Pharmacology Exam #2

[Unit 7: Pain and Inflammation Management Drugs]

- **Nonsteroidal Antiinflammatory Drugs (NSAIDS):**
  - **Aspirin (ASA)- (Salicylates)**
    - used to reduce pain and inflammation symptoms, decreased fever, and inhibit platelet aggregation; for osteoarthritis and rheumatoid arthritis
    - **Side Effects:**
      - Dizziness
      - Drowsiness
      - loss of appetite (anorexia)
      - nausea and vomiting
      - diarrhea
      - heartburn
      - abdominal pain
      - rash
    - **Adverse Reactions:**
      - Tinnitus
      - hearing loss
      - G.I. ulceration and bleeding
    - **Life Threatening:**
      - hemolytic anemia
      - bronchospasm
      - anaphylaxis
      - hepatotoxicity
    - **Drug Interaction:**
      - increased risk of bleeding with anticoagulants and other NSAIDs
      - increased risk of hypoglycemia with oral hypoglycemic drugs
      - effects are decreased by corticosteroids
      - increased ulcerogenecid effect with glucocorticoids
    - **Contraindications:**
      - hypersensitivity to salicylates or NSAIDs
      - flu or virus symptoms in children
      - G.I. bleeding
      - Caution: renal or hepatic disorders, **gout**, alcoholism, anticoagulant therapy, G.I. bleeding, bone marrow suppression, head trauma, immunosuppression, pregnancy.
      - Anemia
      - Measles
      - Chicken Pox
      - **Reye Syndrome**
      - Decreased prothrombin levels (clotting factor)
    - **Salicylate Poisoning:**
      - tinnitus (ringing in ears)
      - elevated temperature
      - nausea and vomiting
      - dehydration/disorientation
      - hyperventilation
      - severe toxicity –
        - metabolic acidosis

        - seizures
    - severe toxicity occurs with 300 to 500 mg/kg acute ingestion of aspirin
    -

- **Steroids:**
    - reverse inflammation systemic in a profound way
    - They suppress the anti-inflammatory response of the body (Increased risk of infection)
    - NSAIDs reverse inflammation (and related pain) in a more limited way (not steroid)
    - steroids may treat <u>diarrhea caused by ulcerative colitis</u>
    - Take in the morning (AM) with food
    - **What is the role for steroids in the treatment of anaphylaxis?**
        - Dilate airways to assist with breathing and also decrease inflammation
    - **Side Effects and Adverse Reactions-**
        - <u>Increased risk of Infection</u>
        - <u>Hyperglycemia (high blood sugar)</u>
        - <u>Hypertension (High BP)</u>
        - Hypokalemia
        - <u>sodium retention</u>
        - <u>Puffy face (moon face)</u>
        - <u>edema (slow weight gain not rapid-often fluid retention)</u>
        - <u>Increased bleeding risk</u>
        - gastric erosion
        - <u>poor wound healing</u>
        - **<u>Addison's disease:</u>**
            - Occurs when the adrenal glands do not produce enough cortisol and often insufficient levels of aldosterone. It can because by prolonged use of steroids
            - another common cause of secondary adrenal insufficiency occurs when people who take corticosteroids for treatment of chronic conditions, such as asthma or arthritis, abruptly stopped taking their corticosteroids
    - **Drug Interactions-**
        - Avoid caffeine
        - <u>Do not take with NSAIDS</u>
            - Increased risk of bleeding and gastric ulcers
    - **Nursing Priorities-**
        - Take with food
        - Take in morning (insomnia)
        - What does a fever indicate?
            - Infection (due to immunodepression)
            - Very sick take seriously
        - Gradually discontinue dose

- **Corticosteroids:**
    - **Use-** treatment of adrenocortical deficiency, other endocrine disorders, allergic states, collagen diseases, dermatological diseases, G.I. disorders, hematological disorders, respiratory disease, rheumatoid disorders.
    - **Side Effects and Adverse Reactions-**
        - Seizures
        - edema due to sodium retention
        - hypertension
        - poor wound healing
        - moon face
        - hyperglycemia

        - G.I. perforation
        - pancreatitis
    - **Contraindications-**
        - live viral vaccines
        - immunosuppressive drugs
        - use can exacerbate fungal infections
        - PO use can induce peptic ulcers and should be given with meals/antacids
        - long-term use can result in osteoporosis, related fractures, tendon ruptures
        - use can increase blood pressure, water retention, potassium excretion
    - **Drug Interactions-**
        - use with aspirin, NSAIDs produces additive effects
        - antidiabetic drugs may require increase in dosage
        - use with toxoid/vaccines decreased their antibody formation
    - **Prednisone/Hydrocortisone (Short-acting corticosteroids)**
        - **Use:** used in a variety of chronic illnesses, including inflammatory, allergic, hematologic, neoplastic, and autoimmune diseases
        - **Side Effects and Adverse Reactions:**
            - Hypertension
            - hyperglycemia
            - fluid retention (long-term high dosages)
            - hypokalemia
            - peptic ulceration
            - anorexia
            - Cushingoid appearance (moon face, buffalo hump)
            - increased susceptibility for infection
            - weight gain (often fluid retention)
        - **Contraindications:**
            - active untreated infections
            - administration of live virus vaccines
            - May mask signs of potential infection
        - **Nursing Priorities:**
            - administer PO with food
            - avoid administration at bedtime (insomnia)
            - avoid exposure to infection
            - Sudden withdrawal can be deadly do not take with aspirin or other NSAIDs

[Unit 8: Antimicrobial Drugs]

Antibiotics (Fights Infection)-

- **Antibacterals/Antibiotics:**
    - **Antibacterial/Antimicrobial-** Substances that inhibit bacterial growth or kill bacteria and other microorganisms.
    - **Antibiotic-**

