Study Guide Zone

# NCLEX-RN Test Study Guide

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# *Introduction to this Guide*

Your NCLEX score is one of the most critical elements to your qualification to become a nurse, so it is naturally much too important for you to take this test unprepared. The higher your NCLEX score, the better your chances of passing the boards.

Careful preparation, as described in this expert guide, along with hard work, will dramatically enhance your probability of success. In fact, it is wise to apply this philosophy not only to your board's exam, but to other elements of your life as well, to raise you above the competition. Your NCLEX score is one of the areas in the licensure process over which you have a substantial amount of control; this opportunity should not be taken lightly. Hence, a rational, prepared approach to your NCLEX test as well as the rest of the licensure process will contribute considerably to the likelihood of success.

Keep in mind, that although it is possible to take the NCLEX more than once, you should never take the test as an "experiment" just to see how well you do. It is of extreme importance that you always be prepared to do your best when taking the NCLEX. For one thing, it is extremely challenging to surmount a poor performance. If you are looking to take a "practice" run, look into review course, professionally developed mock NCLEX examinations, and, of course, this guide.

This guide provides you with the professional instruction you require for understanding the traditional NCLEX test. Covered are all aspects of the test and preparation procedures that you will require throughout the process. Upon completion of this guide, you'll have the confidence

and knowledge you need for maximizing your performance on your NCLEX test.

## *Testing and Analysis*

It won't take you long to discover that the NCLEX is unlike any test you've taken before, and it is probably unlike any test you will ever take again in your academic career. The typical high school or college test is a knowledge-based test. The NCLEX, however, is application-based.

What does this mean to you? It means that you'll have to prepare yourself in a completely different way! You won't simply be reciting memorized facts as they were phrased in some textbook, and you won't be applying any learned formulas to specific problems that will be laid out.

The NCLEX requires you to think in a thorough, quick and strategic manner…and still be accurate, logical and wise. This test is designed to judge your abilities in the ways that the licensure boards feel is vital to the success of first year nursing graduate.

To some extent, you have already gradually obtained these abilities over the length of your academic career. However, what you probably have not yet become familiar with is the capability to use these abilities for the purpose of maximizing performance within the complex and profound environment of a standardized, skills-based examination.

There are different strategies, mindsets and perspectives that you will be required to apply throughout the NCLEX. You'll need to be prepared to use your whole brain as far as thinking and assessment is concerned, and you'll need to do this in a timely manner. This is not

something you can learn from taking a course or reading a book, but it is something you can develop through practice and concentration.

The following chapters in this guidebook will lay out the format and style of the NCLEX as well as give you sample questions and examples of the frame of mind you'll be expected to take. If there is one skill that you take with you from your preparation for the NCLEX, this should be it.

# *Introduction to the NCLEX*

The purpose of the NCLEX is to establish a standard method of measurement for the skills that have been acquired by nursing school graduates. These skills are considered critical to the healthcare profession. The principle behind the NCLEX is similar to the SAT's that are required for application to American colleges. Although these tests are similar experiences in some respects, the NCLEX is a much more challenging and complex.

Fortunately, the NCLEX does not change very dramatically from year to year. What this means to you, is that it has become possible for quality practice tests to be produced, and if you should take enough of these tests, in addition to learning the correct strategies, you will be able to prepare for the test in an effective manner.

The NCLEX is not just a multiple-choice test. Fill in the blank questions and multiple right answer questions have been added to the test. Although these types of questions are not the majority of questions asked on the NCLEX. The main point is that the content has stayed the same. The nursing principles tested prior to these changes are still the same. The content has remained relatively the same. If you understand the content material of the exam, the type of testing question won't matter.

# *The NCLEX Scoring Scale*

The minimum number of questions asked on the NCLEX-RN exam is 75. The maximum number of questions is 265. The exam is offered in CAT format which means the difficultly of the questions varies significantly. If you miss a question, the computer will give you an easier question. If you get it right, then you will get harder questions.

Many NCLEX test takers freak out if computer shuts off after 75 questions, or if they have to take the maximum number of questions. The main point is to be prepared to go the distance. Don't be sprinter and concentrate for 100 questions and then let your concentration begin to fade. Likewise, don't stress on how many questions you have to take. You won't know the outcome until you get your scores, so don't stress out.

Take some time for yourself and do something fun following the exam.

## *NCLEX Tips*

1. Arrive early to the testing center.
2. Bring multiple forms of idea.
3. Wear layered clothing.
4. Get a good night's sleep before the test. (Don't cram)
5. Use a study partner when preparing for the exam.
6. Be familiar with the format of the exam.
7. Know your medical terminology.
8. Limit your distractions preparing for the exam.
9. Take time to unwind and reduce stress as you prepare.

10. Remember if you don't pass, you can retake the exam.

# *General Strategies*

## Strategy 1: Understanding the Intimidation

The test writers will generally choose some material on the exam that will be completely foreign to most test takers. You can't expect all of the medical topics to be a topic with which you have a fair amount of familiarity. If you do happen to come across a high number of topics/cases that you are extremely familiar with, consider yourself lucky, but don't plan on that happening.

Each case and scenario will be slightly different. Try and understand all of the material, while weeding out the distracter information. The cases will also frequently be drawn from real world experiences. Therefore, the passage that you will face on the test may almost seem out of context and as though it begins in the middle of a medical process. You won't have a nice title overhead explaining the general topic being covered but will immediately be thrown into the middle of a strange format that you don't recognize.

Getting hit by strange sounding medical topics that you don't recognize, of which you may only have a small exposure, is just normal on the NCLEX. Just remember that the questions themselves will contain all the information necessary to choose a correct answer.

## Strategy 2: Finding your Optimal Pace

Everyone reads and tests at a different rate. It will take practice to determine what is the optimal rate at which you can read fast and yet absorb and comprehend the information. This is true for both the flyover that you should initially conduct and then the subsequent reading you will have to do as you go through and begin focusing on a specific question. However, on the flyover, you are looking for only a surface level knowledge and are not trying to comprehend the minutia of details that will be contained in the question. Basically, skim the question and then read the question slowly.

With practice, you will find the pace that you should maintain on the test while answering the questions. It should be a comfortable rate. This is not a speed-reading test. If you have a good pace, and don't spend too much time on any question, you should have a sufficient amount of time to read the questions at a comfortable rate. The two extremes you want to avoid are the dumbfounded mode, in which you are lip reading every word individually and mouthing each word as though in a stupor, and the overwhelmed mode, where you are panicked and are buzzing back and forth through the question in a frenzy and not comprehending anything.

You must find your own pace that is relaxed and focused, allowing you to have time for every question and give you optimal comprehension. Note that you are looking for optimal comprehension, not maximum comprehension. If you spent hours on each word and memorized the question, you would have maximum comprehension. That isn't the goal though, you want to optimize how much you comprehend with

how much time you spend reading each question. Practice will allow you to determine that optimal rate.

## Strategy 3: Don't be a Perfectionist

If you're a perfectionist, this may be one of the hardest strategies, and yet one of the most important. The test you are taking is timed, and you cannot afford to spend too much time on any one question.

If you are working on a question and you've got your answer split between two possible answer choices, and you're going back through the question and reading it over and over again in order to decide between the two answer choices, you can be in one of the most frustrating situations possible. You feel that if you just spent one more minute on the problem, that you would be able to figure the right answer out and decide between the two. Watch out! You can easily get so absorbed in that problem that you loose track of time, get off track and end up spending the rest of the test playing catch up because of all the wasted time, which may leave you rattled and cause you to miss even more questions that you would have otherwise.

Therefore, unless you will only be satisfied with a perfect score and your abilities are in the top .1% strata of test takers, you should not go into the test with the mindset that you've got to get every question right. It is far better to accept that you will have to guess on some questions and possibly get them wrong and still have time for every question, than to analyze every question until you're absolutely confident in your answer and then run out of time on the test.

## Strategy 4: Factually Correct, but Actually Wrong

A favorite ploy of question writers is to write answer choices that are factually correct on their own, but fail to answer the question, and so are actually wrong.

When you are going through the answer choices and one jumps out for being factually correct, watch out. Before you mark it as your answer choice, first make sure that you go back to the question and confirm that the answer choice answers the question being asked.

## Strategy 5: Extraneous Information

Some answer choices will seem to fit in and answer the question being asked. They might even be factually correct. Everything seems to check out, so what could possibly be wrong?

Does the answer choice actually match the question, or is it based on extraneous information contained in the question. Just because an answer choice seems right, don't assume that you overlooked information while reading the question. Your mind can easily play tricks on you and make you think that you read something or that you overlooked a phrase.

Unless you are behind on time, always go back to the question and make sure that the answer choice "checks out."

## Strategy 6: Avoiding Definites

Answer choices that make definite statements with no “wiggle room” are often wrong. Try to choose answer choices that make less definite and more general statements that would likely be correct in a wider range of situations and aren’t exclusive.

Example:

A. The nurse should follow universal contact precautions at all times in every case.
B. The nursing assistant completely demonstrated poor awareness of transfer safety.
C. Never allow new medications to be accessible on the unit.
D. Sometimes, the action taken by the aide was not well planned.

Without knowing anything about the question, answer choice D uses the term “sometimes,” which has wiggle room, meaning there could have been a few strong points and weak points about the aide’s performance. All of the other answer choices have a more definite sense about them, implying a more precise answer choice without wiggle room that is often wrong.

## Strategy 7: Using Common Sense

The questions on the test are not intended to be trick questions. Therefore, most of the answer choices will have a sense of normalcy about them that may be fairly obvious and could be answered simply by using common sense.

While many of the topics will be ones that you are somewhat unfamiliar with, there will likely be numerous topics that you have some prior indirect knowledge about that will help you answer the questions.

## Strategy 8: Instincts are Right

When in doubt, go with your first instinct. This is an old test-taking trick that still works today. Oftentimes if something feels right instinctively, it is right. Unfortunately, over analytical test takers will often convince themselves otherwise. Don't fall for that trap and try not to get too nitpicky about an answer choice. You shouldn't have to twist the facts and create hypothetical scenarios for an answer choice to be correct.

## Strategy 9: No Fear

The depth and breadth of the NCLEX test can be a bit intimidating to a lot of people as it can deal with topics that have never been encountered before and are highly technical. Don't get bogged down by the information presented. Don't try to understand every facet of the nursing management process. You won't have to write an essay about the topics afterwards, so don't memorize all of the minute details. Don't get overwhelmed.

## Strategy 10: Don't Get Thrown Off by New Information

Sometimes test writers will include completely new information in answer choices that are wrong. Test takers will get thrown off by the new information and if it seems like it might be related, they could choose that answer choice incorrectly. Make sure that you don't get distracted by answer choices containing new information that doesn't answer the question.

Example: Which conclusion is best supported?

A: Hyponatremia can cause the anxiety presented in this case.

Was anxiety even discussed in the question? If the answer is NO – then don't consider this answer choice, it is wrong.

## Strategy 11: Narrowing the Search

Whenever two answer choices are direct opposites, the correct answer choice is usually one of the two. It is hard for test writers to resist making one of the wrong answer choices with the same wording, but changing one word to make it the direct opposite in meaning. This can usually cue a test taker in that one of the two choices is correct.

Example:

A. Calcium is the primary mineral linked to osteoporosis treatment.
B. Potassium is the primary mineral linked to osteoporosis treatment.

These answer choices are direct opposites, meaning one of them is likely correct. You can typically rule out the other two answer choices.

### Strategy 12: You're not Expected to be Einstein

The questions will contain the information that you need to know in order to answer them. You aren't expected to be Einstein or to know all related knowledge to the topic being discussed. Remember, these questions may be about obscure topics that you've never heard of. If you would need to know a lot of outside knowledge about a topic in order to choose a certain answer choice – it's usually wrong.

## *Respiratory Conditions*

Pulmonary Valve Stenosis

*Causes:*

Congenital
Endocarditis
Rheumatic Fever

*Symptoms:*

Fainting
SOB
Palpitations
Cyanosis
Poor weight gain

*Tests:*

Cardiac catheterization
ECG
Chest-Xray
Echocardiogram

*Treatment:*

Prostaglandins
Dieuretics
Anti-arrhythmics

Blood thinners

Valvuloplasty

ARDS- low oxygen levels caused by a build up of fluid in the lungs and inflammation of lung tissue.

*Causes:*

Trauma

Chemical inhalation

Pneumonia

Septic shock

*Symptoms:*

Low BP

Rapid breathing

SOB

Cyanosis

*Tests:*

ABG

CBC

Cultures

Chest X-ray

Treatment:

Echocardiogram

Auscultation

Mechanical Ventilation

Treat the underlying condition

*Monitor the Patient for:*

Pulmonary fibrosis

Multiple system organ failure

Ventilator associated pneumonia

Acidosis

Respiratory failure

Respiratory Acidosis- Build-up of Carbon Dioxide in the lungs that causes acid-base imbalances and the body becomes acidic.

*Causes:*

COPD

Airway obstruction

Hypoventilation syndrome

Severe scoliosis

Severe asthma

*Symptoms:*

Chronic cough

Wheezing

SOB

Confusion

Fatigue

*Tests:*

CAT Scan

ABG

Pulmonary Function Test.

*Treatment:*

Mechanical ventilation

Bronchodilators

Respiratory Alkalosis: $CO_2$ levels are reduced and pH is high.

*Causes:*

Anxiety
Fever
Hyperventilation

*Tests:*

ABG
Chest X-ray
Pulmonary function tests

*Symtpoms:*

Dizziness
Numbness

*Treatment:*

Paper bag technique
Increase carbon dioxide levels

RSV (Respiratory synctial virus) - spread by contact, virus can survive for various time periods on different surfaces.

