

PHARMACOLOGY: CLASSIFICATIONS OF MEDICATIONS

OBJECTIVES:

At the conclusion of the course, the learner will be able to:

1. Detail the actions, uses, side effects, adverse reactions, contraindications, implications and examples of medications within various medication classifications.
2. Describe the usefulness of medication classifications systems.

INTRODUCTION

Medications can be classified according to their use or function, the system that they treat and their chemical makeup. For example, they can be classified according to system, as follows:

- respiratory medications
- cardiac medications
- nervous system medications, etc.

They can also be classified according to their function or use. For example, they can be classified as below:

- nonsteroidal anti-inflammatory medications
- narcotic analgesics
- antidepressants, etc.

Lastly they can be classified according to their chemical makeup. Examples include:

- aminoglycosides
- estrogens
- opioids, etc.

Most of the medications within a classification group, like alpha-adrenergic blockers, are quite similar although they are not identical. Classification systems enable us to readily identify the similarities and differences among a large number of medications within and outside of a particular classification. One of the best and most efficient ways to master pharmacology is to become familiar with the classifications of medications and then to focus on the similarities and differences of medications within the same classification.

MEDICATION CLASSIFICATIONS

ALPHA-ADRENERGIC BLOCKERS

Actions: They bind to α -adrenergic receptors thus leading to the dilation of peripheral blood vessels, lowering of peripheral resistance and the lowering of blood pressure.

Uses: Hypertension and prevention of necrosis secondary to extravasation.

Adverse Reactions and Side Effects: Hypotension, stuffed nasal passages, tachycardia, diarrhea, nausea, and vomiting.

Contraindications: Myocardial infarction (MI) and coronary artery disease, including angina.

Implications: Check K, Na, Cl, CO₂, daily weights, I&O, BP standing and lying.

Examples of Medications in This Classification:

- dihydroergotamine mesylate
- phentolamine mesylate

ANTACIDS

Actions: They contain magnesium, aluminum, calcium and a combination of these compounds. They slow down the rate of gastric emptying and neutralize gastric acidity.

Uses: Gastritis, peptic ulcer, hiatal hernia and reflux esophagitis.

Adverse Reactions and Side Effects: Constipation, diarrhea, flatus, abdominal distention, alkaluria.

Contraindications: Allergy and sensitivity

Implications: Assess epigastric pain, GI symptoms and renal problems and electrolytes.

Examples of Medications in This Classification:

- aluminum carbonate
- calcium carbonate

ANTIANGINALS

This classification is further divided into:

- nitrates,
- calcium channel blockers, and
- β -adrenergic blockers.

Actions:

Nitrates - dilate coronary arteries, decrease preload and afterload.

Calcium channel blockers- also dilate coronary arteries, but they also decrease SA/AV node conduction

β -Adrenergic blockers- slow the heart rate, thus decreasing O₂ use.

Uses: Angina. Calcium channel blockers and β -blockers can also be used for hypertension and dysrhythmias.

Adverse Reactions and Side Effects: Postural hypotension, fatigue, dysrhythmias, headache, edema, dizziness.

Contraindications: Increased intracranial pressure, cerebral hemorrhage and sensitivity.

Implications: Monitor for side effects and orthostatic B/P. Continue to assess angina pain.

Examples of Medications in This Classification:

- propranolol
- verapamil hydrochloride
- nitroglycerine

ANTICHOLINERGICS

Actions: Inhibit acetylcholine (autonomic nervous system)

Uses: Many uses- some decrease GI, urinary and biliary motility; others decrease GI secretions, decrease involuntary movement, and relieve nausea, and vomiting.

Adverse Reactions and Side Effects: Dryness of the mouth, paralytic ileus, constipation, urinary problems (retention and hesitancy) dizziness and headache.

Contraindications: GI or urinary obstruction, narrow-angle glaucoma, and myasthenia gravis.

Implications: Monitor urinary and bowel function as well as vital signs. Keep the patient in bed for one hour after parenteral dose.

Examples of Medications in This Classification:

- atropine sulfate
- scopolamine

ANTICOAGULANTS

Actions: Prevent clot formation.

Uses: MI, pulmonary embolus, deep vein thrombosis, disseminated intravascular clotting syndrome (DIC), and atrial fibrillation. It is also used with dialysis.

Adverse Reactions and Side Effects: Hemorrhage, diarrhea, fever, rash and blood disorders (leukopenia, thrombocytopenia, etc.) depending on the specific drug.

Contraindications: Bleeding disorders, such as hemophilia and leukemia, ulcers, blood dyscrasias, nephritis, endocarditis and thrombocytopenia purpura.