        - Produced by another microorganism
        - Kills or impairs organisms causing infection
    - **Bacteriostatic Drugs-**
        - Inhibit growth of bacteria
        - Tetracycline and sulfonamides
    - **Bactericidal Drugs-**
        - Kill bacteria
        - Penicillins and cephalosporans
    - **Gram Positive-**
        - Have cell wall and stain
        - Purple with gram stain
    - **Gram Negative-**
        - No cell wall
        - Do not stain purple (they are red/pink like rest of stain
    - **Mechanisms of Antibacterial Action-**
        - inhibition of bacterial cell wall synthesis
        - alteration of membrane permeability
        - inhibition of protein synthesis
        - inhibition of synthesis of bacterial RNA and DNA
        - interference with metabolism within the cell

Action	Effect	Drugs
Inhibition of cell-wall synthesis	Bactericidal effect Enzyme breakdown of cell wall Inhibition of enzyme in synthesis of cell wall	Penicillin Cephalosporins Bacitracin Vancomycin
Alteration of membrane permeability	Bacteriostatic or bactericidal effect Increases membrane permeability Cell lysis caused by loss of cellular substances	Amphotericin B Nystatin Polymyxin Colistin
Inhibition of protein synthesis	Bacteriostatic or bactericidal effect Interferes with protein synthesis without affecting normal cell Inhibits steps of protein synthesis	Aminoglycosides Tetracyclines Erythromycin Lincomycin
Inhibition of synthesis of bacterial RNA and DNA	Inhibits synthesis of RNA and DNA in bacteria Binds to nucleic acid and enzymes needed for nucleic acid synthesis	Fluoroquinolones
Interference with cellular metabolism	Bacteriostatic effect Interferes with steps of metabolism within cells	Sulfonamides Trimethoprim Isoniazid Nalidixic acid Rifampin

    - **Body Defenses-**
        - **Immunoglobulins:** are anti-body proteins such as IgG and I GM-and other elements of the immune response system, such as white blood cells needed to combat infections, may be depleted in individuals with poor nutritional status.
    - **Resistance to Antibacterials-**
        - physical activity inhibits the action of antibiotics
        - when you do not take your antibiotic and tell it is all gone, it can contribute to antibiotic resistance
        - when you are in long-term antibiotics, you can develop antibiotic resistance
        - **Some Famous Antibiotic Resistant Organisms:**
            - MRSA=Methicillin Resistant Staphylococcus Aureus
            - VRE=Vancomycin Resistant E. Coli
            - ESBL=Extended Spectrum Beta Lactamases
        - **Cross-Resistance:**

- resistance to the effects of an antibiotic because of previous exposure to another similar antibiotic
- example: penicillins/cephalosporins

- **Use of Antibiotic Combinations-**
  - **Multiantibiotic Therapy:** The use of more than one antibiotic to treat a bacterial illness
  - **Additive effect:** The effect is the same as adding the two together
  - **Synergistic effect:** The effect of two products is greater than the two of them added together
- **General Adverse Reactions-**
  - **Mild:**
    - Rash
    - Pruritus (itching)
    - Hives
  - **Severe:**
    - Bronchospasm
    - Laryngeal Edema
    - Vascular Collapse
    - Cardiac arrest
  - **Many Antibiotics can cause**
    - Organ Toxicity
      - Kidney
      - Liver
      - Ear (Ototoxicity)
    - Note: Erythromycin and other Macrolides are famous for liver problems
  - **Some IV antibiotics can cause**
    - EXTRAVASATION (leakage from the capillaries to the surrounding tissue)
    - Example: Vancomycin is a horrible vesicant (agent causing blisters)
  - **Secondary Infection (Superinfection):**
    - A superinfection is a secondary infection that occurs when the normal floor of the body is disturbed during antibiotic therapy. Super infections can occur in the mouth, respiratory tract, intestine, and skin. Fungal infections frequently result in super infections, although bacterial organisms may be the offending microorganisms. Super infections really develop when drug is administered for less than one week, and they occur more commonly with the use of broad-spectrum antibiotics
    - infections that happen when the normal flora are killed
    - Examples:
      - yeast (oral thrush, the general yeast infections)
      - C. difficlle
  - **Clostridium Difficile:**
    - common treatment includes:
      - metronidazole (Flagyl)
      - vancomycin
      - ciprofloxacin (Cipro)
    - people at risk:
      - AIDS patients
      - patients taking antibiotics
      - those on chemotherapy
      - healthcare workers
    - Individuals must wash hands with soap and water after leaving the room of the patient in isolation for C. diff, hand sanitizer does not work for C. diff.
    - C. diff is always present within an individual's body and only becomes an issue when the normal flora of an individual's body is suppressed and C. diff is able to flourish

        - NO DAIRY PRODUCTS
    - **Yogurt and Antibiotics-**
        - probiotics decrease risk of C. diff, and other opportune infections
        - do not eat yogurt at the same time as antibiotics, wait a couple hours, especially tetracycline or fluoroquinolones
- **Drug-Drug Interactions:**
    - alcohol and cephalosporins
    - Fluoroquinolones combined with steroids increased risk of tendon rupture (Achilles tendon tears)
    - Antabuse (alcohol abuse therapy adjuncts) reaction with cephalosporins and alcohol combo
    - the following drugs can interfere with antibiotics and should not be taken with them:
        - Tums
        - Vitamins
        - Minerals (Esp. iron, calcium)
        - Carafate
- **Narrow Spectrum and Broad Spectrum Antibiotics-**
    - **Narrow spectrum:**
        - Primarily effective against one bacteria subtype
        - Examples- penicillin and erythromycin
    - **Broad spectrum:**
        - Effective against gram-positive and gram negative
        - Frequently used to treat infections when the offending microorganism has not been identified by C & S (culture and sensitivity)
        - Examples- tetracycline and cephalosporins
        - Broad spectrum antibiotics will be used until sensitivity returns