*Symptoms:*

Fever
SOB
Cyanosis
Wheezing
Nasal congestion
Croupy cough

*Tests:*

ABG
Chest X-ray

*Treatment:*

Ribvirin
Ventilator in severe cases
IV fluids
Bronchodilators

*Monitor the patient for:*

Pneumonia
Respiratory failure
Otitis Media

Hyperventilation

| | |
|---|---|
| Causes: | Ketoacidosis |
| COPD | Aspirin overdose |
| Panic Attacks | Anxiety |
| Stress | |

Apnea: no spontaneous breathing.

| | |
|---|---|
| Causes: | Drug overdose |
| Obstructive sleep apnea | Prematurity |
| Seizures | Bronchospasm |
| Cardiac Arrhythmias | Encephalitis |
| Brain injury | Choking |
| Nervous system dysfunction | |

Lung surgery

| | |
|---|---|
| Causes: | Emphysema |
| Cancer | Pneumothorax |
| Lung abscesses | Tumors |
| Atelectasis | Bronchiectasis |

Pneumonia: viruses the primary cause in young children, bacteria the primary cause in adults. Bacteria: Streptococcus pneumoniae, Mycoplasma pneumoniae
*pneumoniae* (pneumococcus).

*Types of pneumonia:*
Viral pneumonia
Walking pneumonia
Legionella pneumonia
CMV pneumonia
Aspiration pneumonia
Atypical pneumonia
Legionella pneumonia

*Symptoms:*
Fever
Headache
Ribvirin
SOB
Cough
Chest pain

Tests:
Chest X-ray
Pulmonary perfusion scan
CBC
Cultures of sputum
Presence of crackles

*Treatment:*
Antibiotics if caused by a bacterial infection
Respiratory treatments
Steroids
IV fluids
Vaccine treatments

Pulmonary actinomycosis –bacteria infection of the lungs caused by (propionibacteria or actinomyces)

*Causes:*
Microorganisms

*Symptoms:*
Pleural effusions
Facial lesions
Chest pain
Cough
Weight loss
Fever

*Tests:*
CBC
Lung biopsy
Thoracentesis
CT scan
Bronchoscopy

*Monitor patient for:*

Emphysema

Meningitis

Osteomyelitis

Alveolar proteinosis: A build-up of a phospholipid in the lungs were carbon dioxide and oxygen are transferred.

*Causes:*

May be associated with infection

Genetic disorder 30-50 yrs. Old

*Symptoms:*

Weight loss

Fatigue

Cough

Fever

SOB

Tests:

Chest X-ray

Presence of crackles

CT scan

Bronchoscopy

ABG- low O2 levels

Pulmonary Function tests

*Treatment:*

Lung transplantation

Special lavage of the lungs

Pulmonary hypertension: elevated BP in the lung arteries

*Causes:*

May be genetically linked

More predominant in women

*Symptoms:*

Fainting

Fatigue

Chest Pain

SOB with activity

LE edema

Weakness

*Tests:*

Pulmonary arteriogram
Chest X-ray
ECG
Pulmonary function tests
CT scan
Cardiac catheterization

*Treatment:*

Manage symptoms
Diuretics
Calcium channel blockers
Heart/Lung Transplant if necessary

Pulmonary arteriovenous fistulas: a congenital defect were lung arteries and veins form improperly, and a fistula is formed creating poor oxygenation of blood.

*Symptoms:*

SOB with activity
Presence of a murmur
Cyanosis
Clubbing
Paradoxical embolism

*Tests:*

CT Scan
Pulmonary arteriogram
Low O2 Saturation levels
Elevated RBC's

*Treatment:*

Surgery
Embolization

Pulmonary aspergilloma: fungal infection of the lung cavities causing abscesses.

*Cause:*

Fungus *Aspergillus*

*Symptoms:*

Wheezing
SOB
Chest pain
Fever
Cough

*Tests:*

CT scan

Sputum culture

Serum precipitans

Chest X-ray

Bronchoscopy

*Treatment:*

Surgery

Antifungal medications

Pulmonary edema: most commonly caused by Heart Failure, but may be due to lung disorders.

*Symptoms:*

Restless behavior

Anxiety

Wheezing

Poor speech

SOB

Sweating

Pale skin

Drowning sensation

*Tests:*

Murmurs may be present

Echocardiogram

Presence of crackles

Low O2 Saturation levels

*Treatment:*

Diuretics

Oxygen

Treat the underlying cause

Idiopathic pulmonary fibrosis: Thickening of lung tissue in the lower aspects of the lungs.

*Causes:*

Response to an inflammatory agent

Found in people ages 50-70.

Linked to smoking

*Symptoms:*

Cough

SOB

Chest pain

Cyanosis

Clubbing

Cyanosis

*Tests:*

Pulmonary function tests

Lung biopsy

Rule out other connective tissue diseases

CT scan

Chest X-ray

*Treatment:*

Lung transplantation

Corticosteroids

Anti-inflammatory drugs

*Monitor the patient for:*

Polycythemia

Pulmonary Htn.

Respiratory failure

Cor pulmonarle

Pulmonary emboli: Blood clot of the pulmonary vessels or blockage due to fat droplets, tumors or parasites.

*Causes:*

DVT- most common

*Symptoms:*

SOB (rapid onset)

Chest pain

Decreased BP

Skin color changes

LE and pelvic pain

Sweating

Dizziness
Anxiety
Tachycardia
Labored breathing
Cough

*Tests:*
Doppler US
Chest X-ray
Pulmonary angiogram

*Monitor the patient for:*
Shock
Pulmonary hypertension
Hemorrhage
Palpitations
Heart failure

Pulmonary perfusion test
Plethysmography
ABG
Check O2 saturation

*Treatment:*
Placement of an IVC filter
Administer Oxygen
Surgery
Thrombolytic Therapy if clot detected

Tuberculosis- infection caused by *Mycobaterium tuberculosis*.

Causes:
Due to airborne exposure

*Symptoms:*
Fever
Chest pain
SOB
Weight Loss
Fatigue
Wheezing
Phlegm production

*Tests:*
Thoracentesis
Sputum cultures
Presence of crackles

TB skin test
Chest X-ray
Bronchoscopy

Generally about 6 months
Rifampin
Pyrazinamide
Isoniazid

*Treatment:*

Cytomegalovirus – can cause lung infections and is a herpes-type virus.

*Causes:*
More common in immunocompromised patients
Often associated with organ transplantation

*Symptoms:*
Fever
SOB
Fatigue
Loss of appetite
Cough
Joint pain

*Tests:*
CMV serology tests
ABG
Blood cultures

Bronchoscopy

*Treatment:*
Antiviral medications
Oxygen therapy

*Monitor the patient for:*
Kidney dysfunction
Infection
Decreased WBC levels
Relapses

Viral pneumonia – inflammation of the lungs caused by viral infection.

*Causes:*
Rhinovirus

Herpes simplex virus
Influenza

Adenovirus
Hantavirus
CMV
RSV

*Symptoms:*
Fatigue
Sore Throats
Nausea
Joint pain
Headaches
Muscular pain
Cough
SOB

*Tests:*
Bronchoscopy
Open Lung biopsy
Sputum cultures
Viral blood tests

*Treatment:*
Antiviral medications
IV fluids

*Monitor the patient for:*
Liver failure
Heart failure
Respiratory failure

Pneumothorax: a build-up of a gas in the pleural cavities.

*Types:*
Traumatic pneumothorax
Tension pneumothorax
Spontaneous pneumothorax
Secondary spontaneous pneumothorax

*Symptoms:*
SOB
Tachycardia
Hypotension
Anxiety

Cyanosis

Chest pain-sharp

Fatigue

*Tests:*

ABG

Chest X-ray

Poor breath sounds

*Treatment:*

Chest tube insertion

Administration of oxygen

# *Circulatory System*

## *Functions*

The circulatory system serves:

(1) to conduct nutrients and oxygen to the tissues;
(2) to remove waste materials by transporting nitrogenous compounds to the kidneys and carbon dioxide to the lungs;
(3) to transport chemical messengers (hormones) to target organs and modulate and integrate the internal milieu of the body;
(4) to transport agents which serve the body in allergic, immune, and infectious responses;
(5) to initiate clotting and thereby prevent blood loss;
(6) to maintain body temperature;
(7) to produce, carry and contain blood;
(8) to transfer body reserves, specifically mineral salts, to areas of need.

## *General Components and Structure*

The circulatory system consists of the heart, blood vessels, blood and lymphatics. It is a network of tubular structures through which blood travels to and from all the parts of the body. In vertebrates this is a completely closed circuit system, as William Harvey (1628) once demonstrated. The heart is a modified, specialized, powerful pumping blood vessel. Arteries, eventually becoming arterioles, conduct blood

to capillaries (essentially endothelial tubes), and venules, eventually becoming veins, return blood from the capillary bed to the heart.

## Course of Circulation

**Systemic Route:**

a. *Arterial system*. Blood is delivered by the pulmonary veins (two from each lung) to the left atrium, passes through the bicuspid (mitral) valve into the left ventricle and then is pumped into the ascending aorta; backflow here is prevented by the aortic semilunar valves. The aortic arch toward the right side gives rise to the brachiocephalic (innominate) artery which divides into the right subclavian and right common carotid arteries. Next, arising from the arch is the common carotid artery, then the left subclavian artery.

The subclavians supply the upper limbs. As the subclavian arteries leave the axilla (armpit) and enter the arm (brachium), they are called brachial arteries. Below the elbow these main trunk lines divide into ulnar and radial arteries, which supply the forearm and eventually form a set of arterial arches in the hand which give rise to common and proper digital arteries. The descending (dorsal) aorta continues along the posterior aspect of the thorax giving rise to the segmental intercostals arteries. After passage “through” (behind) the diaphragm it is called the abdominal aorta.

At the pelvic rim the abdominal aorta divides into the right and left common iliac arteries. These divide into the internal iliacs, which

supply the pelvic organs, and the external iliacs, which supply the lower limb.

b. *Venous system*. Veins are frequently multiple and variations are common. They return blood originating in the capillaries of peripheral and distal body parts to the heart.

**Hepatic Portal System:** Blood draining the alimentary tract (intestines), pancreas, spleen and gall bladder does not return directly to the systemic circulation, but is relayed by the hepatic portal system of veins to and through the liver. In the liver, absorbed foodstuffs and wastes are processed. After processing, the liver returns the blood via hepatic veins to the inferior vena cava and from there to the heart.

**Pulmonary Circuit:** Blood is oxygenated and depleted of metabolic products such as carbon dioxide in the lungs.

**Lymphatic Drainage:** A network of lymphatic capillaries permeates the body tissues. Lymph is a fluid similar in composition to blood plasma, and tissue fluids not reabsorbed into blood capillaries are transported via the lymphatic system eventually to join the venous system at the junction of the left internal jugular and subclavian veins.

## The Heart

The heart is a highly specialized blood vessel which pumps 72 times per minute and propels about 4,000 gallons (about 15,000 liters) of blood daily to the tissues. It is composed of:

Endocardium (lining coat; epithelium)

Myocardium (middle coat; cardiac muscle)

Epicardium (external coat or visceral layer of pericardium; epithelium and mostly connective tissue)

Impulse conducting system

**Cardiac Nerves:** Modification of the intrinsic rhythmicity of the heart muscle is produced by cardiac nerves of the sympathetic and parasympathetic nervous system. Stimulation of the sympathetic system increases the rate and force of the heartbeat and dilates the coronary arteries. Stimulation of the parasympathetic (vagus nerve) reduces the rate and force of the heartbeat and constricts the coronary circulation. Visceral afferent (sensory) fibers from the heart end almost wholly in the first four segments of the thoracic spinal cord.

**Cardiac Cycle:** Alternating contraction and relaxation is repeated about 75 times per minute; the duration of one cycle is about 0.8 second. Three phases succeed one another during the cycle:

a) atrial systole: 0.1 second,
b) ventricular systole: 0.3 second,
c) diastole: 0.4 second

The actual period of rest for each chamber is 0.7 second for the atria and 0.5 second for the ventricles, so in spite of its activity, the heart is at rest longer than at work.

### *Blood*

Blood is composed of cells (corpuscles) and a liquid intercellular ground substance called plasma. The average blood volume is 5 or 6

liters (7% of body weight). Plasma constitutes about 55% of blood volume, cellular elements about 45%.

**Plasma:** Over 90% of plasma is water; the balance is made up of plasma proteins and dissolved electrolytes, hormones, antibodies, nutrients, and waste products. Plasma is isotonic (0.85% sodium chloride). Plasma plays a vital role in respiration, circulation, coagulation, temperature regulation, buffer activities and overall fluid balance.

# Cardiovascular Conditions

Cardiogenic Shock: heart is unable to meet the demands of the body. This can be caused by conduction system failure or heart muscle dysfunction.

*Symptoms of Shock:*

Rapid breathing
Rapid pulse
Anxiety
Nervousness
Thready pulse
Mottled skin color
Profuse sweating
Poor capilary refill

*Tests:*

Nuclear Scans
Electrocardiogram
Echocardiogram
Electrocardiogram
ABG
Chem-7
Chem-20
Electrolytes
Cardiac Enzymes

*Treatment:*

Amrinone
Norepinephrine
Dobutamine
IV fluids
PTCA
Extreme cases-pacemaker, IABP

Aortic insufficiency: Heart valve disease that prevents the aortic valve from closing completely. Backflow of blood into the left ventricle.