Implications: Observe for bleeding (oral, black stools, stool occult blood, ecchymosis, etc.). Monitor blood and BP (hypertension may occur).

Examples of Medications in This Classification:

- warfarin sodium
- heparin

ANTICONVULSANTS

This classification is further divided into:

- barbiturates,
- hydantoins,
- succinimides,
- benzodiazepines and
- others.

Actions: Act to prevent seizures.

Uses: Depending on the specific drug, they prevent tonic-clonic seizures, psychomotor seizures, status epilepticus, petit mal seizures and cortical focal seizures.

Adverse Reactions and Side Effects:

Bone marrow depression, which can be life-threatening, GI problems, CNS effects like confusion, ataxia and slurring of speech.

Contraindications: Sensitivity

Implications: Monitor hepatic and renal function, blood, mental status, blood dyscrasias, and toxicity (ataxia, bone marrow depression, nausea, vomiting, cardiovascular problems, Stevens-Johnson syndrome)

Examples of Medications in This Classification:

- phenytoin
- diazepam

ANTIDEPRESSANTS

Antidepressants are further divided into:

- MAOIs,
- tricyclics, and
- others.

Actions:

MAOIs- inhibit MAO and thus they increase epinephrine, norepinephrine, serotonin, and dopamine.

Tricyclics- block the reuptake of serotonin and norepinephrine in the nerve endings, thus increasing the actions of both in the nerve cells.

Uses: Depression. Nocturnal enuresis in children.

Adverse Reactions and Side Effects: Orthostatic hypotension, mouth dryness, dizziness, drowsiness, urinary retention, hypertension, renal failure and paralytic ileus.

Contraindications: Hypertrophy of the prostate, seizure disorders, renal, hepatic and cardiac disease.

Implications: Monitor standing and lying BP, blood, mental status, hepatic function. Observe for extrapyramidal symptoms and urinary retention. Withdrawal symptoms occur with abrupt cessation.

Examples of Medications in This Classification:

- sertraline
- amitriptyline
- bupropion
- phenelzine

ANTIDIABETIC MEDICATIONS

Antidiabetics are also subdivided into the following groups:

- insulins of varying kinds, and
- oral hypoglycemic agents.

Actions:

Insulin- lowers blood sugar, potassium and phosphate

Oral hypoglycemic agents- stimulate the β -cells of the pancreas to release insulin.

Uses: Diabetes and ketoacidosis

Adverse Reactions and Side Effects: Hypoglycemia, hepatotoxicity, allergic responses

Contraindications: Sensitivity. Oral agents are contraindicated for juvenile diabetes and ketoacidosis.

Implications: Monitor blood glucose, assess for hypoglycemia, rotate insulin injection sites, and use human insulin with pork or beef sensitivity.

Examples of Medications in This Classification:

- insulin
- glyburide

ANTIDIARRHEALS

Actions: Varying. Some decrease water content of stool, some slow down GI peristalsis.

Uses: Diarrhea

Adverse Reactions and Side Effects: Constipation, paralytic ileus, abdominal pain.

Contraindications: Colitis

Implications: Used for short term therapy (48 hours or less). Monitor electrolytes and bowel response.

Examples of Medications in This Classification:

- bismuth subgallate
- kaolin and pectin mixtures

ANITDYSRHYTHMICS

Antidysrhythmics are subdivided into five groups:

- Class I
- Class II
- Class III
- Class IV
- Others

Actions:

Class I- decreases any disparity in the refractory period, increases the duration of action potential and effective refractory period

Class II- slows down the rate of SA node discharge and conduction through the AV node. Increases recovery time and decreases the heart rate, thus lowering O₂ consumption in the myocardium

Class III- increases effective refractory period as well as the duration of action potential

Class IV- decreases SA node discharge and slows the conduction velocity through the AV node. They also inhibit calcium movement across the cell.

Others- slows conduction through the AV node (adenosine) and increases the refractory period in the AV node and decreases conduction velocity (digoxin)

Uses: Atrial and ventricular arrhythmias (atrial fibrillation, PVCs, and tachycardia), hypertension, and angina

Adverse Reactions and Side Effects: Hypotension, bradycardia, other arrhythmias and various other wide ranging side effects.

Contraindications: Various. Check each medication.

Implications: Monitor rate and rhythm, blood pressure, potassium, dependent edema and I & O

Examples of Medications in This Classification:

- digoxin
- procainamide
- quinidine

- acebutolol
- bretylium
- verapamil

ANTIFUNGALS

Actions: Decreases sodium, potassium and nutrients in the cell and increases cell permeability.