- **Penicillins:**
    - Penicillins are all alike in that they have:
        - A Beta Lactam ring in their chemical structure
        - "cillin" is often in their generic name
    - Treatment of a wide variety of infections
    - **Side Effects and Adverse Reactions-** Penicillins are FAMOUS for
        - Allergies:
            - Hives (Give Benadryl)
            - Anaphlaxis
                - Epinephrine
                - Solu-Medrol (methylprednisolone)(corticosteroid)
                - Diphenhydramine (Benadral)
        - hypersensitivity/superinfection
        - anorexia/nausea/vomiting/diarrhea
    - **Drug Interactions-**
        - decreased effectiveness with oral contraceptives
    - **Nursing Interventions-**
        - check culture and sensitivity before drugs are given
        - monitor for bleeding
        - monitor closely during 1st dose
        - increase fluid
        - take one hour before or 2 hours after meals
        - check for superinfection
        - consider safety issues
        - observed patient for signs of anaphylaxis
            - rash

- pruritus
- laryngeal edema
- wheezing

- monitor bowel function
  - diarrhea/abdominal cramping/fever/bloody stools should be reported to healthcare professionals promptly as a sign of C. diff associated diarrhea
  - may begin up to several weeks following cessation of therapy

- **Cephalosporins:**
  - **Cephalexin-**
    - Used to treat otitis media and skin, bone/joint, respiratory, and urinary tract infections
    - may cause anaphylaxis, nephritis, G.I. disturbances, C. diff diarrhea, rash, elevated hepatic enzymes, superinfection, and Stevens-Johnson syndrome
  - **Ceftriaxone (Rocephin)-**
    - **IM Ceftriaxone**
      - **Can be painful**
      - **Mix with 1% lidocaine to reduce pain during injection**
    - **USE:**
      - Treatment of:
        - otitis media, meningitis, appendicitis, gonorrhea
        - surgical infection prophylaxis
        - skin, respiratory, bone/joint, and urinary tract infections
    - **Contraindications:**
      - renal impairment
      - hypersensitivity to cephalosporins
      - gallbladder disease
      - **Caution-**
        - Bleeding
        - receiving calcium IVs
        - hypersensitivity to penicillins
        - vitamin K deficiency
        - anticoagulants
        - diabetes
        - hepatic dysfunction
    - **Side Effects:**
      - anorexia/nausea/diarrhea/abdominal cramping/flatulence
      - dyspepsia
      - dysgeusia
      - stomatitis
      - rash/Flushing
      - diaphoresis
      - fever
      - pruritus
      - headaches/dizziness
      - edema
    - **Adverse Reactions:**
      - Superinfection
      - Bleeding
      - palpation’s
      - jaundice
      - blood in the urine

- **Life threatening-**
    - Seizures
    - Anaphylaxis
    - hemolytic anemia
    - renal failure
    - C. diff
    - Steven Johnson syndrome
- **Drug interactions:**
    - increased nephrotoxicity with vancomycin
    - increase bleeding with anticoagulants

- **Side Effects and Adverse Reactions-**
    - Pruritus (itching)
    - GI distress (nausea/vomiting/diarrhea)
    - With high doses
        - Increased bleeding
        - Seizures
        - Nephrotoxicity
- **Drug Interactions-**
    - **Alcohol:** may cause flushing, dizziness, headache, nausea, vomiting, muscular cramps (otherwise known as disulfuram reaction). In other words, there's a hypersensitivity to alcohol
    - **Uricosurics:** decreases cephalosporin excretion
- **Nursing Interventions-**
    - assess for allergy
    - perform culture and sensitivity before therapy
    - assess renal and liver function
    - administer IV over 30 minutes BID-Q ID
    - monitor for superinfection
    - for safety, keep out of reach of children

- **Macrolides:**
    - **Erythromycin-**
        - for treating acne, impetigo, tonsillitis, neuritis, STI's, Legionnaires' disease, PID, diphtheria, and respiratory and skin infections
        - may cause skin irritation, irreversible hearing loss, superinfection, dysrhythmias, G.I. distress, C. diff diarrhea, seizures, elevated hepatic enzymes, and Stevens-Johnson syndrome.
    - **Side Effects and Adverse Reactions-**
        - monitor liver enzymes as they may be eliminated in bile and are hard on the liver
        - tinnitus, ototoxicity
        - G.I. distress
        - Superinfection
        - Hepatotoxicity
        - Can cause **cholestatic hepatitis** (prolonged can evolve into vanishing bile duct syndrome and resulting chronic liver injury, cirrhosis and need for liver transplantation.)
    - **Drug Interactions-**
        - can increase warfarin (Coumadin) levels
- **Glycopeptides:**
    - **Vancomycin-**
        - Can be used with MRSA
        - for treating bacteremia, endocarditis, C. diff diarrhea, and respiratory, skin, and bone/joint infections
        - may cause anaphylaxis, hypotension, fever, headache, flushing, G.I. distress, peripheral edema, hypokalemia,