*Causes:*

Rheumatic fever
Congenital abnormalities
Endocarditis
Marfan's syndrome
Ankylosing spondylitis

Reiter's syndrome

*Symptoms:*
Fainting
Weakness
Bounding pulse
Chest pain on occasion
SOB
Fatigue

*Tests:*
Palpation
Increased pulse pressure and diastolic pressure
Pulmonary edema present
Auscultation
Left heart cathereterization
Aortica angiography
Dopper US
Echocardiogram
Treatment:
Digoxin
Dieuretics
Surgical aorta valve repair

*Monitor patient for:*
PE
Left-sided heart failure
Endocarditis

Aortic aneurysm: Expansion of the blood vessel wall often identified in the thoracic region.

*Causes:*
Htn
Marfan's syndrome
Syphilis
Atherosclerosis (most common)
Trauma

*Symptoms:*
Possible back pain may be the only indicator

*Tests:*
Aortogram
Chest CT
X-ray
Treatment:

Varies depending on location
Stent
Circulatory arrest
Surgery

Bleeding
Stroke
Graft infection
Irregular Heartbeats
Heart Attack

*Monitor patient for:*

Hypovolemic shock: Poor blood volume prevents the heart from pumping enough blood to the body.

*Causes:*
Trauma
Diarrhea
Burns
GI Bleeding

Cardiogenic shock: Enough blood is available, however the heart is unable to move the blood in an effective manner.

*Symptoms:*
Anxiety
Weakness
Sweating
Rapid pulse
Confusion
Clammy skin

*Tests:*
CBC
Echocardiogram
CT scan
Endoscopy with GI bleeding
Swan-Ganz catheterization

*Treatment:*
Increase fluids via IV
Avoid Hypothermia
Epinephrine
Norepinephrine
Dobutamine

Dopamine

Myocarditis: inflammation of the heart muscle.

*Causes:*

Bacterial or Viral Infections

Polio, adenovirus, coxsackie virus

*Symptoms:*

Leg edema

SOB

Viral symptoms

Joint Pain

Syncope

Heart attack (Pain)

Fever

Unable to lie flat

Irregular heart beats

*Tests:*

Chest X-ray

Echocardiogram

ECG

WBC and RBC count

Blood cultures

*Treatment:*

Diuretics

Pacemaker

Antibiotics

Steroids

*Monitor the patient for:*

Pericarditis

Cardiomyopathy

Heart valve infection: endocarditis (inflammation), probable valvular heart disease. Can be caused by fungi or bacteria.

*Symptoms:*

Weakness

Fever

Murmur

SOB

Night sweats

Janeway lesions

Joint pain

*Tests:*

CBC

ESR

ECG
Blood cultures
Enlarged speen
Presence of splinter hemorrhages

*Treatment:*
IV antibiotics
Surgery may be indicated

*Monitor the patient for:*
Jaundice
Arrhythmias
CHF
Glomerulonephritis
Emboli

Pericarditis: Inflammation of the pericardium.

Causes:
Viral- coxsackie, adenovirus, influenza, rubella viruses
Bacterial (various microorganisms)
Fungi
Often associated with TB, Kidney failure, AIDS, and autoimmune disorders.
Surgery

*Symptoms:*
Dry cough
Pleuritis
Fever
Anxiety
Crackles
Pleural effusion
LE swelling
Chest pain
Unable to lie down flat

*Tests:*
Auscultation
MRI scan
CT scan
Echocardiogram (key test)
ESR
Chest x-ray

Blood cultures
CBC

*Treatment:*
NSAIDS
Pericardiocentesis
Analgesics
Pericardiectomy

*Monitor the patient for:*
Constrictive pericarditis
A fib.
Supraventricular tachycardia (SVT)

Arrhythmias: Irregular heart beats and rhythms disorder

*Types:*
Bradycardia
Tachycardia
Ventricular fibrillation
Ectopic heart beat
Ventricular tachycardia
Wolff-Parkinson-white syndrome
Atrial fib.
Sick sinus syndrome
Sinus Tachycardia
Sinus Bradycardia

*Symptoms:*
SOB
Fainting
Palpitations
Dizziness
Chest pain
Irregular pulse

*Tests:*
Coronary angiography
ECG
Echocardiogram
Holter monitor

*Treatment:*
Defibrillation
Pacemaker
Medications

*Monitor the patient for:*
Heart failure
Stroke
Heart attack
Ischemia

Arteriosclerosis: hardening of the arteries.

*Causes:*
Smoking
Htn
Kidney disease
CAD
Stroke

*Symptoms:*
Claudication pain
Cold feet
Muscle acheness and pain in the legs
Hair loss on the legs
Numbness in the extremities
Weak distal pulse

*Tests*:
Doppler US
Angiography
IVSU
MRI test
Poor ABI (Ankle brachial index) reading

*Treatment:*
Analgesics
Vasodilation medications
Surgery if severe
Ballon surgery
Stent placement

*Monitor the patient for:*
Arterial emboli
Ulcers
Impotence
Gas gangreene
Infection of the lower extremities

Cardiomyopathy- poor hear pumping and weakness of the myocardium.

*Causes:*
Htn
Heart attacks
Viral infections

*Types:*

Alcoholic cardiomyopathy- due to alcohol consumption

Dilated cardiomyopathy-left ventricle enlargement

Hypertrophic cardiomyopathy-abnormal growth left ventricle

Ischemic cardiomyopathy- weakness of the myocardium due to heart attacks.

Peripartum cardiomyopathy- found in late pregnancy

Restrictive cardiomyopathy-limited filling of the heart due to inability to relax heart tissue.

*Symptoms:*

Chest pain

SOB

Fatigue

Ascites

LE swelling

Fainting

Poor Appetite

Htn

Palpitations

*Tests:*

ECG

CBC

Isoenzyme tests

Coronary Angigraphy

Chest X-ray

MRI

Auscultation

*Treatment:*

Ace inhibitors

Dieuretics

Blood thinners

LVAD – Left Ventricular Assist Device

Digoxin

Vasodilators

Congestive Heart Failure:

Class I describes a patient who is not limited with normal physical activity by symptoms.
Class II occurs when ordinary physical activity results in fatigue, dyspnea, or other symptoms.
Class III is characterized by a marked limitation in normal physical activity.
Class IV is defined by symptoms at rest or with any physical activity.

*Causes:*

CAD
Valvular heart disease
Cardiomyopathies
Endocarditis
Extracardiac infection
Pulmonary embolus

*Symptoms:*

Skin cold or cyanotic
Wheezing
Mitral valvular deficits
Lower extremity edema
Pulsus alternans
Hypertension
Tachypnea

Heart Sounds:

S1- tricuspid and mitral valve close

S2- pulmonary and aortic valve close

S3- ventricular filling complete

S4-elevated atrial pressure (atrial kick)

Wave Review

| | |
|---|---|
| ST segment: | ventricles depolarized |
| P wave: | atrial depolarization |
| PR segment: | AV node conduction |
| QRS complex: | ventricular depolarization |
| U wave: | hypokalemia creates a U wave |
| T wave: | ventricular repolarization |

Wave Review Indepth:

1. P WAVE - small upward wave; indicates atrial depolarization
2. QRS COMPLEX - initial downward deflection followed by large upright wave followed by small downward wave; represents ventricular depolarization; masks atrial repolarization; enlarged R portion - enlarged ventricles; enlarged Q portion - probable heart attack.
3. T WAVE - dome shaped wave; indicates ventricular repolarization; flat when insufficient oxygen; elevated with increased K levels
4. P - R INTERVAL - interval from beginning of P wave to R wave; represents conduction time from initial atrial excitation to initial ventricular excitation; good diagnostic tool; normally < 0.2sec.

5. S-T SEGMENT - time from end of S to beginning to T wave; represents time between end of spreading impulse through ventricles and ventricular repolarization; elevated with heart attack; depressed when insufficient oxygen.

6. Q-T INTERVAL - time for singular depolarization and repolarization of the ventricles. Conduction problems, myocardial damage or congenital heart defects can prolong this.

# Arrhythmias Review

*Supraventricular Tachyarrhythmias*

Atrial fibrillation – Abnormal QRS rhythm and poor P wave appearance. (>300bpm.)

Sinus Tachycardia- Elevated ventricular rhythum/rate.

Paroxysmal atrial tachycardia- Abnormal P wave, Normal QRS complex

Atrial flutter- Irregular P Wave development. (250-350 bpm.)

Paroxysmal supraventricular tachycardia- Elevated bpm (160-250)

Multifocal atrial tachycardia- bpm (>105). Various P wave appearances.

*Ventricular Tachyarrhythmias*

Ventricular Tachycardia- Presence of 3 or greater PVC's (150-200bpm), possible abrupt onset. Possibly due to an ischemic ventricle. No P waves present.

(PVC)- Premature Ventricular Contraction- In many cases no P wave followed by a large QRS complex that is premature, followed by a compensatory pause.

Ventricular fibrillation- Completely abnormal ventricular rate and rhythum requiring emergency innervention. No effective cardiac output.

*Bradyarrhythmias*

AV block (primary, secondary (I,II) Tertiary
Primary- >.02 PR interval
Secondary (Mobitz I) – PR interval Increase
Secondary (Mobitz II) – PR interval (no change)
Tertiary- most severe, No signal between ventricles and atria noted on ECG. Probable use of Atrophine indicated. Pacemaker required.

Right Bundle Branch Block (RBBB)/Left Bundle Branch Block (LBBB)

Sinus Bradycardia- <60 bpm, with presence of a standard P wave.

# *Cardiac Failure Review*

Right Sided Heart Failure

A. Right Upper Quadrant Pain
B. Right Ventricular heave
C. Tricuspid Murmur
D. Weight gain
E. Nausea
F. Elevated Right Atrial pressure
G. Elevated Central Venous pressure
H. Peripheral edema
I. Ascites
J. Anorexia
K. Hepatomegaly

Left Sided Heart Failure

A. Left Ventricular Heave
B. Confusion
C. Paroxysmal noturnal dyspnea
D. DOE
E. Fatigue
F. $S_3$ gallop
G. Crackles
H. Tachycardia
I. Cough
J. Mitral Murmur
K. Diaphoresis
L. Orthopnea

ECG Changes with MI

T Wave inversion
ST Segment Elevation
Abnormal Q waves

ECG Changes with Digitalis

Inverts T wave
QT segment shorter

Depresses ST segment

ECG Changes with Quinidine

Inverts T wave

QT segment longer

QRS segment longer

ECG Changes with Potassium

Hyperkalemia- Lowers P wave, Increases width of QRS complex

Hypokalemia- Lowers T wave, causes a U wave

ECG Changes with Calcium

Hypercalcemia-Makes a longer QRS segment

Hypocalcemia- Increases time of QT interval

# *Endocrine Review*

Hypothyroidism: Poor production of thyroid hormone:
Primary- Thyroid cannot meet the demands of the pituitary gland.
Secondary- No stimulation of the thyroid by the pituitary gland.

*Causes:*
Surgical thyroid removal
Irradiation
Congenital defects
Hashimoto's thyroiditis (key)

*Symptoms:*
Constipation
Weight gain
Weakness
Fatigue
Poor taste
Hoarse vocal sounds
Joint pain
Muscle weakness
Poor speech
Color changes
Depression

*Tests:*
Decreased BP and HR
Chest X-ray
Elevated liver enzymes, prolactin, and cholesterol
Decreased T4 levels and serum sodium levels
Presence of anemia
Low temperature
Poor reflexes

*Treatment:*
Increase thyroid hormone levels
Levothyroxine

*Monitor the patient for:*
Hyperthyroidism symptoms following treatment
Heart disease
Miscarriage
Myxedema coma if untreated

Hyperthyroidism: excessive production of thyroid hormone.

*Causes:*
Iodine overdose
Thyroid hormone overdose
Graves' disease (key)
Tumors affecting the reproductive system

*Symptoms:*
Skin color changes
Weight loss
Anxiety
Possible goiter
Nausea
Exophthalmos
Diarrhea
Hair loss
Elevated BP
Fatigue
Sweating

*Tests:*
Elevated Systolic pressure noted
T3/T4 (free) levels increased
TSH levels reduced

*Treatment:*
Radioactive iodine
Surgery
Beta-blockers
Antithyroid drugs

Congenital adrenal hyperplasia: Excessive production of androgen and low levels of aldosterone and cortisol. (Geneticially inherited disorder). Different forms of this disorder that affect males and females differently.

Causes: Adrenal gland enzyme deficit causes cortisol and aldosterone to not be produced. Causing male sex characteristics to be expressed prematurely in boys and found in girls.

*Symptoms:*

Boys:

Small testes development

Enlarged penis development

Strong musculature appearance

*Girls:*

Abnormal hair growth

Low toned voice

Abnormal genitalia

Lack of menstruation

Salt levels

Low levels of cotisol

Low levels of aldosterone

Increased 17-OH progesterone

Increased 17-ketosteroids in urine

*Treatment:*

Reconstructive surgery

Hydrocoristone

Dexamethasone

*Tests:*

Primary/Secondary Hyperaldosteronism

Primary Hyperaldosteronism: problem within the adrenal gland causing excessive production of aldosterone.

Secondary Hyperaldosteronism: problem found elsewhere causing excessive production of aldosterone.

*Causes:*

Primary:

Tumor affecting the adrenal gland

Possibly due to HBP

Secondary:

Nephrotic syndrome

Heart failure

Cirrhosis

Htn

*Symptoms:*

Paralysis

Fatigue

Numbness sensations

Htn

Weakness

*Tests:*

Increased urinary aldosterone

Abnormal ECG readings
Decreased potassium levels
Decreased renin levels

*Treatment:*
Primary: Surgery
Secondary: Diet/Drugs

Cushing's syndrome: Abnormal production of ACTH which in turn causes elevated cortisol levels.