Uses: Fungal infections such as cryptococcosis, aspergillosis, histoplasmosis, blastomycosis, coccidiomycosis, , phycomycosis, and candidiasis

Adverse Reactions and Side Effects: Renal, liver damage and failure, gastroenteritis, hypokalemia, anorexia, nausea and vomiting.

Contraindications: Sensitivity and bone marrow depression.

Implications: For IV administration, use a filter, check for extravasation and protect from light (cover with foil). Monitor vital signs, I & O, blood, weight, renal and hepatic function, hypokalemia and ototoxicity.

Examples of Medications in This Classification:

- nystatin
- amphotericin B

ANTI-HISTAMINES

Actions: Antagonists of histamine.

Uses: Allergies, pruritus and rhinitis.

Adverse Reactions and Side Effects: Most cause drowsiness, headache, urinary retention, blood dyscrasias, thickened bronchial secretions and GI effects

Contraindications: Sensitivity, asthma, peptic ulcer, narrow angle glaucoma.

Implications: Monitor urinary, respiratory and cardiac status. Also monitor for blood dyscrasias.

Examples of Medications in This Classification:

- diphenhydramine hydrochloride
- chlorpheniramine maleate

ANTIHYPERTENSIVES

This classification is further divided into:

- angiotensin-converting enzyme (ACE) inhibitors,
- b-adrenergic blockers,
- calcium channel blockers,
- centrally acting adrenergics,
- diuretics,
- peripherally acting antiadrenergics, and
- vasodilators.

Actions:

Angiotensin-converting enzyme inhibitors- dilatation of the arterial and venous systems occur through the suppression of renin-angiotensin I to angiotensin II conversion

Centrally acting adrenergics- inhibit impulses in the CNS and the sympathetic nervous system, decreases cardiac output, blood pressure and pulse rate

Peripherally acting antiadrenergics- inhibit the release of norepinephrine thus decreasing sympathetic vasoconstriction

Vasodilators- reduce blood pressure, cardiac rate and cardiac output because these medications relax and dilate the smooth muscle of the arteries

b-Blockers, calcium channel blockers, and diuretics are discussed in another section below.

Uses: Hypertension, heart failure, angina and some dysrhythmias

Adverse Reactions and Side Effects: Hypotension, tachycardia, bradycardia, nausea, vomiting and headache.

Contraindications: Heart block, hypersensitivity

Implications: Check for edema, monitor renal function, blood and for symptoms of congestive heart failure.

Examples of Medications in This Classification:

- captopril
- propranolol hydrochloride
- reserpine
- nitroprusside sodium

ANITIINFECTIVES

Antiinfectives are divided further into the following groups:

- penicillins,
- cephalosporins,
- aminoglycosides,
- sulfonamides,
- tetracyclines,
- monobactam,
- erythromycins, and
- quinolones.

Actions: Inhibit the growth and/or replication of susceptible bacteria

Uses: Infection

Adverse Reactions and Side Effects: Diarrhea, nausea, vomiting, bone marrow depression and anaphylaxis (life threatening)

Contraindications: Hypersensitivity. Most people allergic to penicillins are also allergic to the cephalosporins.

Implications: Observe bowel pattern and urinary output. Monitor renal function, blood and for signs of a superinfection and bleeding.

Examples of Medications in This Classification:

- penicillin
- tetracycline

ANTINEOPLASTICS

This classification is further divided into:

- alkylating agents,
- antimetabolites,
- antibiotic agents,
- hormonal agents, and
- others

Actions:

Alkylating agents- interfere with DNA

Antimetabolites - inhibit DNA synthesis

Antibiotic agents- inhibit RNA synthesis by delaying or inhibiting mitosis

Hormones- change the effects of androgens, estrogen, luteinizing hormone, and follicle-stimulating hormone

Uses: Tumors, lymphoma, leukemia and Hodgkin's disease

Adverse Reactions and Side Effects: Anemia, thrombocytopenia, leukopenia, nausea, vomiting, hair loss, hepatotoxicity, cardiotoxicity and hepatotoxicity

Contraindications: Sensitivity, liver and renal damage.

Implications: Monitor blood studies (CBC, platelet count and differential (the drug may have to be held), renal and liver function, I & O. Observe for bleeding, jaundice, dependent edema, breaks in the skin and mucosal inflammation. Check for irritation and phlebitis with IV administration.

Examples of Medications in This Classification:

- fluorouracil
- cisplatin

ANTIPARKINSON AGENTS

This classification is further divided into:

- cholinergics and
- dopamine antagonists.