- **Side Effects and Adverse Reactions-**
  - Is a VESSICANT (cause blisters)
  - Can EXTRAVASATE (Leak from capillaries to tissue) leading to tissue damage
    - Use central line (if available)
    - **Extravasation –** inadvertent administration of a vesicant into the surrounding tissue instead of the intended intravenous pathway. Results in blistering and tissue necrosis and requires immediate attention to limit further injury. Risk Factors: neonates and small children, small fragile veins, poorly secured IV's, use of metal cannula (ie butterfly needles), unconscious/altered mental state/nonverbal child, poor insertion technique, multiple venous punctures, IV placement across areas of flexion (wrist, antecubital fossa).
  - Red Man Syndrome- when given too fast
  - **Ototoxic** and Nephrotoxic
  - Blood Dyscrasias (presence of abnormal material)
  - Stevens-Johnson's Syndrome
  - hearing problems (such as ringing in the years, hearing loss)
  - signs of kidney problems (such as change in amount of urine)
  - easy bleeding/bruising
  - Superinfection
- **Drug Interactions-**
  - Disulfiram-like reaction to alcohol
  - NO ALCOHOL
  - May inhibit methotrexate excretion and can cause methotrexate toxicity

- **Tetracyclines:**
  - **USE-**
    - Acne
    - Anthrax
    - Amebiaisis
    - Gingivitis
    - Plaque
    - STI's
    - respiratory, urinary tract, and skin infections
  - **Side Effects and Adverse Reactions-**
    - Anaphylaxis
    - Headache
    - Dermatitis
    - tooth/tongue/nail discoloration
    - G.I. distress
    - C. diff diarrhea
    - Photosensitivity
    - Hepatotoxicity
  - **Nursing Considerations-**
    - do not use if pregnant
    - do not give to children younger than 8 years of age (discoloration of permanent teeth)
    - Advise patients to use sunblock and protective clothing during sun exposure. Photosensitivity is associated with tetracycline
    - can cause discoloration of forming teeth
    - decreased effectiveness of oral birth control (do not rely on oral contraceptives alone)
    - taken with a full glass of water, and on an empty stomach
    - DO NOT EAT YOGURT AT SAME TIME give some time in-between for absorption
  - **Drug Interactions-**

        - Do not take with oral contraceptives
        - May increase effects of warfarin
        - antacids and iron containing drugs can prevent absorption of tetracycline from the G.I. tract
        - milk and foods high in calcium can inhibit tetracycline absorption

- **Aminoglycosides:**
    - **Tobramycin-**
        - **USE-**
            - Bacteremia
            - Meningitis
            - pelvic inflammatory disease (PID)
            - respiratory, urinary tract, intra-abdominal, skin, and bone/joint infections
        - **Side Effects and Adverse Reactions-**
            - Anaphylaxis
            - headache/dizziness
            - G.I. distress
            - C. diff diarrhea
            - Weakness
            - chest pain
            - superinfection
            - neurotoxicity/nephrotoxicity/ototoxicity
            - Stevens-Johnson syndrome
            - Dysphonia (hoarseness or difficulties in speaking)
            - Dysgeusia (taste disturbance)
        - **Drug Interactions-**
            - when administered with penicillins desired effect is decreased
            - oral anticoagulant such as warfarin can increase when taken simultaneously
        - **Nurse considerations-**
            - assess for nephrotoxicity
            - changes in urine output
            - check for hearing loss (ototoxicity)
            - monitor for signs of superinfection (mouth ulcers)
            - encourage use of sunblock due to photosensitivity

- **Fluoroquinolones (Quinolones):**
    - **Ciprofloxacin (Cipro)-**
        - used in combination with METRONIDAZOLE (Flagyl) for C-Diff

    - **Levofloxacin-**
        - **USE:**
            - Sinusitis
            - Cellulitis
            - Impetigo
            - flag/anthrax
            - respiratory, urinary tract, and skin infections

    - **Side Effects and Adverse Reactions-**
        - FAMOUS FOR TENDONITIS (tissue connecting muscle and bone becomes inflamed)
        - famous for Achilles tendon ruptures, especially when given with **STEROIDS**

        - increases the risk of sunburn (wear sun block)
        - C. diff diarrhea
    - **Drug Interactions-**
        - inactivated when taken with vitamins/minerals (antacids, iron, calcium)
        - do not take with multivitamin take it separate times
- **Sulfonamides:**
    - **Trimethoprim-Sulfamethoxazole (<u>Bactrim</u>)-**
        - **USE:**
            - Otitis media
            - Gastroenteritis
            - MRSA
            - respiratory and urinary tract infections
        - **Contraindications:**
            - severe renal or hepatic disease
            - pregnancy
            - breast-feeding
            - advanced age
            - hypothyroidism
            - diabetes
        - **Side Effects:**
            - anorexia/abdominal pain
            - stomatitis
            - nausea/vomiting/diarrhea
            - weakness
            - rash
            - headache
            - vertigo
            - insomnia
            - photosensitivity
            - tinnitus
        - **Adverse Reactions:**
            - Anaphylaxis
            - Angioedema
            - Seizures
            - C. diff diarrhea
            - Stevens-Johnson syndrome
            - renal failure
        - **Drug Interactions:**
            - increased anticoagulant effect with warfarin
            - increase potassium levels with ace inhibitors
- **Antiprotozoals:**
    - **Metronidazole (Flagyl)-**
        - Used with Cipro for C-Diff and Giardiasis
        - Used for:
            - pelvic inflammatory disease (PID)
            - endocarditis
            - bacterial vaginosis
    - **Side Effects and Adverse Effects-**
        - common side effects:
            - nausea

                - metallic taste
                - loss of appetite
            - dangerous side effects:
                - seizures
                - allergies
    - **Drug Interactions-**
        - Disulfuram (Antabuse-like) reaction with ethyl alcohol (EtOH)
        - NO ALCOHOL
- **Antitubercular Antibiotics:**
    - **Rifampin-**
        - Rifampin: Famous for turning body fluids orange
    - **Isoniazide (INH)-**
        - Neuropathies (weakness, numbness, and pain) can develop
            - B6 (pyridoxine is used to decrease this effect)