*Causes:*
Corticosteroids prolonged use
Tumors

*Symptoms:*
Muscle weakness
Central obesity distribution
Back pain
Thirst
Skin color changes
Bone and joint pain
Htn
Headaches
Frequent urination
Moon face
Weight gain
Acne

*Tests:*
Dexamethasone suppression test
Cortisol level check
MRI- check for tumors

*Treatment:*
Surgery to remove tumor
Monitor corticosteroid levels

*Monitor the patient for:*
Kidney stones
Htn
Bone fractures
DM
Infections

Diabetic ketoacidosis: increased levels of ketones due to a lack of glucose.

Causes: Insufficient insulin causing ketone production which end up in the urine. More common in type I vs. type 2 DM.

*Symptoms:*
Low BP
Abdominal pain
Headaches
Rapid breathing
Loss of appetite
Nausea
Fruit breath smell
Mental deficits

*Tests:*
Elevated glucose levels
Increased amylase and potassium levels
Ketones in urine
Check BP

*Treatment:*
Insulin
IV fluids

*Monitor the patient for:*
Renal failure
MI
Coma

T3/T4 Review
Both are stimulated by TSH release from the Pituitary gland
T4 control basal metabolic rate
T4 becomes T3 within cells. (T3) Active form.
T3 radioimmunoassay- Check T3 levels
Hyperthyroidism- T3 increased, T4 normal- (in many cases)

*Medications that increase levels of T4:*
Methadone
Oral contraceptives
Estrogen

Cloffibrate

*Medications that decrease levels of T4:*

Lithium

Propranolol

Interferon alpha

Anabolic steroids

Methiamazole

Lymphocytic thyroiditis: Hyperthyroidism leading to hypothyroidism and then normal levels.

Causes: Lymphocytes permeate the thyroid gland causing hyperthyroidism initially.

*Symptoms:*

Fatigue

Menstrual changes

Weight loss

Poor temperature tolerance

Muscle weakness

Hyperthyroidism symptoms

*Tests:*

T3/T4 increased

Increased HR

Lymphocyte concentration noted with biopsy

*Treatment:*

Varies depending on symptoms. (Beta blockers may be used.)

*Monitor the patient for:*

Autoimmune thyroditis

Hashimoto's thyroiditis

Goiter

Stuma lymphomatosoma

Graves' disease: most commonly linked to hyperthyroidism, and is an autoimmune disease. Exophthalmos may be noted (protruding eyeballs). Excessive production of thyroid hormones.

*Symptoms:*

Elevated appetite
Anxiety
Menstrual changes
Fatigue
Poor temperature tolerance
Diplopia
Exophthalmos

*Tests:*

Elevated HR
Increased T3/T4 levels
Serum TSH levels are decreased
Goiter

*Treatment:*

Beta-blockers
Surgery
Prednisone
Radioactive iodine

*Monitor the patient for:*

Fatigue
CHF
Depression
Hypothyroidism (over-correction)

Type I diabetes (Juvenile onset diabetes)

Causes: Poor insulin production from the beta cells of the pancreas. Excessive levels of glucose in the blood stream that cannot be used due to the lack of insulin. Moreover, the patient continues to experience hunger, due to the cells not getting the fuel that they need. After 7-10 years the beta cells are completely destroyed in many cases.

*Symptoms:*

Weight loss

Vomiting

Nausea

Abdominal pain

Frequent urination

Elevated thirst

*Tests:*

Fasting glucose test

Insulin test

Urine analysis

*Treatment:*

Insulin

Relieve the diabetic ketoacidosis symptoms

Foot ulcer prevention

*Monitor for infection:*

Monitor for hypoglycemia conditions if type I is over-corrected.

Glucagon may need to be administered if hypoglycemia conditions are severe.

Monitor the patient for ketone build-up if type I untreated.

Get the eyes checked- once a year

Type II diabetes

The body does not respond appropriately to the insulin that is present. Insulin resistance is present in Type II diabetes. Results in hyperglycemia.

*Risk factors for Type II Diabetes:*

Obesity
Limited exercise individuals
Race-Minorities have a higher distribution
Elevated Cholesterol levels
Htn

*Symptoms:*

Blurred vision
Fatigue
Elevated appetite
Frequent urination
Thirst
Note: A person may have Type II and be symptom free.

*Tests:*

Random blood glucose test.
Oral glucose tolerance test
Fasting glucose test.

*Treatment:*

Tlazamide
Glimepiride
Control diet
Increase exercise levels
Repaglidine/Nateglinide
Glycosylated hemoglobin
BUN/ECG
Frequent blood sugar testing
Acarbose
Diabetic Ulcer prevention

Monitor the patient for:

Neuropathy
CAD
Increased cholesterol
Retinopathy
PVD
Htn

Diabetes Risk Factors:

Bad diet

Htn

Weight distribution around the waist/overweight.

Certain minority groups

History of diabetes in your family

Poor exercise program

Elevated triglyceride levels

# *Microbiology Review*

## Characteristics of Bacteria Types

Rickettsias- gram-negative bacteria, small

*Rickettsia rickettsii*

Spirochetes- spiral shape, no flagella, slender

*Lyme disease, Treponema pallidum-syphilis*

Gram positive cocci- Hold color with Gram stain, ovoid or spherical shape

*Staphlyococcus aureus, Streptococcus pneumoniae*

Gram negative cocci- Loose color with Gram stain, spherical or oval shape

*Neisseria meningidis* (meningococcus*), Neisseria gonorrhoeae* (gonococcus)

Mycoplasmas- *Mycoplasma pneumoniae*

Acid-fast bacilli- Hold color with staining even when stained with acid in most

cases. *Mycobacterium leprae, Mycobacterium tuberculosis*

Acitinomycetes- Stained positive with a gram stain, narrow filaments

*Nocardia, Actinomyces israelii*

Gram positive- Rod shaped, hold color with gram stain

*Clostridium tetani, Bacillus anthracis*

Gram negative- Do not hold color with gram stain, also rod shaped. *Pseudomonas aeruginosa, Escherichia coli, Klebsiella pneumoniae*

**Diseases and Acid Fast Bacilli Review**

| Disease | Bacteria | Primary Medication |
|---|---|---|
| Tuberculosis, renal and meningeal infections | *Mycobacterium tuberculosis* | Isoniazid + rifampin + pyrazinamide |
| Leprosy | *Mycobacterium leprae* | Dapsone + rifampin |

**Diseases and Spirochetes Review**

| Disease | Bacteria | Primary Medication |
|---|---|---|
| Lyme Disease | *Borrelia burgdorferi* | Tetracycline |
| Meningitis | *Leptospira* | Penicillin G |
| Syphilis | *Treponema pallidum* | Penicillin G |

**Diseases and Actinomycetes Review**

| Disease | Bacteria | Primary Medication |
|---|---|---|
| Cervicofacial, and other lesions | *Actinomyces israelii* | Penicillin G |

## Diseases and Gram-Negative Bacilli Review

| Disease | Bacteria | Primary Medication |
|---|---|---|
| Meningitis | *Flavobacterium meningosepticum* | Vancomycin |
| UTI's Bacteremia | *Escherichia coli* | Ampicillin+/- aminoglycoside |
| Gingivitis, Genital infections, ulcerative pharyngitis | *Fusobacterium nucleatum* | Penicillin G |
| Abscesses | *Bacteroides species* | Clindamycin/Penicillin G |
| Hospital acquired infections | *Acinetobacter* | Aminoglycoside |
| Abscesses, Endocarditis | *Bacteroides fragilis* | Clindamycin, metronidazole |
| Legionnaires' Disease | *Legionella pneumonphila* | Erythromycin |
| UTI's | *Proteus mirabilis* | Ampicillin/Amoxicillin |
| Pneumonia, UTI's, Bacteremia | *Pseudomonas aeruginosa* | Penicillin-Broad |
| Bacteremia, Endocarditis | *Streptobacillus moniliformis* | Penicillin G |
| Pneumonia, UTI | *Klebsiella pneumoniae* | Cephalosporin |
| Bacteremia, Wound infections | *Pasteurella multocida* | Penicillin G |

## Diseases and Gram-Positive Bacilli Review

| Disease | Bacteria | Primary Medication |
|---|---|---|
| Gas Gangrene | *Clostridium* | Penicillin G |
| Tetanus | *Clostridium tetani* | Penicillin G |
| Pharyngitis | *Corynebacterium diphtheriae* | Penicillin G |
| Meningitis, Bacteremia | *Listeria monocytogenes* | Ampicillin |
| Anthrax / pneumonia | *Bacillus anthracis* | Penicillin G |
| Endocarditis | *Corynebacterium species* | Penicillin G/Vancomycin |

## Diseases and Cocci Review

| Disease | Bacteria | Primary Medication |
|---|---|---|
| Genital infections, arthritis-dermatitis syndrome | *Neisseria gonorrhoeae* | Ampicillin, Amoxicillin |
| Meningitis, Bacteremia | *Neisseria meningitidis* | Penicillin G |
| Endocarditis, Bacteremia | *Streptococcus (viridans group)* | Gentamicin |
| Bacteremia, brain and other absesses | *Streptococcus (anaerobic species)* | Penicillin G |
| Endocarditis, Bacteremia | *Streptococcus agalactiae* | Ampicillin |
| Pneumonia, Osteomyelitis, | *Staphyloccus aureus* | Penicillin G/Vancomycin |

| | | |
|---|---|---|
| abscesses | | |
| UTI's, Endocarditis | *Streptococcus faecalis* | Ampicillin, Penicillin G |
| Pneumonia, sinusitis, otitis, Arthritis | *Streptococcus pneumoniae* | Penicillin G or V |
| Cellulitis, Scarlet fever, bacteremia | *Streptococcus pyogenes* | Penicillin G or V |
| Bacteremia, endocarditis | *Streptococcus bovis* | Penicillin G |

**DNA Virus Review**

| *DNA Virus* | *Infection* |
|---|---|
| Adenovirus | Eye and Respiratory infections |
| Hepatitis B | Hepatitis B |
| Cytomegalovirus | Cytomegalic inclusion disease |
| Epstein-Barr | Infectious mononucleosis |
| Herpes Types 1 and 2 | Local infections oral and genital |
| Varicella-zoster | Chickenpox, herpes zoster |
| Smallpox | Smallpox |

**RNA Virus Review**

| *RNA Virus* | *Infection* |
|---|---|
| Human respiratory virus | Respiratory tract infection |
| Hepatitis A virus | Hepatitis A |
| Influenza virus A-C | Influenza |
| Measles virus | Measles |
| Mumps virus | Mumps |

| | |
|---|---|
| Respiratory syncytial virus | Respiratory tract infection in children |
| Poliovirus | Poliomyelitis |
| Rhinovirus types 1-89 | Cold |
| Human immunodeficiency virus | AIDS |
| Rabies virus | Rabies |
| Alphavirus | Encephalitis |
| Rubella virus | Rubella |

## Immunoglobulin isotypes

IgA– can be located in secretions and prevents viral and bacterial attachment to membranes.

IgD- can be located on B cells

IgE-main mediator of mast cells with allergen exposure.

IgG- primarily found in secondary responses. Does cross placenta and destroys viruses/bacteria.

IgM- primarily found in first response. Located on B cells

## Cytokines Review

IL-1 Primarily stimulate of fever response. Helps activate B and T cells. Produced by macrophages.

IL-2 Aids in the development of Cytotoxic T cells and helper cells. Produced by helper T cells.

IL-3 Aids in the development of bone marrow stem cells. Produced by T-cells.

IL-4 Aids in the growth of B cells. Produced by helper T-cells. Aids in the production of IgG and IgE

IL-5 Promotes the growth of eosinophils. Produced by helper T-cells. Also promotes IgA production.

IL-8 Neutrophil factor

TNF-$\alpha$ Promotes the activation of neutrophils and is produced by macrophages.

TNF-$\beta$Produced by T lymphocytes and encourages the activation of neutrophils

$\gamma$-interferon (Activates macrophages and is produced by helper T cells.)

**Controlled Substance Categories**

| | |
|---|---|
| Schedule I | Highest potential abuse, used mostly for research. (heroin, peyote, marijuana) |
| Schedule II | High potential abuse, but used for therapeutic purposes (opioids, amphetamines and barbiturates) |
| Schedule III | Mild to moderate physical dependence or strong psychological dependence on both. (opioids such as codeine, hydrocodone that are combined with other non-opoid drugs) |
| Schedule IV | Limited potential for abuse and physical and/or psychological dependence (benzodiazepines, and some low potency opioids) |
| Schedule V | Lowest abuse potential of controlled substances. Used in cough medications and anti-diarrheal preps. |

Dose Response- the relationship between dose and the body's response is called a dose-response curve (DRC).

Potency- relates to the dosage required to produce a certain response. A more potent drug requires a lower dosage than does a less potent drug to produce a given effect.

Efficacy- usually refers to maximum efficacy. Maximum efficacy is plateau (or maximum response), but may not be achievable clinically due to undesirable side effects. In general, the steepness of the curve dictates the range of doses that are useful therapeutically.

$LD_{50}/ED_{50}$ -- Quantal dose response curve is the relationship between the dose of the drug and the occurrence of a certain response.