Actions:

Cholinergics- block acetylcholine receptors

Dopamine antagonists- activate dopamine receptors

Uses: Parkinson's disease

Adverse Reactions and Side Effects: Involuntary movement, insomnia, nausea, vomiting, orthostatic hypotension, dry mouth, numbness and headache

Contraindications: Sensitivity and narrow angle glaucoma

Implications: Monitor respirations, blood pressure and changes in mental and behavioral status

Examples of Medications in This Classification:

- levodopa
- entacapone

ANTIPSYCHOTIC AND NEUROLEPTIC AGENTS

Again, this classification is subdivided. The groups are:

- phenothiazines,
- thioxanthenes,
- butyrophenones,
- dibenzoxazepines,
- dibenzodiazepines,
- indolones and
- other heterocyclic compounds.

Actions: All of these pharmacological agents block the dopamine receptors in the brain, the area that involves psychotic behavior

Uses: Schizophrenia, mania, paranoia, and anxiety. They are also sometimes used for unrelieved hiccups, nausea, vomiting, and pediatric behavioral problems as well as pre-operative relaxation.

Adverse Reactions and Side Effects: Some symptoms (EPS, dystonia, akathisia and tardive dyskinesia) can be controlled with antiparkinsonian medications. Others side effects include dry mouth, photosensitivity, agranulocytosis, hypotension, and life threatening cardiac problems and laryngospasm.

Contraindications: Coronary disease, severe hypertension, severe depression, bone marrow depression, blood dyscrasias, parkinsonism, cerebral arteriosclerosis, narrow angle glaucoma and children less than 12 years of age. Cautiously used with the elderly.

Implications: Monitor CBC, liver function, I & O, blood pressure lying and standing (orthostatic hypotension), EPS (antiparkinsonian agents should be used for this). Observe for dizziness, palpitations, tachycardia, changes in affect, level of consciousness, gait and sleep patterns.

Examples of Medications in This Classification:

- haloperidol
- chlorpromazine

ANTITUBERULARS

Actions: Decreases the replication of the offending bacillus through the inhibition of RNA or DNA

Uses: Pulmonary tuberculosis

Adverse Reactions and Side Effects: Anorexia, nausea, vomiting, rash, renal, hepatic and ototoxic effects, which could be severe.

Contraindications: Sensitivity, renal disease. Caution with hepatic disease, pregnancy and lactation

Implications: Check renal and hepatic status and for signs of anemia.

Examples of Medications in This Classification:

- isoniazid
- rifabutin
- rifampin

ANTITUSSIVES and EXPECTORANTS

Actions:

Antitussives- suppression of the cough reflex

Expectorants- decrease the viscosity of thick, tenacious secretions

Uses: The expectorants are used with a cough associated with bronchitis, TB, pneumonia, cystic fibrosis and COPD. Antitussives are used for nonproductive coughs.

Adverse Reactions and Side Effects: Dizziness, drowsiness and nausea

Contraindications: Iodine sensitivity, pregnancy, lactation and hypothyroidism. Caution with the elderly and those with asthma

Implications: Monitor the cough and the sputum. Increase fluid intake and humidification to thin secretions.

Examples of Medications in This Classification:

- guaifenesin
- codeine

ANTIVIRALS

Actions: Interferes with the DNA needed for viral replication

Uses: HIV infections, herpes (herpes simplex virus and herpes genitalis), encephalitis (herpes simplex) and varicella zoster encephomyelitis

Adverse Reactions and Side Effects: Nausea, vomiting, diarrhea, headache, anorexia, vaginitis, moniliasis, blood dyscrasias, renal failure and metabolic encephalopathy which could be fatal

Contraindications: Immunosuppressed patients with herpes zoster and hypersensitivity. Caution with pregnancy, lactation, renal and liver disease and dehydration

Implications: Assess for renal and liver problems. Observe for signs of infection and allergic reactions (itching, rash, urticaria). Monitor the blood for dyscrasias.

Examples of Medications in This Classification:

- acyclovir sodium
- cidofovir

BARBITURATES

Actions: Decreases impulse transmission to the cerebral cortex

Uses: Epilepsy, sedation, insomnia, anesthesia, cholestasis with some medications in this classification.

Adverse Reactions and Side Effects: Drowsiness, nausea, blood dyscrasias and Stevens-Johnson syndrome

Contraindications: Allergy, poor liver function, porphyria, pregnancy (category D). Caution with the elderly renal or hepatic disease (slowed metabolism)

Implications: Monitor seizure control, blood, hepatic and renal function. Observe for toxicity (insomnia, hallucinations, hypotension, pulmonary constriction; cold, clammy skin; cyanosis of lips, nausea, vomiting, delirium, weakness)

Examples of Medications in This Classification:

- phenobarbital
- secobarbital

BENZODIAZEPINES

Actions: Decreases anxiety by potentiating g-aminobutyric acid and other CNS inhibitory transmitters

Uses: Anxiety secondary to phobic disorders and other conditions, acute alcohol withdrawal and pre-operative relaxation.