    - prophylaxis recommended for those with close contact to HIV patients with positive mantoux, neg to pos conversion
    - multi-drug therapy is most effective (single drug therapy is usually ineffective)
    - **Side Effects and Adverse Reactions-**
        - most drugs are hard on liver and are contraindicated in liver disease
        - Isoniazid, Rifampin, and Streptomycin: ALL VERY HEPATOTOXIC
    - **Drug Interactions-**
- **Antifungal:**
    - **Mycostatin (Nystatin)-**
        - Used on skin, vaginal, oral, and esophageal Candida organisms
        - "Swish and Spit" for oral
        - "Swish and Swallow" for esophageal
    - **Side Effects and Adverse Reactions-**
        - Diarrhea
        - abdominal pain
        - tachycardia
        - bronchospasm
        - hypersensitivity (allergy and Stevens-Johnson syndrome)

Tuberculosis-

- **Tuberculosis:**
    - Drug therapy for tuberculosis differs from the therapy for most other infections because the microorganism that causes tuberculosis has a cell wall that is resistant to penetration by anti-infective agents.
    - For therapy to be effective the drug therapy needs to occur for 6 to 12 months. Although the patient may not show symptoms it is essential that the patient completes drug therapy.
    - Some patients develop drug resistance and require therapy for up to 24 months
    - high rate of noncompliance with treatment
    - multiple drugs are often used in concurrence due to the high incidence of drug resistance, using multiple drugs in concurrence reduces the likelihood of drug resistance and increases the therapeutic effect.
    - The drugs are used to prevent the disease as well as treat it (individuals coming to contact with TB positive patients can be treated prophylactically)

- **Typical Drug Combination (With no complicating factors)**
  - 2 months of daily therapy of:
    - Isoniazide (INH)
    - Rifampin
    - TVA?
    - Myambutol (ethambutol)
  - Continuation Phase (4 months)
    - Isoniazide
    - Rifampin
    - 2 to 3 times per week
- **Categories of Antitubercular Drugs –**
  - **First line:** generally most effective and best tolerated by patients
  - **Second line:** more toxic and less effective, used when resistance to first-line drugs develops
- **Rifampin-**
  - can cause all body fluids to turn orange in color (i.e. sweat, tears, urine) very common and normal
  - **Side Effects:**
    - nausea/vomiting
    - gastric pain
    - anorexia
    - flatulence
    - diarrhea
    - cramping
    - orange color of body fluids
- **Isoniazide (INH)-**
  - **Use:**
    - treatment of active and latent tuberculosis
    - use prophylactically for prevention in individuals at high risk of TB
  - **Contraindications:**
    - history of Isoiazide hypersensitivity reaction
    - alcoholics
    - liver problems
    - <u>when treating active tuberculosis it must be used in conjunction with another antituberculosis drug</u>
  - **Side Effects and Adverse Reactions:**
    - Hepatotoxicity
    - dose-related clinical neuropathy
    - clumsiness
    - unsteadiness
    - muscle ache
    - epigastric distress
    - jaundice
    - drug-induced hepatitis
    - nausea/vomiting/diarrhea
    - may cause neuropathy
      - What may ward off neuropathies caused by INH?
        - Administration of pyridoxine (vitamin B6)
  - **Patient Teaching:**
    - take orally on an empty stomach
    - one hour before or 2 hours after a meal

- vitamin B6 (pyridoxine) is depleted with use of medication (need to take supplements)
- the most common side effect is peripheral neuritis (inflammation of peripheral nerves causing pain and loss of function) is preceded by paresthesia (numbness and tingling)
- teach patient to reduce or eliminate use of alcohol to reduce effects of hepatotoxicity
- treatment of tuberculosis is often treated by more than 1 drug such as rifampin

- **BCG (Bacillis Calmette-Guerin)**
  - the immunization for tuberculosis
  - live virus (do not use live viruses with immunosuppressive patients)
  - because patient was given a live virus they will test positive for a mantle screening which does not mean they have the virus but they have built up an immunity towards it

Hypothyroidism-

- **Levothyroxine Sodium (Synthroid): (Thyroid Hormone)**
  - A synthetic preparation of thyroxine (T4)
  - **Action-**
    - increases the basal metabolic rate
    - Enhances gluconeogenesis
    - Stimulates protein synthesis
    - whenever a therapeutic level patients will have more energy
  - **Use-**
    - People with decreases or absent thyroid function
    - Hypothyroidism
    - Cretinism (stunted growth due to congenital defect of thyroid hormone)
    - Goiter (enlarged thyroid gland, swelling of neck)
    - Myxedema coma (severe hypothyroidism leading to decreased mental status, hypothermia, slowing the function of multiple organs)
    - management of thyroid cancer following surgery
    - thyroid suppression test
- **Contraindications:**
  - the treatment of obesity
  - hypersensitivity
  - older adult patients
  - patients with impaired cardiac function
  - hypertension
  - thyroid toxicity
  - myocardial infarction
- **Side Effects and Adverse Reactions:**
  - overdose may cause thyroid toxicity
  - tachycardia
  - increase blood pressure
  - angina
  - tremor
  - nervousness
  - insomnia
  - intolerance to heat
  - with long-term use patient may develop osteoporosis and atrial fibrillation
  - **When dose is too low-**
    - Bradycardia
    - Lethargy
    - Constipation