Therapeutic index (TI)- the ratio of the median effective dose ($ED_{50}$) and the toxic dose ($TD_{50}$) is a predictor of the safety of a drug. This ratio is called the therapeutic index. Note: Acetominophin has TI of 27. Meperidine (DEMEROL) has a TI of 8.

| Drug Suffix | Example | Action |
|---|---|---|
| -azepam | Diazepam | Benzodiazepine |
| -azine | Chlorpromazine | Phenothiazine |
| -azole | Ketoconazole | Anti-fungal |
| -barbital | Secobarbital | Barbiturate |
| -cillin | Methicillin | Penicillin |
| -cycline | Tetracycline | Antibiotic |
| -ipramine | Amitriptyline | Tricyclic Anti-depressant |
| -navir | Saquinavir | Protease Inhibitor |
| -olol | Timolol | Beta Antagonist |
| -oxin | Digoxin | Cardiac glycoside |
| -phylline | Theophylline | Methylxanthine |
| -pril | Enalapril | ACE Inhibitor |
| -terol | Albuterol | Beta 2 Agonist |
| -tidine | Ranitidine | $H_2$ Antagonist |
| -trophin | Somatotrophin | Pituitary Hormone |
| -zosin | Doxazosin | Alpha 1 Antagonist |

## Cardiovascular Pharmacology

Antiarrhythmics- Na+ channel blockers (Class I)

| Class IA | | |
|---|---|---|
| Procainamide | Class IB | Class IC |
| Disopyramide | Mexiletine | Flecainide |
| Amiodarone | Lidocaine | Encainide |
| Quinidine | Tocainide | Propafenone |

Antiarrhythmics (Beta blockers) (Class II)

Metroprolol

Atenolol

Propranolol

Timolol

Esmolol

Antiarrhythmics (K+Channel blockers) (ClassIII)

Sotaolol

Amiodarone

Bretylium

Ibutilide

Antiarrhythmics (Ca2+ channel blockers) (Class IV)

Diltiazem

Verapamil

Vasodilators: Verapamil

Minoxidil
Hydralazine

Calcium Channel Blockers:
Verapamil
Diltiazem
Nifedipine

Sympathoplegics:
Beta blockers
Clonidine
Reserpine
Guanethidine
Prazosin

ACE Inhibitors:
Lisinopril
Enalapril
Captopril

Cardiac glycosides:
Digoxin

Dieuretics:
Loop Dieuretics
Hydrocholorothiazide

K+ Sparing Dieuretics
Spironolactone
Triamterene
Amiloride

## CNS Pharmacology

Sympathomimetics:
Dopamine
Dobutamine
Epinephrine
Norephinephrine
Isoproterenol

Cholinomimetics:
Carbachol
Neostigmine
Pyridostigmine
Echothiophate
Bethanechol

Cholinoreceptor blockers:
Hexamethonium-Nicotinic blocker
Atropine-Muscarinic blocker

Beta blockers:
Atenolol
Nadolol
Propranolol
Metoprolol
Pindolol
Labetalol

Tricyclic Antidepressants:
Doxepine
Imipramine
Amitriptyline
Nortriptyline
Amitriptyline

Parkinson's Treatment:
L-dopa
Amantadine
Bromocriptine

Benzodiazepindes:
Iorazepam
Triazolam
Oxazepam
Diazepam

Opiod Analgesics:
Heroin
Methadone
Morphine
Codeine
Dextromethorphan
Meperidine

MAO Inhibitors:

Tranylcypromine
Phenelzine

Seroton specific Re-uptake inhibitors:
Paroxetine
Sertraline
Fluoxetine
Citalopram

Epilepsy Treatment:
Valproic acid
Phenobarbital
Benzodiazepines
Gabapentin
Ethosuximide
Carbamazepine

Barbiturates:
Pentobarbital
Thiopental
Phenobarbital
Secobarbital

IV Anethestics:
Midazolam
Ketamine
Morphine
Fentanyl
Propofol
Thiopental

Local Anesthetics:
Tetracaine
Procaine
Lidocaine

Neuroleptics (Antipsychotic drugs)
Chlorpromazine
Thioridazine
Clozapine
Fluphenazine
Haloperidol

Alpha 1 Selective blockers:
Terazosin
Prazosin
Doxazosin
Alpha 2 Selective blockers:
Yohimbine

Glaucoma Treatment:
Prostaglandins
Dieuretics
Alpha agonists
Beta Blockers

Cholinomimetics

Cancer Treatment Drugs:

Etoposide
Nitrosoureas
Cisplatin
Doxorubicin
Incristine
Paclitaxel
Methotrexate
6 – mercaptopurine
Busulfan
5 – fluorouracil
Lomustine
Carmustine

Throbolytics:
Urokinase
Anistreplase
Streptokinase
Alteplase

Cox 2 Inhibitors:
Rofecoxib
Celecoxib

NSAID's:
Naproxen
Indomethacin
Ibuprofen

Diabetic Treatment:
Sulfonylureas:
Chlorpropamide
Tolbutamide
Glyburide

Insulin- Key

Metformin

Glitazones:

Rosiglitazone

Troglitazone

Pioglitazone

Asthma Treatment:

Corticosteroids:

Prednisone

Beclomethasone

Antileukotrienes:

Zafirlukast

Zileuton

Beta 2 agonists:

Salmeterol

Albuterol

Nonselective Beta agonists:

Isoproterenolol

Muscarinic agonists:

Ipratropium

$H_2$ blockers:

Famotidine

Nizatidine

Cimetidine

Ranitidine

## Anti-Microbial Drugs

Tetracyclines:
Tetracycline
Doxycycline
Minocycline
Demeclocycline

Macrolides:
Carithormycin
Erythromycin
Azithromycin

Aminoglycosides:
Amikacin
Gentamicin
Neomycin
Tobramycin
Streptomycin

Protein Synthesis Inhibitors:
Chloramphenicol
Aminoglycosides
Tetracyclines

TB Medications:
Isoniazid
Rifampin
Ethambutol
Pyrazinamide
Ethambutol

Fluoroquinolones:
Ciprofloxacin
Sparfloxacin
Enaxacin
Nalidixic acid
Norfloxacin
Mortifloxacin

Sulfonamides:
Sulfadiazine
Sulfisoxazole
Sulfamethoxazole

Malaria Treatment:
Chlorquine
Quinine
Mefloquine

Additional Mentionable Anti-viral Drugs:
Acyclovir

Amatadine

Ribavirin

Zanamivir

Ganciclovir

HIV Treatment:

Zidovudine (AZT)

Nevirapine

Didanosine

Protease Inhibitors-(HIV)

Saquinavir

Retinonavir

Nelfinavir

# *Measurement Equivalents*

## Weights Conversion Table

| | |
|---|---|
| .1 mg | 1/600 grain |
| .2 mg | 1/300 grain |
| .5 mg | 1/120 grain |
| 1 mg | 1/60 grain |
| 10 mg | 1/6 grain |
| 30 mg | ½ grain |
| 60 mg | 1 grain |
| 300 mg | 5 grains |
| 1 gm | 15 grains |
| 4 gm | 60 grains |
| 15 gm | 4 drams |
| 30 gm | 1 ounce |

## Volume Conversion Table

| *Household* | *Metric* | *Apothecary* |
|---|---|---|
| 1 quart | 1000 ml | 1 quart |
| 1 pint | 500 ml | 1 pint |
| 2 tablespoons | 30 ml | 1 ounce |
| 1 tablespoons | 15 ml | 4 fluid drams |
| 1 teaspoon | 5 ml | 1 fluid dram |
| 15 drops | 1ml | 15 minims |

## Common Conversions

| | |
|---|---|
| 1 meter | 1000 (mm) |
| 1 meter | 100 (cm) |
| .001 milligram | 1 (mcg) |
| 1 gram | 1000(mg) |
| 1000 grams | 1 (kg) |
| 1 tablespoon (T) | 15 (ml) |
| 1 teaspoon (tsp) | 5 (ml) |
| 20 drops | 1 (ml) |
| 2.2 (lb) | 1 (kg) |
| 1 (lb) | 453.6 (gm) |
| 1 (oz) | 30 (gm) |
| 1 (ml) | 1 (cc) |
| 1 (dl) | 100 (ml) |

**Solid Conversions**

| *Apothecary* | *Avoirdupois* |
|---|---|
| 2.7 (lb) | 2.2 (lb) |
| 1.33 (lb) | 1 (lb) |
| 480 (gr) | 1 (ounce) |
| 15 (gr) | 15.4 (gr) |
| 1 (gr) | 1 (gr) |

**Liquid Conversions**

| *Household* | *Metric* | *Apothecary* |
|---|---|---|
| 1 drop | .06 (ml) | 1 minim |
| ¼ teaspoon | 1 (ml) | 15 or 16 minims |

| | | |
|---|---|---|
| 1 teaspoon | 4 or 5 (ml) | 1 fluid dram |
| 1 tablespoon | 15 (ml) | 4 fluid dram |
| 2 tablespoons | 30 (ml) | 1 fluid ounce |
| 1 cup | 250 (ml) | 8 fluid ounces |
| 1 pint | 500 (ml) | 16 fluid ounces |
| 1 quart | 1000 (ml) | 32 fluid ounces |

**Metric - (Apothecaries')**

| | |
|---|---|
| 1/100 grain | .6 (mg) |
| 1/60 grain | 1 (mg) |
| 1/30 grain | 2 (mg) |
| 1/20 grain | 3 (mg) |
| 1/15 grain | 4 (mg) |
| 1/10 grain | 6 (mg) |
| 1/6 grain | 10 (mg) |
| 1/5 grain | 12 (mg) |
| 1/3 grain | 20 (mg) |
| 3/8 grain | 25 (mg) |
| ½ grain | 30 (mg) |
| 1 grain | 60 (mg) |
| 1 ½ grains | 100 (mg) |
| 5 grains | 300 (mg) |
| 10 grains | 600 (mg) |

# *Drug Distribution*

Bioavailability dependant on several things:

1. Route of administration
2. The drug's ability to cross membranes
3. The drug's binding to plasma proteins and intracellular components

Membrane Review:

1. Membranes separate the body in components
2. The ability of membranes to act as barriers is related to its structure
3. Lipid Soluable compounds (many drugs) pass through by becoming dissolved in the lipid bylayer.
4. Glucose, H20, electrolytes can't pass on their own. They use pores.
5. In excitable tissues, the pores open and close.
6. Movement occurs by:
    a. passive diffusion
    b. active transport
    c. facilitated diffusion
    d. endocytosis

Passive Diffusion Review:

1. No energy expended.
2. Weak acids and bases need to be in non-ionized form (no net charge).

3. Drugs can also move between cell junctions. BBB is exception.
4. Must be lipid soluable to pass through pores.
5. Osmosis is a special case of diffusion
    a. A drug dissolved in H2O will move with the water by “bulk flow”
    b. Usually limited to movement through gap junctions because size too large for pores.

Active Transport Review:

1. Requires energy and requires a transport protein
2. Drugs must be similar to some endogenous substance.
3. Can carry substances against a gradient
4. Some drugs may exert their effect by increasing or decreasing transport proteins.

Facilitated Diffusion Review:

1. Requires transport protein
2. Does not require energy
3. Very few drugs move this way

Endocytosis:

1. Drug gets engulfed by cell via invagination
2. Very few drugs move this way and only in certain cells.

Regulation of distribution determined by:

1. Lipid permeability
2. Blood flow

3. Binding to plasma proteins
4. Binding to subcellular components

Volume of Distribution ($V_d$) - is a calculation of where the drug is distributed.

$V_d$ = $\frac{\text{amount of drug given (mg)}}{\text{concentration in plasma (mg/ml)}}$

Calculate the $V_d$ and compare to the total amount of body H20 in a person.
-if $V_d$ = total amount of body (approx. 42) is uniformly distributed
-if $V_d$ is less than 42 – retained in plasma and probably bound to plasma proteins
-if $V_d$ is more than 42 – concentrated in tissues

This is not a “real value” but tells you where the drug is being distributed.

Placental Transfer of Drugs

1. Some drugs cause congenital anomalies
2. Cross placenta by simple diffusion
3. Must be polar or lipid-insoluable Not to Enter
4. Must assume the fetus is subjected to all drugs taken by the mother to some extent.

# *Biotransformation of Drugs*

Biotransformation refers to chemically altering the original drug structure. "Metabolite" refers to the altered version. Biotransformation metabolites are generally more polar than the original drug. The kidney will excrete polar compounds, but reabsorb non-polar compounds.

Enzymatic reactions are either Phase I or Phase II reactions:
Phase I include:

1. hydrolysis rxns – split the original compound into separate parts
2. reduction rxns – either remove O2 or add H
3. oxidation rxns- adds an O2 molecule and removes a H molecule. These are the most predominant reactions for biotransforming drugs

Phase I reactions are generally more polar and usually inactive-some exceptions.

Phase II reactions are called conjugation rxns.

1. Lead to the formation of a covalent bond between the drug and another compound such as glucaronic acid, amino acids or acetate.
2. Products are highly polar and generally inactive- morphine is exception.
3. Products are rapidly excreted in urine and feces because poorly reabsorbed by kidney and intestine.
4. There is also a phenomenon known as entrohepatic recirculation – can result in re-entry of the parent drug back

into the circulation and leads to delayed elimination and prolonged effect of the drug.

Most metabolism takes place in the liver- 1st pass significant. Kidney, skin, GI, and lugs have significant metabolic capacity. Phase I reactions take place mostly in endoplasmic reticulum (ER). Phase II reactions take place mostly in cytosol.

Cytochrome P450 mono-oxygenase enzymes are the major catalyst in Phase I. The Cyt 450 system is a series of enzymes that are heme containing proteins. The catalyze oxidation/reduction reactions- which make compounds more + or -. These metabolites are subjected to conjugation reactions and then excreted.

Biotransformation Factors:

1. Induction- certain drugs induce synthesis of addition Cyt 450 enzymes
2. Inhibition- certain drugs inhibit Cyt 450 enzymes
3. Genetic Polymorphism-slow vs. fast metabolizers
4. Disease- impaired liver function, decreased hepatic blood flow
5. Age/Gender-rate of phase I/II reactions slow in infants, females may have reduced ability to metabolize certain compounds?