Adverse Reactions and Side Effects: Physical dependence and abuse, dizziness, drowsiness, orthostatic hypotension, and blurred vision

Contraindications: Narrow angle glaucoma, infants less than 6 months old, hypersensitivity, lactation (diazepam) and liver disease (clonazepam). Caution with the elderly as well as those with renal and/or hepatic disease

Implications: Monitor lying and standing blood pressure (notify MD if B/P drops 20 mm Hg or more), pulse, hepatic and renal function and signs of dependency. Administer with milk or food to prevent GI symptoms.

Examples of Medications in This Classification:

- diazepam
- clonazepam

BETA-ADRENERGIC BLOCKERS

β -Blockers are divided into two categories:

- selective blockers and
- nonselective blockers.

Actions:

Selective blockers- block the stimulation of b_1 -receptors in the cardiac smooth muscle with chronotropic and inotropic effects.

Nonselective blockers- lowers blood pressure (plasma renins are reduced) without a reduction in heart rate or reflex tachycardia.

Uses: Hypertension, angina prophylaxis and ventricular dysrhythmias

Adverse Reactions and Side Effects: Orthostatic hypotension, diarrhea, nausea, vomiting, bradycardia, blood dyscrasias, CHF and bronchospasm

Contraindications: Heart block, cardiogenic shock and CHF. Cautious use with the elderly and those patients with COPD, coronary artery disease, asthma, renal disease, thyroid disease, pregnancy.

Implications: Monitor blood pressure, I&O, daily weights, pulse and renal function. Observe for edema and take the apical and radial pulse before administration in order to determine if significant changes have occurred.

Examples of Medications in This Classification:

- metoprolol
- propranolol

BRONCHODILATORS

This classification is further subdivided into:

- anticholinergics,
- α/β -adrenergic agonists,
- β -adrenergic agonists, and
- phosphodiesterase inhibitors.

Actions:

Anticholinergics- inhibit the interaction of acetylcholine at receptor sites on bronchial smooth muscle

α/β -adrenergic agonists- increase the diameter of nasal passages and relax bronchial smooth muscle

β -adrenergic agonists- relax the smooth muscle of the bronchii

Phosphodiesterase inhibitors- increased smooth muscle relaxation in the respiratory system

Uses: Asthma, bronchospasm, COPD, emphysema, Cheyne-Stokes respirations

Adverse Reactions and Side Effects: Dyspnea, bronchospasm, anxiety, tremors, throat irritation, nausea and vomiting.

Contraindications: Narrow angle glaucoma, severe cardiac disease, tachydysrhythmias and sensitivity. Cautious use with hypertension, seizure disorders, pregnancy and lactation, hyperthyroidism and prostatic hypertrophy

Implications: Assess for a therapeutic response (absence of dyspnea and/or wheezing) and patient/family education about the use of the inhaler

Examples of Medications in This Classification:

- albuterol
- aminophylline

CALCIUM CHANNEL BLOCKERS

Actions: Inhibits the flow of **calcium** ions across the cell membrane of cardiac and vascular smooth muscle, thus relaxing the coronary vascular smooth muscle, dilating the coronary arteries, slowing SA/AV node conduction, and dilating peripheral arteries.

Uses: Angina, hypertension, and dysrhythmias.

Adverse Reactions and Side Effects: Dysrhythmias, edema, fatigue, headache, and drowsiness.

Contraindications: Systolic blood pressure of less than 90 mm HG, Wolff-Parkinson-White syndrome, 2nd or 3rd degree heart block, sick sinus syndrome, and cardiogenic shock. CHF may get worse in the presence of edema. Cautious use with hepatic and renal disease.

Implications: Monitor blood pressure, pulse and respirations. Administer at bedtime and before meals.

Examples of Medications in This Classification:

- verapamil
- felodipine

CARDIAC GLYCOSIDES

Actions: Cardiac output and cardiac contractility are enhanced by making more calcium available.

Uses: CHF and tachycardia

Adverse Reactions and Side Effects: Cardiac changes, hypotension, GI symptoms, blurred vision, yellowish-green halos and headache.

Contraindications: Hypersensitivity, ventricular fibrillation, ventricular tachycardia and carotid sinus syndrome. Caution among patients with imbalances of potassium, magnesium and/or calcium, acute MI, severe respiratory disease, AV block, renal or liver disease, hypothyroid and the elderly.