        - excessive fatigue and excessive sleeping
- **What is a Thyroid Storm?**
    - Thyroid crisis (Emergency) (if dose is too high)
        - Fever
        - Irritable
        - dysrhythmia
        - Nervousness
        - Rapid pulse
        - Diarrhea
        - Tachycardia
- **Nursing Implications:**
    - monitor for tachycardia and abnormal pulse rate
    - teach patient to report any persistent symptoms of thyroid toxicity
    - treatment for hypothyroidism is lifelong
    - patient must understand the need to not discontinue medication
    - have thyroid stimulating hormone levels measured
    - take 6 to 8 weeks for medication to take full effect
    - take medication in morning
    - take medication on an empty stomach (30 to 60 minutes before meals)

Vaccines-

- **Viruses:**
    - **Live Attenuated Influenza Vaccine-**
        - Who should not receive this vaccine?
            - Someone that is immunocompromised
            - chemotherapy patients
            - steroid use (corticosteroid)
            - elderly patients (over 55)
            - Younger than 2
            - Asthmatics
            - Guillian Barre in the past 6 weeks
            - Antiviral treatment in last 48 hours
            - Pregnant
        - **Side Effects and Adverse Reactions:**
    - **Herpes Antivirals-**
    - **Hepatitis Antivirals-**
        - **Hepatitis B Series:**
        - **Side Effects and Adverse Effects:**

Endocrine-

- **Pituitary Gland:**
    - **Anterior pituitary gland-**
        - Growth hormone (GH)- stimulates growth in tissue and bone
        - thyroid stimulating hormone (TSH)-axon thyroid gland
        - adrenocorticotropic hormone (ACTH)-stimulates adrenal gland
        - gonadotropins (FSH, LH)-affects ovaries
    - **Posterior pituitary gland-**

        - antidiuretic hormone
        - vasopressin (Pitressin)
        - Desmopressin acetate (DDAVP)
        - Oxytocin
- **Thyroid gland hormones:**
    - Thyroxine (T4)
    - Triiodothyronine (T3)
- **Functions:**
    - regulates protein synthesis
    - enzyme activity
    - stimulate myocardial oxidation
- **Hypothyroidism:**
    - decrease in thyroid hormone secretion
    - etiology
        - primary: thyroid gland disorder, more common due to thyroid gland inflammation, radioiodine therapy, excess intake of anti-thyroid drugs, surgery, Myxedema (adult), cretinism (child)
        - secondary: lack of TSH secretion
    - **Levothyroxine sodium (Synthroid)-**
        - drug of choice for replacement therapy for the treatment of hypothyroidism
        - increases the level of T3 and T4
        - also used to treat simple goiter and chronic lymphatic (Hashimoto) thyroiditis
        - **Action:**
            - increase metabolism
            - body growth
        - **Contraindications:**
            - Thyrotoxicosis
            - myocardial infarction
            - severe renal disease
        - **Drug Interactions:**
            - increase cardiac insufficiency with epinephrine
            - increased effects of anticoagulants
            - TCAs
            - Vasopressors
            - Decongestants
            - decreased effects of antidiabetics
            - decreased absorption with cholestyramine
        - **Side Effects:**
            - Nervousness
            - Insomnia
            - weight loss
            - tremors
            - headache
            - nausea/vomiting/diarrhea
            - cramping
            - tachycardia
            - palpitations
            - hypertension
            - dysrhythmias
            - angina
            - thyroid crisis
        - **increase in circulating T4 and T3 levels:**

- Graves' disease or thyrotoxicosis
- most common type of hyperthyroidism caused by hyper function of the thyroid gland
- characterized by-
    - tachycardia/palpitations
    - excessive perspiration
    - heat intolerance
    - nervousness/irritability
    - Exophthalmos (bulging eyes)
    - weight loss

- **What is the relationship between thyroid stimulating hormone and hypothyroidism?**
- **What does high thyroid stimulating hormone indicate?**

- **Parathyroid Gland:**
    - **Parathyroid hormone (PTH)-** regulates calcium levels in the blood. Parathyroid hormone agents treat hypoparathyroidism
    - **Hypoparathyroidism-**
        - **Cause:**
            - malignancies of the parathyroid glands
            - ectopic PTH hormone secretion from lung cancer
            - hyperthyroidism
            - prolonged immobility, during which calcium is lost from bone
        - **Treatment:**
            - synthetic calcitonin
- **Adrenal Glands:**
    - **Adrenal cortex-**
        - produces glucocorticoids (cortisol)
            - promote sodium retention, potassium excretion
            - adrenal hypo secretion (Addison's disease)
            - levels controlled by negative feedback
        - Mineralocorticoids (aldosterone)
            - secretes aldosterone
            - promote sodium and water retention
            - controlled by rennin-angiotensin system glucocorticoids
    - **Prednisone (Deltasone)-**
        - **Action:** suppresses information, immunosuppression
        - **Use:** decreases inflammation
        - **Interactions:**
            - increased effect with barbiturates, phenytoin, rifampin, ephedrine, theophylline
            - decreased effects of aspirin, anticonvulsants, INH, antidiabetics
        - **Side Effects:**
            - increased appetite
            - sweating
            - headache
            - flushing
            - mood change/depression/psychosis
            - tachycardia/hypertension
            - hyperglycemia
            - abnormal fat deposits
            - muscle wasting
            - edema
            - glaucoma
            - peptic ulcers

Cancer-

- **Methotrexate (Trexall):** [Antineoplastics: Antimetabolites]
  - can cause pancytopenia (low everything in blood) platelets, hemoglobin, and white blood cells will be low
  - use with salicylates, NSAIDs, sulfonamides, PCNs, and tetracycline can cause methotrexate toxicity
  - do not use with proton pump inhibitors, and/or folic acid
  - use for solid tumors, head and neck cancer, lymphomas, and some autoimmune disorders