## Drug Elimination

1. Renal elimination

a. Drugs get filtered and if not reabsorbed, gets excreted in urine
b. Renal excretion involves: glomerular filtration, active tubular secretion, and passive tubular reabsorption.

2. Elimination by other routes.
    a. Lungs mostly volatile compounds
    b. Bile/fecal excretion
    c. Saliva, sweat, tears, breast milk
    d. Hair, skin

# *General Pharmacokinetics Review*

Clinical Pharmacokinetics attempts to quantify the relationship between dose and effect. Primary parameters that dictate dosage include:

1. Clearance
2. Volume of Distribution
3. Bioavailability

Clearance-measure of the body's ability to eliminate a drug. Clearance is an expression of the volume of plasma which is cleared of the drug per unit time (ml/hr) not the concentration of the drug cleared.

$$\text{Clearance} = \text{flow (ml/min)} \times \frac{\text{amount of drug removed from the blood (mg/ml)}}{\text{Amount of drug going in to kidney (mg/ml)}}$$

Or

$$Cl = \text{flow} \times \frac{[C]in - [C]out \text{ (amount removed)}}{[C] \text{ in (amount in blood)}}$$

The systems of drug elimination are not usually saturated so drug elimination is dependent on the concentration of drug in the plasma. This means the higher the concentration of the drug, the faster the blood is cleared. When this is true this is called 1$^{st}$ order kinetics. In

1st order kinetics a constant faction of the drug is eliminated/unit time. The time required to remove half of the drug is called t ½. T1/2 is constant in 1st order kinetics.

In 1st order kinetics the:

Rate of elimination = concentration of drug in plasma (mg/ml) x Cl (ml/hr). When the systems for drug elimination become saturated, now have zero order elimination. Zero order elimination means that the elimination rate is constant over time, regardless of the concentration of drug in the system.

The aim is to maintain a steady-state concentration of a drug within a known therapeutic range. Steady state is achieved when the rate of elimination = rate of availability.

$$\text{Availability} = \frac{\text{amount of drug in plasma}}{\text{amount of drug given}}$$

Rate of Elimination = Cl x concentration in plasma

Time to reach steady state depends on dosing interval and elimination t ½ . If you want to achieve steady state more rapidly, a loading dose can be given followed by a maintenance dose.

Loading dose (mg) = target concentration (mg/ml) x $V_d$ (ml)

Maintenance dose = amount given must equal amount eliminated within dosing time.

If given at intervals shorter than elimination time = toxicity.

If given at intervals longer than elimination time = ineffective dose.

## Pharmacodynamic Terms

1. Agonist – has affinity and efficacy
2. Partial agonist – has affinity and partial efficacy
3. Antagonist – has affinity, no efficacy
4. Additive effects- !+1 = 2
5. Synergistic effects- 1+1 = 3
6. Affinity – attraction between drug and (X)
7. Specificity- attraction between drug and specific (X)
8. Potentiation- one drug enhances the effect of another drug
   Ex. Aspirin bumps T3/T4 off plasma proteins- more free T3/T4

## Autonomic Nervous System Receptors

1. Cholinergic Receptors – Ach binds both – prefers Muscarinic

    a. Nicotinic-preferentially binds nicotine. Found at ganglion on post synaptic fiber. Found in both SNS and PNS. Drugs that bind to nicotinic receptors affect both systems.

b. Muscarinic- preferentially binds muscarine. Found on target tissue in PNS and located on sweat gland in SNS.

2. Adrenergic Receptors:

Alpha- found NE excited target tissue and also inhibited further release of NE from nerve. (constricted VSM)
Beta- found that NE and EPI equally potent in heart but EPI 50x more potent

## *Specific Pediatric Conditions*

Wilm's tumor: kidney tumor found in children. Cause: unknown/possible genetic link. Tumor will spread to other regions. Sometimes children will be born with aniridia. Do not exert pressure over the abdomen.

*Symptoms:*
Fever
Vomiting
Fatigue
Irregular urine coloration
Abdominal pain
Constipation
Abdominal mass
Increased BP

*Tests:*
BUN
Creatinine
Analysis of the urine
X-ray
CT Scan
Family history of cancer
CBC

*Treatment:*
Surgery
Chemotherapy

Radiation

Neuroblastoma: tumor in children that starts from nervous tissue. Capable of spreading rapidly. Cause unknown.

*Symptoms:*
Abdominal mass
Skin color changes
Fatigue
Tachycardia
Motor paralysis
Anxiety
Diarrhea
Random eye movements
Bone and joint pain
Labored breathing

*Tests:*
Bone scan
CBC
MIBG scan
Catecholamines tests
X-ray
CT scan
MRI

*Treatment:*
Radiation
Chemotherapy
Surgery

*Monitor the patient for:*
Kidney failure
Metastasis
Various Organ system failures
Liver failure

Cerebral palsy: Cerebrum injury causing multiple nerve function deficits.

*Types:*
Spastic CP 50%
Dyskinetic CP 20%
Mixed CP

Ataxic CP

*Symptoms:*

Poor respiration status

Mental retardation

Spasticity

Speech and language deficits

Delayed motor and sensory development

Seizures

Joint contractions

*Tests:*

Sensory and Motor Skill testing

Check for spasticity

CT scan/MRI

EEG

*Treatment:*

PT/OT/ST

Surgery

Seizure medications

Spasticity reducing medication

Croup: trouble breathing in infants and children that can be caused by bacteria, viruses, allergies or foreign objects. Primarily, caused by viruses.

*Symptoms:*

Labored breathing

Symptoms increased at night.

Noisy cough

Stridor

*Tests:*

X-rays

Breaths sounds check

*Treatment:*

Acetaminophen

Steroid medications

Intubation

Nebulizers

*Monitor the patient for:*
Respiratory arrest
Atelectasis
Dehydration
Epiglottitis

Kawasaki disease: a disease that affects young children primarily. Unknown origin probable autoimmune disease. Attacks the heart, blood vessels, and lymph nodes.

*Symptoms:*
Fever
Joint pain
Swollen lymph nodes
Peripheral edema
Rashes
Papillae on the tongue
Chapped/Red lips

*Tests:*
CBC
Presence of pyuria
Chest X-ray
ECGH
ESR
Urine Analysis

*Treatment:*
Gamma globulin
Salicylate treatment

*Monitor the patient for:*
Coronary aneurysm
MI
Vasculitis

Pyloric stenosis: a narrowing of the opening between the intestine and stomach. Most common in infants. May have genetic factors

*Symptoms:*
Diarrhea
Abdominal pain
Belching
Vomiting
Weight loss

*Tests:*

Abdomen distended

Barium X-ray

US

Electrolyte imbalance

*Treatment:*

Surgery

IV fluids

*Vaccinations*

Attenuated – Varicella, MMR

Inactivated – Influenza

Toxoid – Tetanus/Diptheria

Biosynthetic – Hib conjugate vaccine

Tetralogy of Fallot- 4 heart defects that are congenital. Poorly oxygenated blood is pumped to the body's tissues.

*4 factors:*
Right ventricular hypertrophy
Ventricular septal defect
Aorta from both ventricles
Stenosis of the pulmonic outflow tract

*Symptoms:*
Poor weight gain
Cyanosis
Death
Limited infant feeding
Clubbing
SOB

*Tests:*
Chest X-ray
EKG
Echocardiogram
Heart Catheterization
CBC
Heart Murmur

*Treatment:*
Surgery
Small meals
Limit child's anxiety

*Monitor the patient for:*
Seizures
Poor overall development
Cyanois

Atrial septal defect- congenital opening between the atria.

*Symptoms:*
Dyspnea
Reoccurring infections (respiratory)
SOB
Palpitations

*Tests:*
Catheterization
Echocardiography
ECG
MRI

Irregular heart rhythm/sounds

*Treatment:*

Surgery

Antibiotics

*Monitor the patient for:*

Heart failure

A fib.

Pulmonary Htn.

Endocarditis

Ventricular septal defect- opening between the ventricles of the heart.

*Symptoms:*

Poor weight gain

Labored breathing

Profuse sweating

SOB

Poor color

Irregular heart beat

Respiratory infections reoccurring

*Tests:*

Ausculatation

Echocardiogram

ECG

Chest X-ray

Treatment:

Digoxin

Surgery

Digitalis

*Monitor the patient for:*

Endocarditis

Pulmonary Htn.

Aortic insufficiency

Limited growth and development

Arrhythmias

CHF

Patent ductus arteriosus: open blood vessel (ductus ateriosus) that does not close after birth.

*Symptoms:*

SOB

Limited feeding

*Tests:*

ECG

Echocardiogram

Heart murmur

Chest X-ray

*Treatment:*

Surgery

Indomethacin

Decrease fluid volumes

*Monitor the patient for:*

Surgical complications

Endocarditis

Heart failure

Aortic coarctation: aorta becomes narrow at some point due to a birth defect

*Symptoms:*

Headache

Hypertension with activity

Nose bleeding

Fainting

SOB

*Tests:*

Check BP

Doppler US

Chest CT

MRI

ECG

Chest X-ray

Cardiac catheterization

*Treatment:*

Surgery

*Monitor the patient for:*

Stroke

Heart failure

Aortic aneurysm

Htn

CAD

Endocarditis

Aortic dissection

# *Tumor Review*

Primary Tumors

Neuromas-80-90% of brain tumors, named for what part of nerve cell affected.

Meningiomas - outside of arachnoidal tissue, usually benign and slow growing

Glioblastoma Multiform-50% of all primary tumors, linked to specific genetic mutations

Secondary Tumors

Metastatic carcinomas

Scale –degree of anaplasia: differentiation of mature (good) vs. immature cells (bad)

Grade I: up to 25% anaplasia

Grade II: 26-50% anaplasia

Grade III: 51-75% anaplasia

Grade IV: 76-100% anaplasia

Primary Tumor Effect:

1. Headaches
2. Vomiting
1. Seizures
2. Neurological problems
3. Dementia
4. Drowsiness

Secondary Tumor Effect:

1. Direct compression/necrosis

2. Herniation of brain tissue
3. Increase ICP

*Noteworthy Tumor Markers*

1. AFP
2. Alkaline phosphatase
3. β-hCG
4. CA-125
5. PSA

Define the following terms:

Basal cell carcinoma:

Chondrosarcoma:

Ewing's sarcoma:

Giant cell tumor:

Melaonoma:

Meningioma:

Oligodendroglioma:

Pituitary ademona:

Schwannoma:

Squamous cell carcinoma:

Leukemia Review

Know the following four types of leukemias.

ALL- acute lymphocytic leukemia

AML- acute myelocytic leukemia

CLL- chronic lymphocytic leukemia

CML- chronic myeloid leukemia

# *GI Review*

Zollinger-Ellison syndrome: Tumors of the pancreas that cause upper GI inflammation. The tumors secrete gastrin causing high levels of stomach acid.

*Symptoms:*
Diarrhea
Vomiting
Abdominal pain

*Tests:*
Abdominal CT
+ Calcium Infusion Test
+ Secretin Stimulation Test

Elevated gastrin levels
Tumors in the pancreas

*Treatment:*
Ranitidine
Cimetidine
Lansoprazole
Omeprazole
Surgery

Wilson's disease: High levels of copper in various tissues throughout the body. (Genetically linked- Autosomal recessive).

*Key organs affected are:*
Eyes
Brain
Liver
Kidneys

*Symptoms:*
Gait disturbances
Jaundice
Tremors

Abdominal pain/distention
Dementia
Speech problems
Muscle weakness
Spenomegaly
Confusion
Dementia

*Tests:*
Various lab tests:

Bilirubin/PT/ SGOT increased
Albumin/Uric acid production decreased
MRI
Genetic testing
Low levels of serum copper
Copper is found in the tissues
Kayser-Fleisher Rings in the eye

*Treatment:*
Pyridoxine
Low copper diet

Corticosteroids
Penicillamine

*Monitor the patient for:*

Cirrhosis
Muscle weakness
Joint pain/stiffness
Anemia
Fever
Hepatitis

Pancreatitis: Inflammation of the pancreas

*Symptoms:*
Fever
Vomiting
Nausea
Chills
Anxiety
Jaundice
Sweating

*Tests:*
X-ray
CT scan
Various Lab tests

Pancreatic Cancer: cancer of the pancreas. Higher rates in men.

*Symptoms:*
Nausea
Jaundice
Depression
Back pain
Indigestion

Abdominal pain
Weight loss

*Tests:*
CT scan
Biopsy
Abdominal US
Liver function test

*Treatment:*
Surgery
Chemotherapy
Radiation
Whipple procedure

Hepatitis A: Viral infection that causes liver swelling.

*Symptoms:*
Fatigue
Nausea
Fever
Itching
Vomiting

*Tests:*
Increased liver enzymes
Presence of IgG and IgM antibodies
Enlarged liver

*Treatment:*
Rest
Proper diet low in fatty foods

Hepatitis B: Sexually transmitted disease, also transmitted with body fluids and some individual may be symptom free but still be carriers.

*Symptoms:*
Jaundice
Dark Urine
Malaise
Joint pain
Fever
Fatigue

*Tests:*

Decreased albumin levels

+ antibodies and antigen

Increased levels of transaminase

*Treatment:*

Monitor for changes in the liver.

Recombinant alpha interferon in some cases.

Transplant necessary if liver failure occurs.

Hepatitis C

*Symptoms:*

Fatigue

Vomiting

Urine color changes (dark)

Jaundice

Abdominal pain

*Tests:*

ELISA assay

Increased levels of liver enzymes

No Hep. A or B antibodies

*Treatment:*

Interferon alpha

Ribavirin

Gastritis: can be caused by various sources (bacteria, viruses, bile reflux or autoimmune diseases). Inflammation of the stomach lining.