Implications: Assess vital signs, check apical rate for one full minute prior to administration (if less than 60, hold the dose and notify the MD), electrolytes (sodium, potassium, chloride and magnesium), renal and hepatic function. Monitor I & O. If K level is less than 3mg/dl, potassium supplements may be ordered.

Examples of Medications in This Classification:

- digitoxin
- digoxin

CHOLINERGICS

Actions: These medications prevent the destruction of acetylcholine, thus increasing its concentration, which enhances the transmission of impulses.

Uses: Myasthenia gravis, bladder distention, urinary distention, and postoperative paralytic ileus

Adverse Reactions and Side Effects: Bronchospasm, laryngospasm, respiratory depression, convulsion, paralysis, respiratory arrest, nausea, vomiting and diarrhea

Contraindications: Renal or intestinal obstruction. Cautious use with children, lactation, bradycardia, hypotension, seizure disorders, bronchial asthma, coronary occlusion, and hyperthyroidism

Implications: Monitor vital signs, I & O. Assess for urinary retention, bradycardia, bronchospasm, hypotension, respiratory depression.

Examples of Medications in This Classification:

- neostigmine
- bethanechol

CHOLINERGIC BLOCKERS

Actions: Blocks the autonomic nervous system's acetylcholine

Uses: Prevention of surgical secretions, to decrease the motility of the urinary, biliary and GI tracts, reverses neuromuscular blockade. Some are used for parkinsonian symptoms secondary to the use of neuroleptic medications

Adverse Reactions and Side Effects: Constipation and dryness of the mouth.

Contraindications: GU or GI obstruction, angle closure glaucoma, myasthenia gravis, and hypersensitivity. Cautious use among the elderly and with patients who have prostatic hypertrophy or tachycardia

Implications: Monitor urinary status and I & O with particular attention to any dysuria, frequency or retention. The medication may be discontinued with these signs. Observe mental status and for constipation. Administer oral doses with milk or food and administer parenteral doses slowly with the person in a recumbent position to prevent postural hypotension

Examples of Medications in This Classification:

- atropine
- scopolamine

CORTICOSTEROIDS

This classification is also subdivided. These groups are:

- glucocorticoids and
- mineralcorticoids.

Actions:

Glucocorticoids- increase capillary permeability and suppress the movement of fibroblasts and leukocytes, thereby decreasing inflammation.

Mineralcorticoids- increase potassium and hydrogen excretion in the distal tubule by increasing the resorption of sodium

Uses:

Glucocorticoids- decrease inflammation. Some are used for adrenal insufficiency, allergies and cerebral edema.

Mineralcorticoids- adrenal insufficiency

Adverse Reactions and Side Effects: Insomnia, euphoria, behavioral changes, peptic ulcer (GI irritation), sodium and fluid retention, hypokalemia, hyperglycemia, and carbohydrate intolerance (metabolic reactions)

Contraindications: Fungal infections, amebiasis, hypersensitivity, and lactation. Caution with the elderly, children and pregnant women, diabetes, seizures, peptic ulcers, glaucoma, CHF, hypertension, impaired renal function, myasthenia gravis and ulcerative colitis

Implications: GI symptoms can be prevented when the dose is given with food or milk. Monitor blood sugar, potassium, weight, I & O, plasma cortisol levels, adrenal insufficiency and for any signs of infection. Observe for mood changes, particularly depression

Examples of Medications in This Classification:

- cortisone
- dexamethasone
- hydrocortisone

DIURETICS

This classification of medications is subdivided into:

- thiazides and thiazide-like diuretics,
- loop diuretics,
- carbonic anhydrase inhibitors,
- osmotic diuretics, and
- potassium-sparing diuretics.

Actions:

Thiazides and thiazide-like diuretics- slow resorption in the distal tubule, thus increasing the excretion of sodium and water

Loop diuretics- inhibit the resorption of sodium and chloride in the loop of Henle.

Carbonic anhydrase inhibitors- decrease the sodium-hydrogen ion exchange in the tubule, thus increasing sodium excretion

Osmotic diuretics- decrease the absorption of sodium by increasing the osmotic pressure of glomerular filtrate

Potassium-sparing diuretics- decrease potassium excretion by interfering with sodium resorption at the distal tubule

Uses: Hypertension and edema with CHF

Adverse Reactions and Side Effects: Hypokalemia, hyperglycemia and hyperuricemia (mostly with thiazides), blood dyscrasias, aplastic anemia, volume depletion, and dehydration (thiazides, loop diuretics, and carbonic anhydrase inhibitors)

Contraindications: Electrolyte imbalances (K, Cl, Na), anuria, dehydration. Caution among the elderly as well as in the presence of renal or hepatic disease

Implications: A potassium supplement may be needed. Monitor electrolytes, blood sugar, and lying and standing blood pressures. Observe for signs of hypokalemia and metabolic alkalosis. The medication should be given in the morning to prevent the need for frequent nocturnal voiding.