Hormone-

- **Desmopressin (Anti-diuretic hormone):**
  - used to treat diabetes insipidus (disorder causing an imbalance of water in the body) or head injuries
  - **If you drink too much water how is your sodium level affected?**
    - Sodium levels will decrease (hyponatremia)
  - **What is a normal sodium level?**
    - 135 – 145 mEq/L

- **Birth Control Pills:**
  - **How do they work?**
    - Stopping ovulation
    - Most birth-control pills contain synthetic forms of 2 female hormones: estrogen and progestin. These synthetic hormones stabilize a woman's natural hormone levels, and prevent acid and from peaking. Without the estrogen bump, the pituitary glands does not release other hormones and naturally cause ovaries to release mature eggs.
    - Make the uterine inhospitable
  - **Risks-**
    - blood clots (especially with smoking) (DVT, PE, MI, stroke)
    - vein inflammation
    - breast cancer
    - migraine headaches
    - high blood pressure
    - liver disease
    - possible changes in blood sugar control
  - **Contraindications-**

- **Absolute contraindications:**
  - pregnancy (known or suspected)
  - venous thrombosis history or risk factors
  - vascular disease, including coronary artery disease and cerebrovascular accident (CVA)
  - liver disease, including cirrhosis, viral hepatitis, and benign or malignant liver tumors
  - undiagnosed the gentle bleeding or known or suspected endometrial cancer
  - breast cancer
  - tobacco use more than 15 cigarettes per day and a patient older than 35 years of age
- **Cautious use:**
  - hypertension with associated vascular disease
  - hypertension with blood pressure greater than 160/100
  - hyperlipidemia
  - diabetes complicated by neuropathy, nephropathy, or vascular disease
  - diabetes for more than 20 years duration
  - postpartum fewer than 3 weeks
  - lactation fewer than 6 weeks
  - age greater than 35 and smoking fewer than 15 cigarettes per day
  - hyper coagulation disorders
  - prolonged immobility
  - use of drugs that affect liver enzymes (e.g. anticonvulsants, rifampin)

- **Oral Birth Control-**
  - Very important to take pill at the same time each day. It creates a more stable level of hormones in an individual's body
  - When you forget your pill (or take it 3 or 4 hours late or more), it causes the dip in the body's level of birth control hormones.
  - If you forget your pill one day, do not take 2 pills the next day, which will cause a spike in your body's levels of birth control hormones.
  - Birth-control pills traditionally come in packs of 21 are 28 pills. Both packs contain 21 active pills. The 7 extra pills in the 28 pill pack are placebo pills which are there to remind you to continue taking one pill every day and to remind you when to begin the next pack.
  - The 7 day break from hormones triggers monthly bleeding that mimics a woman's menstrual.
  - Women are still protected from pregnancy during the 7 day.
- **Emergency Contraception-**
  - must know when patient conceived
  - when the last time they had unprotected sex
  - emergency contraception will work within 72 hours of conception
  - examples:
    - Plan B (ella)
    - RU 486 (mifepristone)
  - **What assessment will you make before discharging a patient with a prescription for emergency contraceptives?**

Diabetes-

- **Diabetes Mellitus:**
  - a chronic disease of deficient glucose metabolism
  - insufficient insulin secretion from beta cells
  - impaired insulin use
  - Without enough insulin glucose stays in the blood
  - major symptoms: polyuria, polydipsia (great thirst), polyphagia (excess hunger)
  - **Types-**

- **Type 1 (insulin-dependent)** Does not make insulin
- **Type 2 (non-insulin dependent)** Does not make or use insulin well (most common)
- **Prediabetes** (high blood sugar but not high enough to be deemed diabetes) higher risk of getting type II diabetes

- **Types of Insulin:**

Drug	Pregnancy Category	Half-Life	ACTION		
			Onset	Peak	Duration
Rapid-Acting Insulins					
Insulin lispro	B *	1 h	15-30 min	30-90 min	3-5 h
Insulin aspart	B *	1.5 h	10-20 min	40-50 min	3-5 h
Insulin glulisine	C *	5-6 min	20-30 min	55 min	1-2.5 h
Oral inhalation insulin	C *	28-39 min	12-15 min	53 min	2.5 h
Short-Acting Insulins					
Insulin regular	B *	1.5 h	Subcut: 30 min IV: 15 min	Subcut: 2.5-5 h IV: 15-30 min	Subcut: 4-12 h IV: 30-60 min
Intermediate-Acting Insulins					
Insulin isophane NPH	B *	5-6 min	1-2 h	4-12 h	14-24 h
Long-Acting Insulins					
Insulin glargine	C *	5-6 min	1-1.5 h	None	24 h
Insulin detemir	B *	5-6 min	1-2 h	6-8 h	24 h
Insulin degludec	C *	25 h	1 h	12 h	42 h

- **Insulin:**
  - **Normal Range for Fasting Blood Glucose-** 70 to 99 mg/dL
  - release from beta cells of islets of Langerhans in pancreas
  - response to increase in blood glucose
  - in the US insulin concentration is 100 mg/ml
  - **Function-**
    - promote uptake of glucose, amino acids, and fatty acids
    - converts to glycogen for future glucose needs in liver and muscles
  - **Action-**
    - promote use of glucose by body cells
    - store glucose as glycogen and muscles
  - **Use-**
    - reduce blood glucose
  - **Interactions-**
    - Increased hypoglycemia with aspirin, oral anticoagulants, alcohol, oral hypoglycemic, TCAs, MAOIs, tetracyclines
    - Decreased hypoglycemia with thiazides, glucocorticoids, oral contraceptives, thyroid drugs, smoking
    - steroids and beta blockers can increase blood sugar leading to hyperglycemia
    - hypoglycemia can occur if a patient takes insulin and does not eat or they exercise
  - **HYPOglycemia-** 60 mg/dL or less
    - **Symptoms:**
      - Headache
      - Dizziness

