the disease process, needed lifestyle changed and required drug therapy.
- The patient should remain at or near pain free during periods of inflammation with disease process.
- The patient should know what adverse effects and symptoms to report.

Identifying Foods

During a home health care visit, the nurse is helping Mr. Smith identify foods that can aggravate his gout. The nurse provides patient teaching on which of following foods that should be avoided?

- Sardines
- Crackers
- Bananas
- Sweetbreads
- Whole wheat bread
- Craft beer