*Symptoms:*

Loss of appetite

Hiccups

Nausea

Vomiting blood

Abdominal pain

*Tests:*

EGC

X-Ray

CT scan

Ulcers

Peptic Ulcers-ulcer in the duodenum or stomach

Gastric Ulcers- ulcer in the stomach

Duodenum Ulcer-ulcer in the duodenum

Bacteria: Helicobacter pylori- often associated with ulcer formation.

*Symptoms:*

Weight loss

Chest pain

Heartburn

Vomiting

Indigestion

Fatigue

*Tests:*

EGD

Stool guaiac

GI X-rays

*Treatment:*

Bismuth

Famotidine

Sucralfate

Cimetidine

Omeprazole

Antibiotics

Diverticulitis – abnormal pouch formation that becomes inflamed in the intestinal wall.

*Symptoms:*

Fever

Diarrhea

Nausea

Vomiting

Constipation

*Tests:*

Barium enema
WBC count
Colonoscopy
CT Scan
Sigmoidoscopy

Intestinal obstruction: Can a paralytic ileus/false obstruction (children) or a mechanical obstruction:

*Types of mechanical obstruction:*
Tumors
Volvulus
Impacted condition
Hernia

*Symptoms:*
Constipation
Vomiting
Diarrhea
Breath
Abdominal swelling
Abdominal pain

*Tests:*
Barium enema
CT scan
Upper/Lower GI series
Poor bowel sounds

Carcinoid Syndrome: symptoms caused by cardinoid tumors. Linked to increased secretion of Serotonin.

*Symptoms:*
Flush appearance
Wheezing
Diarrhea
Onset of niacin deficiency
Abdominal pain
Decreased BP

*Tests:*
5-HIAA test
Increased levels of Chromogranin A and Serotonin
CT scan
MRI

*Treatment:*
Surgery
Sandostatin

Chemotherapy
Multivitamins
Octreotide
Interferon

*Monitor the patient for:*
Low BP
Right Sided Heart Failure

Hiatal Hernia: Stomach sticks into the chest through the diaphragm. Can cause reflux symptoms.

*Symptoms:*
Chest pain
Heartburn
Poor swallow

*Tests:*
EGD

Barium Swallow X-ray.

*Treatment:*
Weight loss
Surgical repair
Medications for reflux

(GERD) -Gastroesophageal reflux disease

*Symptoms:*
Nausea
Vomiting
Frequent coughing
Hoarseness
Belching
Chest pain
Anatacid relief
Sore Throat

*Tests:*
Barium swallow
Bernstein test
Stool guaiac
Endoscopy

*Treatment:*
Weight loss
Antacids
Proton pump inhibitors

Limit fat and caffeine
Histamine H2 blockers

*Monitor the patient for:*
Chronic pulmonary disease
Barrett's esophagus
Esophagus inflammation
Bronchospasms

Ulcerative colitis: chronic inflammation of the rectum and large intestine.

*Symptoms:*
Weight loss

Jaundice
Diarrhea
Abdominal pain
Fever
Joint pain
GI bleeding

*Tests:*
Barium edema
ESR
CRP
Colonoscopy

*Treatment:*
Corticosteroids
Mesalamine
Surgery
Ostomy
Azathioprine

*Monitor the patient for:*
Ankylosing spondylitis
Liver disease
Carcinoma
Pyoderma gangrenosum
Hemorrhage
Perforated colon

# *Eye, Ear, and Mouth Review*

## Disorders of the Eye

*Diabetic retinopathy:*

Blood vessels in the retina are affected. Can lead to blindness if untreated. Two primary stages (Proliferative and Nonproliferative. Retina may experience bleeding in nonproliferative stage. During the proliferative stage damage begins moving towards the center of the eye and there is an increase in bleeding. Any damage caused is non-reversible. Only further damage can be prevented.

Strabismus:

Eyes are moving in different stages. The axes of the eyes are not parallel. Normally, treated with an eyepatch; however, eye drops are now used in many cases. Atropine drops are placed in the stronger eye for correction purposes. Surgery may be necessary in some cases. Suture surgery will reduce the pull of certain eye muscles.

*Macular Degeneration:*

Impaired central vision caused by destruction of the macula, which is the center part of the retina. Limited vision straight ahead. More common in people over 60. Can be characterized as dry or wet types. Wet type more common. Vitamin C, Zinc, and Vitamin E may help slow progression.

*Esotropia:*

Appearance of cross-eyed gaze or internal strabismus.

*Exotropia:*

External strabismus or divergent gaze.

*Conjunctivitis:*

Inflammation of the conjuctiva, that can be caused by viruses or bacteria. Also known as pink eye. If viral source can be highly contagious. Antibiotic eye drops and warm cloths to the eye helpful treatment. Conjunctivitis can also be caused by chemicals or allergic reactions. Re-occurring conjunctivitis can indicate a larger underlying disease process.

*Glaucoma:*

An increase in fluid pressure in the eye leading to possible optic nerve damage. More common in African-Americans. Minimal onset symptoms, often picked to late. Certain drugs may decrease the amount of fluid entering the eye. Two major types of glaucoma are open-angle glaucoma and \angle-closure glaucoma.

# Disorders of the Mouth

*Acute pharyngitis:*

Often the cause of sore throats, inflammation of the pharynx.

*Acute tonsillitis:*

Viral or Bacterial infection that causes inflammation of the tonsils.

*Aphthous ulcer:*

Also known as a canker sore. A sensitive ulcer in the lining of the mouth. 1 in 5 people have these ulcers. Cause is unknown in many cases.

*Acute Epiglottitis*

Inflammation of the epiglotitis that may lead to blockage of the respiratory system and death if not treated. Often caused by numerous bacteria. Intubation may be required and speed is critical in treatment. IV antibiotics will help reverse this condition in most cases. Common symptoms are high fever and sore throat.

*Oral candidiasis:*

This is a yeast infection of the throat and mouth by Candida albicans.

*Oral leukoplakia:*

A patch or spot in the mouth that can become cancerous.

*Parotitis:*

A feature of mumps and inflammation of the parotid glands.

# Disorders of the Ear

*Otitis media:*

Most common caused by the bacteria (H.flu) and Streptococcus pneumoniae in about 85% of cases. 15% of cases viral related. More common in bottlefeeding babies. Can be caused by upper respiratory infections. Ear drums can rupture in severe cases. A myringotomy may be performed in severe cases to relieve pus in the middle ear.

*Barotitis:*

Atmospheric pressures causing middle ear dysfunction. Any change in altitude causes problems.

*Mastoiditis:*

May be caused by an ear infection and is known as inflammation of the mastoid.

*Meniere's disease:*

Inner ear disorder. Causes unknown. Episodic rotational vertigo, Tinnitus, Hearing loss, and Ringing in the ears are key symptoms. Dazide is the primary medication for Meniere's disease. Low salt diet and surgery are also other treatment options. Diagnosis is a rule-out diagnosis.

*Labyrinthitis:*

Vertigo associated with nausea and malaise. Related to bacterial and viral infections. Inflammation of the labyrinth in the inner ear.

*Otitis externa:*

Usually caused by a bacterial infection. Swimmer's ear. Infection of the skin with the outer ear canal that progress to the ear drum. Itching, Drainage and Pain are the key symptoms. Suctioning of the ear canal may be necessary. Most common ear drops (Volsol, Cipro, Cortisporin).

# *Obstetrics/Gynecology*

Amniocentesis: Removal of some fluid surrounding the fetus for analysis. Fetus location is identified by US prior to the procedure. Results may take a month.

*Used to check for:*
Spina bifida
Rh compatibility
Immature lungs
Down syndrome

Chorionic villus sampling: Removal of placental tissue for analysis from the uterus during early pregnancy. US helps guide the procedure. 1-2 weeks get the results. Can be performed earlier than amniocentesis.

*Used to check for:*
Tay-Sachs disease
Down syndrome
Other disorders

*Monitor the patient for:*
Infection
Miscarriage
Bleeding

Preeclampsia: presence of protein in the urine, and increased BP during pregnancy. Found in 8% of pregnancies.

*Symptoms:*

Abnormal Rapid Weight gain
Headaches
Peripheral edema
Nausea
Anxiety
Htn
Low urination frequency

*Tests:*

Proteinuria
BP check
Weight gain analysis
Thrombocytopenia
Evidence of edema

*Treatment:*

Deliver the baby
Bed rest
Medications

*Induced labor may occur with the following criteria:*

Eclampsia
HELLP syndrome
High serum creatinine levels
Prolonged elevated diastolic blood pressure >100mmHg
Thrombocytopenia
Abnormal fetal growth

Eclampsia: seizures occurring during pregnancy, symptoms of pre-eclampsia have worsened. Factors that cause eclampsia vs. pre-eclampsia relatively unknown.

*Symptoms:*

Weight gain sudden

Seizures
Trauma
Abdominal pain
Pre-eclampsia

*Tests:*
Check liver function tests
Check BP
Proteinuria presence
Apnea

*Treatment:*
Magnesium sulfate

Bedrest
BP medications

*Induced labor may occur with the following criteria:*

Eclampsia
HELLP syndrome
High serum creatinine levels
Prolonged elevated diastolic blood pressure >100mmHg
Thrombocytopenia
Abnormal fetal growth

Amniotic fluid- greatest at 34 weeks gestation.

*Functions:*
Allows normal lung development
Freedom for movement
Fetus temperature regulation
Trauma prevention

Oligohydramnios: Low levels of amniotic fluid that can cause: fetal abnormalities, ruptured membranes and fetus disorders.

Polyhydamnios: High levels of amniotic fluid that can cause: gestational diabetes and congenital defects.

*Polyhydaminos Causes:*

Beckwith-Wiedemann syndrome

Hydrops fetalis

Multiple fetus development

Anencephaly

Esophageal atresia

Gastroschisis

Sheehan's syndrome: hypopituitarism caused by uterine hemorrhage during childbirth. The pituitary gland is unable to function due to blood loss.

*Symptoms:*

Amenorrhea

Fatigue

Unable to breast-feed baby

Anxiety

Decreased BP

Hair loss

*Tests:*

CT scan of Pituitary gland

Check pituitary hormone levels

*Treatment:*

Hormone therapy

Breast infections/Mastitis: Infection or inflammation due to bacterial infections. (S. aureus).

*Symptoms:*

Fever

Nipple pain/discharge

Breast pain

Swelling of the breast

*Tests:*

Physical examination

*Treatment:*

Antibiotics
Moist heat

Breast pump

Atrophic vaginitis- low estrogen levels cause inflammation of the vagina. Most common after menopause.

*Symptoms:*
Pain with intercourse
Itching pain
Vaginal discharge
Vaginal irritation after intercourse

*Tests:*
Pelvic examination

*Treatment:*
Hormone therapy
Vaginal lubricant

Cervicitis: infection, foreign bodies,or chemicals that causes inflammation of the cervix.

*Symptoms:*
Pain with intercourse
Vaginal discharge
Pelvic pain
Vaginal pain

*Tests:*
Pelvic examination

STD tests
Pap smear

*Treatment:*
Laser therapy
Antibiotics/antifungals
Cryosurgery

Pelvic inflammatory disease: infection of the fallopian tubes, uterus or ovaries caused by STD's in the majority of cases.

*Symptoms:*
Vaginal discharge
Fever
Pain with intercourse
Fever
Nausea
Urination painful
LBP
No menstruation

*Tests:*
Pelvic exam
Laparoscopy
ESR
WBC count
Pregnancy test
Cultures for infection

*Treatment:*
Antibiotics
Surgery

Toxic shock syndrome: infection of (S. aureus) that causes organ disorders and shock.

*Symptoms:*
Seizures
Headaches
Hypotension
Fatigue
Multiple organ involvement
Fever
Nausea
Vomiting

*Tests:*
Check BP
Multiple organ involvement

*Treatment:*
Dialysis- if kidneys fail
BP medications
IV fluids
Antibiotics

*Monitor the patient for:*
Kidney failure

Liver failure
Heart failure
Extreme shock

Hirsutism: development of dark areas of hair in women that are uncommon.

*Causes:*
Cushing's syndrome
Congenital adrenal hyperplasia
Hyperthecosis
PCOS
High Androgen levels
Certain medications

*Treatment:*
Laser treatment
Birth control medications
Electrolysis
Bleaching

Dysmenorrhea: painful menses.

*Symptoms:*
Constipation
Nausea
Vomiting
Diarrhea

*Tests:*
Determine if normal dysmenorhea is occurring.
Pain relief
Anti-inflammatory medications

Endometriosis: abnormal tissue growth outside the uterus.

*Symptoms:*
Spotting

Infertility
LBP
Periods (painful)
Sexual intercourse painful

*Tests:*
Pelvic US
Laparoscopy
Pelvic exam.

*Treatment:*
Progesterone treatment
Pain management
Surgery
Hormone treatment
Synarel treatment

Stress Incontinence: A laugh, sneeze or activity that causes involuntary urination. Urethral sphincter dysfunction.

*Tests:*
Rectal exam
X-rays
Pad test
Urine analysis
PVR test
Cystoscopy
Pelvic exam

*Treatment:*
Surgery
Medications (pseudoephedrine/phenylpropanolamine)/Estrogen
Pelvic floor re-training
Fluid intake changes

Urge incontinence- urine loss caused by bladder contraction.