- Confusion
- slurred speech
- nervousness/anxiety
- agitation
- tremors
- uncoordination
- sweating
- tachycardia
- seizures

- **Causes**:
  - administration of insulin without consuming food
  - exercise
  - Alcohol consumption
  - Aspirin
- **Treatment:**
  - orange juice (if alert)
  - hard candy
  - dextrose 50% (IV) if difficulty swallowing

- **HYPERglycemia-** 250 mg/dL or more
  - too much sugar in the blood
  - **Symptoms:**
    - extreme thirst
    - dry mouth
    - poor skin turgor
    - polyuria
    - fruity breath
    - fatigue
    - tachycardia
    - Kussmaul respirations (deep, rapid, labored, distressed, dyspneac)
  - **Causes**:
    - use of steroids and/or beta blockers
    - Smoking
    - Oral contraceptives
  - **Treatment:**

- **Types of Insulin:**
  - **Rapid Acting-**
    - **Lispro (Humalog):**
  - **Short Acting-**
    - **Regular Insulin:**
  - **Intermediate Acting-**
    - **NPH Insulin:**
  - **Long Acting-**
    - **Glargine (Lantus):**

- **Side Effects-**
  - Confusion/agitation
  - Tremors
  - Headache
  - Flushing
  - Hunger
  - weakness/lethargy/fatigue
  - urticaria (itchy skin rash)
  - diarrhea
  - flulike symptoms
  - weight gain
- **Adverse Effects-**
  - tachycardia/palpitations
  - hypoglycemic reaction
  - rebound hyperglycemia (Somogyi effect)
  - lipodystrophy (breakdown of fats that cause weight loss and high blood fat levels)
  - hypokalemia
  - shock
  - anaphylaxis
  - ketoacidosis
- **Contraindications-**
  - Hypoglycemia
  - Hypersensitivity
  - **caution:**
    - hypokalemia
    - fever
    - the surgery or trauma
    - vomiting
    - renal or hepatic impairment
- **Drug Interactions-**
  - **increased hypoglycemic affect with:**
    - aspirin
    - oral anticoagulants
    - alcohol
    - oral hypoglycemic's
    - beta blockers
    - ace inhibitors
    - MAOIs
    - Tetracycline
  - **decreased hypoglycemic affect with:**
    - thiazides
    - glucocorticoids
    - oral contraceptives
    - thyroid drugs
    - furosemide
    - bumetamide
    - phenytoin
    - fluoroquinolones
    - smoking

- green tea

- **Insulin Administration:**
  - **Nursing Interventions-**
    - monitor vital signs and glucose levels
    - instruct patient to report hypoglycemia and hyperglycemia
    - encourage compliance with diet, insulin, exercise
    - advise patient aware medical alert tag
    - teach patient how to check blood glucose
    - teach patient how to administer insulin
  - **Sliding-scale insulin coverage-**
    - adjusted doses dependent on individuals blood glucose
    - usually done before eating and at bedtime
    - usually uses rapid or short acting insulin
  - **Storage of insulin-**
    - keep in the refrigerator
    - remove from refrigerator 30 minutes before injection
    - avoid storing insulin in direct sunlight or at high temperature
- **Oral Antidiabetic Drugs:**
  - **Sulfonureas-**
    - treat type II diabetes
    - stimulate beta cells to secrete more insulin
    - **Glucatrol (Glipizide):**
      - **USE-**
        - use for type II diabetes
        - causes the pancreas to produce insulin
      - **Side Effects-**
        - Diarrhea
        - gas (flatulence)
        - jittery/dizziness
        - uncontrollable shaking of a body part
        - red or itchy skin
        - rash/hives/blisters
        - feeling tingly (pins and needles)
      - **Contraindications-**
        - diabetic ketoacidosis
        - hypersensitivity to drug
        - hepatic or renal dysfunction
        - older adults
        - debilitated or malnourished patients
        - adrenal or pituitary insufficiency
        - type I diabetes
        - trauma
        - infection
      - **Drug Interaction-**
        - Alcohol may produce disulfiram (Antabuse)-like reaction (flushing, headache, sweating, nausea, violent vomiting, weakness.
        - Beta blockers
        - oral anticoagulants
        - oral contraceptives
        - glucocorticoids

- **Non-Sulfonureas-**
  - **Metformin (Glucophage):**
    - decreases hepatic production of glucose following a meal
    - lower serum glucose post-prandial (after meal)
    - absorption of glucose from small intestine is reduced
    - increases insulin receptor sensitivity
- **Who CAN take oral antidiabetics?**
  - Diabetes onset greater than 40 years of age
  - diagnosis of diabetes for less than 5 years
  - not underweight
  - fasting blood glucose equal to or less than 200 mg/dL
  - less than 40 units of insulin required per day
  - normal renal and hepatic function

- **Severe Hypoglycemia-**
  - **Glucagon:**
    - is a hyperglycemic hormone secreted by health the cells of the islet of Langerhans in Pancreas
      - increases blood sugar by stimulating glycogenesis
    - comes as a powder and liquid that needs to be mixed right before administration
    - after administration patient should be placed on side to avoid choking on vomit
    - **USE-**
      - EMERGENCY
      - treat insulin induced hypoglycemia when other methods of providing glucose are not available
      - given to individuals who are **unresponsive**
      - Used to raise very low blood sugar
    - **Route of administration-**
      - Subcutaneously (Subq) or intramuscular (IM)
      - maybe IV

  - **Dextrose 50 & 25%:**
    - **USE-**
      - severe hypoglycemia
      - When patient is still conscious but confused
    - placing IV in hand may cause infiltration (Dextrose extravaication)
    - only place in central vein