Examples of Medications in This Classification:

- furosemide
- hydrochlorothiazide

HISTAMINE H₂ ANTAGONISTS

Actions: Inhibits histamine in the parietal cells, thereby inhibiting the secretion of gastric acid secretion

Uses: Gastric and duodenal ulcers, gastroesophageal reflux disease

Adverse Reactions and Side Effects: Thrombocytopenia, neutropenia agranulocytosis, aplastic anemia, confusion (not ranitidine), diarrhea and headache.

Contraindications: Hypersensitivity. Cautious use with children less than 16 years of age, hepatic or renal disease, organic brain syndrome, lactation and pregnancy

Implications: Monitor I & O, creatinine, BUN and gastric pH. The pH should be maintained above 5. Give slowly IV over 30 minutes to avoid bradycardia and administer oral doses with meals to prolong the effect of the medication

Examples of Medications in This Classification:

- cimetidine
- ranitidine

IMMUNOSUPPRESSANTS

Action: Inhibits lymphocytes

Uses: Prevention of organ transplant rejection

Adverse Reactions and Side Effects: Proteinuria, renal failure, albuminuria, hematuria, hepatotoxicity, oral *Candida*, gum hyperplasia, headache and tremors

Contraindications: Hypersensitivity. Caution with severe hepatic or renal disease and pregnancy

Implications: Monitor liver and kidney function, and drug blood levels. Observe for signs of hepatotoxicity, which can include itching, light colored stools, jaundice and dark urine. Administer with meals to avoid GI symptoms

Examples of Medications in This Classification:

- cyclosporine
- azathioprine

LAXATIVES

This group is also subdivided as below:

- bulk products,
- lubricants,
- osmotics,
- saline laxative stimulants, and
- stool softeners

Actions:

Bulk laxatives – absorb water thus adding bulk to the stool

Lubricants- increase water retention in the stool

Stimulants- speed up peristalsis

Saline laxatives- pull water into the intestines

Osmotics- enhance peristalsis and increase distention

Stool softeners- reduce the surface tension of liquids within the bowel.

Uses: Constipation, as a bowel prep and a stool softener

Adverse Reactions and Side Effects: Cramping, diarrhea, and nausea

Contraindications: Megacolon, abdominal pain, nausea, vomiting, impaction, GI obstruction or perforation, gastric retention and colitis. Caution with large hemorrhoids and rectal bleeding

Implications: Monitor blood, I & O, and urine electrolytes. Administer only with water to enhance absorption. Do not administer within one hour of taking an antacid, cimetidine or drinking milk.

Examples of Medications in This Classification:

- psyllium
- docusate sodium
- magnesium hydroxide
- mineral oil
- bisacodyl

NEUROMUSCULAR BLOCKING AGENTS

This classification is divided into:

- depolarizing blockers and
- nondepolarizing blockers.

Actions: Inhibition of nerve impulse transmission

Uses: The facilitation of endotracheal intubation and skeletal muscle relaxation (surgery, general anesthesia and mechanical ventilation)

Adverse Reactions and Side Effects: Apnea, respiratory depression, bronchospasm, and bradycardia

Contraindications: Hypersensitivity. Cautious use with collagen, thyroid and cardiac disease, lactation, pregnancy, children less than two years of age, dehydration, electrolyte imbalances, and myasthenia gravis

Implications: Monitor potassium and magnesium (imbalances may increase the action of this medication), vital signs every 15 minutes until recovery, and I & O. IV doses must be given over 1 to 2 minutes by a person qualified and competent to do so (usually an anesthesiologist)

Examples of Medications in This Classification:

- gallamine
- pancuronium

NONSTEROIDAL ANTIINFLAMATORIES

Actions: Decreases prostaglandin synthesis

Uses: Mild to moderate pain, arthritis and dysmenorrhea

Adverse Reactions and Side Effects: Blood dyscrasias, nephrotoxicity (oliguria, azotemia, hematuria and dysuria), abdominal pain, cholestatic hepatitis, anorexia, dizziness and drowsiness.

Contraindications: Asthma, severe liver and/or renal disease, hypersensitivity. Cautious use with the elderly, children, lactation, pregnancy and for patients with GI, cardiac and/or bleeding disorders.

Implications: Monitor blood, renal and hepatic function. Baseline hearing and eye exams are recommended so that changes can be identified. Toxicity may be signaled with tinnitus and/or blurred vision.

Examples of Medications in This Classification:

- ibuprofen
- naproxen

OPIOID ANALGESICS

This classification includes:

- opiates and
- nonopiates.

Actions: Depression of the pain impulse transmission at the level of the spinal cord

Uses: Moderate to severe pain

Adverse Reactions and Side Effects: GI (constipation, nausea, vomiting, anorexia, cramps), sedation, respiratory depression, circulatory depression and increased intracranial pressure

Contraindications: Upper airway obstruction, bronchial asthma, hypersensitivity, addiction. Cautious use with renal, hepatic, respiratory and heart disease.

Implications: Monitor respiratory, urinary and mental status, level of consciousness. An antiemetic can be used for nausea and vomiting. Continue to assess level of pain

Examples of Medications in This Classification:

- codeine
- fentanyl

SALICYLATES

Actions: Antipyretic (inhibits the heat regulation center in the hypothalamus), anti-inflammatory (inhibits prostaglandin), analgesic (inhibits prostaglandin)

Uses: Mild to moderate pain, inflammation (arthritis), fever, and thromboembolic disorders

Adverse Reactions and Side Effects: Rash, GI symptoms, hepatotoxicity, blood dyscrasias, hearing problems and tinnitus (a sign of possible toxicity)

Contraindications: Frequently occurring hypersensitivity. Contraindicated with a vitamin K deficiency, GI bleeding, a bleeding disorder, children with Reye's syndrome. Caution with Hodgkin's disease, hepatic and renal failure, anemia

Implications: Monitor renal and hepatic function, blood. Observe for signs of hepatotoxicity (clay colored stool, dark urine, diarrhea, yellow sclera and skin, itching, fever, abdominal pain) and ototoxicity (ringing or roaring in the ears, tinnitus)

Examples of Medications in This Classification:

- aspirin
- salsalate

THROMBOLYTICS

Actions: These medications convert plasminogen into plasmin which is able to break down the fibrin of clots

Uses: Pulmonary emboli, deep vein and arterial thrombosis, with or after MI, arteriovenous cannula occlusion

Adverse Reactions and Side Effects: Anaphylaxis, GI, GU, intracranial retroperitoneal bleeding, and anaphylaxis. The most common side effects are decreased Hct, urticaria, headache, and nausea.

Contraindications: Hypersensitivity, people with CNS neoplasms, bleeding, renal or hepatic disease, hypertension, COPD, subacute bacterial endocarditis, rheumatic valvular disease, cerebral embolism or thrombosis or hemorrhage, and recent surgery

Implications: Monitor vital signs and neuro signs q 4 hours, be alert for internal bleeding (temperature of more than 104 degrees), arrhythmias, retroperineal bleeding (leg weakness, back pain, and poor pulses), allergic responses (rash, fever, itching, chill), ecchymosis, hematuria, hematemesis, epistaxis. Monitor blood before and during therapy. Thrombolytics are not effective if the thrombi is more than one week old. Use 0.8 mm filter with IV administration

Examples of Medications in This Classification:

- streptokinase
- urokinase

THYROID MEDICATIONS

Actions: Increase metabolism cardiac output, blood volume, oxygen consumption, and respiratory rate

Uses: Thyroid replacement

Adverse Reactions and Side Effects: Palpitations, tachycardia, insomnia, tremors, angina, weight loss, dysrhythmias, thyroid storm.

Contraindications: MI, adrenal insufficiency and thyrotoxicosis. Cautious use with the elderly, pregnant and lactating women, and for patients with diabetes, hypertension, angina, and cardiac disease

Implications: Administer at the same time of day. Check the blood pressure before each dose. Monitor I & O, weight, cardiac status and for irritability, excitability and nervousness

Examples of Medications in This Classification:

- thyroid
- levothyroxin

VASODILATORS

Actions: Various modes for each. Check a drug reference book for specifics

Uses: Hypertension, angina, intermittent claudication, vasospasm, arteriosclerosis

Adverse Reactions and Side Effects: Both hypotension and hypertension, changes in EKG, nausea, headache

Contraindications: Tachycardia, acute MI and thyrotoxicosis. Cautious use with peptic ulcer and uncompensated heart disease

Implications: Administer with meals to reduce any GI symptoms. Check bleeding times and cardiac status

Examples of Medications in This Classification:

- amyl nitrate
- hydralazine

CONCLUSION

A thorough knowledge of medications and pharmacology is necessary in order to safely and effectively administer medication and monitor patient responses to them. Classification systems facilitate this knowledge.

To learn more about pharmacology, take our ***Calculation of Dosages and Solutions: Dimensional Analysis, Pharmacology and Medication Administration*** courses.

REFERENCES

Skidmore-Roth, Linda (2004). Mosby's Rapid Reference Library. CD-ROM