*Symptoms:*
Frequent urination
Abdominal pain/distention

*Tests:*
Pelvic exam
X-rays
Cystoscopy
EMG
Pad test

Urinary stress test
PVR test
Genital exam-men

*Treatment:*
Surgery

Medications-(tolterodine, propatheline, imipramine, tolterodine, terbutaline)
Biofeedback training
Kegel strengthening

## ***Dermatology Review***

*Atopic Dermatitis*:

Scaling, Itching, Redness and Excoriation. Possible lichenification in chronic cases. Most common in young children around the elbow and knees. Adults are more common in neck and knees. May be associated with an allergic disorder, hay fever, or asthma.

*Contact Dermatitis:*

Itchy, weepy reaction with a foreign substance (Poison Ivy) or lotions. Skin becomes red.

*Diaper Rash:*

Inflammatory reaction in the region covered by a diaper. This may include chemical allergies, sweat, yeast, or friction irritation.

*Ermatitis stasis:*

Decreased blood flow the lower legs resulting in a skin irritation, possible ulcer formation.

*Onychomycosis:*

Fungal infection related to the fingernails or toenails. Often caused by Trichophyton rubrum.

*Lichen planus:*

Treated with topical corticosteroids. The presence of pink or purple spots on the legs and arms. Lesions are itchy, flat and polygonal. May cause hair loss.

*Pityriasis rosea:*

A mild to moderate rash that starts as a single pink patch and then numerous patches begin to appear on the skin. This may lead to itching. Found primarily in ages 10-35 years old.

*Psoriasis:*

An autoimmune disease mediated by T lymphocytes that can lead to arthritis. Generally, treated with UV light, tar soap and topical steroid cream. A reddish rash that can be found in numerous locations.

*Stevens-Johnson syndrome:*

An allergic reaction that can include rashes, and involve the inside of the mouth. May be due to drug sensitivity. Can lead to uveitis and keratitis. Other factors related to SJS include: pneumonia, fever, myalgia and hepatitis. SJS can be extremely similar to varicella zoster and pemphigus vulgaris conditions. There may also be the presence of herpes virus or Mycoplasma pneumoniae.

*Bullous pemphigoid:*

Eruptions of the skin caused by the accumulation of antibodies in the basement membrane of the skin. Treated with cortisone creams or internally. Skin biopsy offers definitive diagnosis.

*Acne vulgaris:*

Oil glands become inflamed, plugged or red. May be treated in moderate to severe cases with anti-inflammatory medications or creams.

*Rosacea:*

A redness that covers the middle part of the face. Blood vessels in the face dilate. Most common in adults 30-50 years old. Unable to be cured, only treated. May cause long term skin damage is left untreated. Antibiotics are often prescribed.

*Seborrheic keratosis:*

The development of skin “tags” or the barnacles of old age. Usually found in people over 30 years old. Appear to be tabs growing in groups or individually on your skin. Can be treated with Scrapping, Freezing or Electrosurgery.

*Actinic keratosis:*

A site that can become cancerous, usually small and rough on the skin that has been exposed to the sun a lot. Usually treated with cryosurgery and photodynamic therapy.

*Scabies:*

Caused by the human itch mite: Sarcaptes scabies, and identified by presence of raised, red bumps that are itchy. Closer identification with a visual aid will show streaks in the skin created by the mite.

*Molluscum contagiosum:*

Considered a STD. Small downgrowths called molluscum bodies that include the presence of soft tumors in the skin caused by a virus. Contagious.

*Herpes zoster:*

Infection caused by the varicella-zoster virus. Can cause chickenpox and then shingles in later years. The virus infects the dosal root ganglia of nerves and can cause intense itching.

*St. Anthony's Fire:*

Claviceps purpurea (fungus) can cause intense pain in the extremities by causing blood vessels to constrict. Fungus produces ergotamines.

*Impetigo:*

A skin infection caused by Staph or Streptococcus that causes itchy, red skin and pustules. Treated with topical antibiotics and primarily affects children.

*Acanthosis nigricans:*

The presence of dark velvety patches of skin around the armpit, back, neck and groin. Can occur with multiple diseases. Has been linked to patients with insulin dysfunction.

*Hidradenitis suppurativa:*

The presence of numerous abscess in the groin and armpit region.

*Melasma:*

“Mask of Pregnancy” Changes in the pigmentation of women that are pregnant. Occurs in 50% of all pregnancies.

Urticaria:

Elevated itchy areas that are linked to allergic reactions. May be accompanied with edema and may blanch with touch. “Hives”

Vitiligo:

Loss of melanocytes resulting in skin turning white. Hair in regions affected will also turn white. Primarily identified in ages 10-30. Several genetic factors involved. May be associated with other more severe autoimmune disorders.

# *Axial Skeleton*

The axial skeleton consists of 80 bones forming the trunk (spine and thorax) and skull.

**Vertebral Column**: The main trunk of the body is supported by the spine, or vertebral column, which is composed of 26 bones, some of which are formed by the fusion of a few bones. The vertebral column from superior to inferior consists of 7 cervical (neck), 12 thoracic and 5 lumbar vertebrae, as well as a sacrum, formed by fusion of 5 sacral vertebrae, and a coccyx, formed by fusion of 4 coccygeal vertebrae.

**Ribs and Sternum:** The axial skeleton also contains 12 pairs of *ribs* attached posteriorly to the thoracic vertebrae and anteriorly either directly or via cartilage to the *sternum* (breastbone). The ribs and sternum form the *thoracic cage*, which protects the heart and lungs. Seven pairs of ribs articulate with the sternum (*fixed ribs*) directly, and three do so via cartilage; the two most inferior pairs do not attach anteriorly and are referred to as *floating ribs*.

**Skull:** The skull consists of 22 bones fused together to form a rigid structure which houses and protects organs such as the brain, auditory apparatus and eyes. The bones of the skull form the *face* and *cranium* (brain case) and consist of 6 single bones (*occipital, frontal, ethmoid, sphenoid, vomer* and *mandible*) and 8 paired bones (*parietal, temporal, maxillary, palatine, zygomatic, lacrimal, inferior concha* and *nasal*). The *lower jaw* or *mandible* is the only movable bone of the skull (head); it articulates with the temporal bones.

**Other Parts:** Other bones considered part of the axial skeleton are the *middle ear bones* (*ossicles*) and the small U-shaped *hyoid bone* that is suspended in a portion of the neck by muscles and ligaments.

## *Appendicular Skeleton*

The *appendicular skeleton* forms the major internal support of the appendages—the *upper* and *lower extremities* (limbs).

**Pectoral Girdle and Upper Extremities:** The arms are attached to and suspended from the axial skeleton via the *shoulder* (*pectoral*) *girdle*. The latter is composed of two *clavicles* (*collarbones)* and two *scapulae* (*shoulder blades*). The clavicles articulate with the sternum; the two *sternoclavicular joints* are the only sites of articulation between the trunk and upper extremity.

Each upper limb from distal to proximal (closest to the body) consists

Each upper limb from distal to proximal (closest to the body) consists of hand, wrist, forearm and arm (upper arm). The *hand* consists of 5 *digits* (fingers) and 5 *metacarpal* bones. Each digit is composed of three bones called *phalanges*, except the thumb which has only two bones.

**Pelvic Girdle and Lower Extremities:** The lower *extremities*, or legs, are attached to the axial skeleton via the *pelvic* or *hip girdle*. Each of the two coxal, or *hip bones* comprising the pelvic girdle is formed by the fusion of three bones—*illium, pubis,* and *ischium*. The

coxal bones attach the lower limbs to the trunk by articulating with the sacrum.

| THE HUMAN SKELETAL SYSTEM | |
|---|---|
| **Part of the Skeleton** | **Number of Bones** |
| **Axial Skeleton** | **80** |
| Skull | 22 |
| Ossicles (malleus, incus and stapes) | 6 |
| Vertebral column | 26 |
| Ribs | 24 |
| Sternum | 1 |
| Hyoid | 1 |
| **Appendicular Skeleton** | **126** |
| Upper extremities | 64 |
| Lower extremities | 62 |

***Characteristics of Bone***

*Bone* is a specialized type of connective tissue consisting of cells (*osteocytes*) embedded in a calcified matrix which gives bone its characteristic hard and rigid nature. Bones are encased by a *periosteum*, a connective tissue sheath. All bone has a central marrow cavity. *Bone marrow* fills the marrow cavity or smaller marrow spaces, depending on the type of bone.

**Types of Bone:** There are two types of bone in the skeleton: *compact bone* and *spongy* (cancellous) bone.

*Compact Bone. Compact bone* lies within the periosteum, forms the outer region of bones, and appears dense due to its compact organization. The living osteocytes and calcified matrix are arranged in layers, or *lamellae*. Lamellae may be circularly arranged surrounding a central canal, the *Haversian canal*, which contains small blood vessels.

*Spongy Bone. Spongy bone* consists of *bars, spicules* or *trabeculae*, which forms a lattice meshwork. Spongy bone is found at the ends of long bones and the inner layer of flat, irregular and short bones. The trabeculae consist of osteocytes embedded in calcified matrix, which in definitive bone has a lamellar nature. The spaces between the trabeculae contain bone marrow.

**Bone Cells:** The cells of bone are osteocytes, osteoblasts, and osteoclasts. *Osteocytes* are found singly in *lacunae* (spaces) within the calcified matrix and communicate with each other via small canals in the bone known as *canaliculi*. The latter contain osteocyte cell processes. The osteocytes in compact and spongy bone are similar in structure and function.

*Osteoblasts* are cells which form bone matrix, surrounding themselves with it, and thus are transformed into osteocytes. They arise from undifferentiated cells, such as mesenchymal cells. They are cuboidal cells which line the trabeculae of immature or developing spongy bone.

*Osteoclasts* are cells found during bone development and remodeling. They are multinucleated cells lying in cavities, *Howship's lacunae*, on the surface of the bone tissue being resorbed. Osteoclasts remove the existing calcified matrix releasing the inorganic or organic components.

**Bone Matrix:** *Matrix* of compact and spongy bone consists of collagenous fibers and ground substance which constitute the organic component of bone. Matrix also consists of inorganic material which is about 65% of the dry weight of bone. Approximately 85% of the inorganic component consists of calcium phosphate in a crystalline form (hydroxyapatite crystals). Glycoproteins are the main components of the ground substance.

## MAJOR TYPES OF HUMAN BONES

| Type of Bone | Characteristics | Examples |
|---|---|---|
| Long bones | Width less than length | Humerus, radius, ulna, femur, tibia |
| Short bones | Length and width close to equal in size | Carpal and tarsal bones |
| Flat bones | Thin flat shape | Scapulae, ribs, sternum, bones of cranium (occipital, frontal, parietal) |
| Irregular bones | Multifaceted shape | Vertebrae, sphenoid, ethmoid |
| Sesamoid | Small bones located in tendons of muscles | --- |

***Joints***

The bones of the skeoeton articulate with each other at *joints*, which are variable in structure and function. Some joints are immovable, such as the *sutures* between the bones of the cranium. Others are *slightly movable joints*; examples are the *intervertebral joints* and the *pubic symphysis* (joint between the two pubic bones of the coxal bones).

## TYPES OF JOINTS

| Joint Type | Characteristic | Example |
|---|---|---|
| Ball and socket | Permits all types of movement (abduction, adduction, flexion, extension, circumduction); it is considered a universal joint. | Hips and shoulder joints |
| Hinge (ginglymus) | Permits motion in one plane only | Elbow and knee, interphalangeal joints |
| Rotating or pivot | Rotation is only motion permitted | Radius and ulna, atlas and axis (first and second cervical vertebrae) |
| Plane or gliding | Permits sliding motion | Between tarsal bones and carpal bones |
| Condylar (condyloid) | | |

| | | |
|---|---|---|
| | Permits motion in two planes which are at right angles to each other (rotation is not possible) | Metacarop-phalangeal joints, temporomandibular |

Adjacent bones at a joint are connected by fibrous connective tissue bands known as *ligaments*. They are strong bands which support the joint and may also act to limit the degree of motion occurring at a joint.

# *Musculoskeletal Conditions*

Legg-Calve-Perthes disease: poor blood supply to the superior aspect of the femur. Most common in boys ages 4-10. The femur ball flattens out and deteriorates. 4x higher incidence in boys + Bony cresent sign.

*Symptoms:*
Hip and Knee pain
Limited AROM and PROM
Pain with gait and unequal leg length.

*Tests:*
X-ray Hip

Test ROM of hip

*Treatment:*
Surgery
Physical therapy
Brace
Bedrest

Developmental dysplasia of the hip: abnormal development of the hip joint found that is congenital.

*Symptoms:*
Fat rolls asymmetrical
Abnormal leg length
AROM limited

*Tests:*
US

X-ray of hips
AROM testing of hips

*Treatment:*
Cast
Surgery
Physical Therapy

Slipped capital femoral epiphysis: 2x greater incidence in males, most common hip disorder in adolescents. The ball of the femur separates from the femur along the epiphysis.

*Symptoms:*
Hip pain
Gait dysfunction
Knee pain
Abnormal Hip AROM

*Tests:*
X-ray
Palpation of the hips

Treatment:
Surgery

Polymyalgia Rheumatica- hip or shoulder pain disorder in people greater than 50 years old.

*Symptoms:*
Shoulder pain
Hip pain
Fever
Anemia
Fatigue

*Tests:*
ESR increased
CPK
Hemoglobin low

*Treatment:*
Pain management
Corticosteroids

Systemic lupus serythemtosus: autoimmune disorder that affects joints, skin and various organ systems. Chronic and inflammatory. 9x more common in females.

*Symptoms:*
Butterfly rash
Weight loss
Fever
Hair loss
Abdominal pain
Mouth sores
Fatigue
Seizures
Arthritis
Nausea
Joint pain
Psychosis

*Tests:*
CBC
Chest X-ray
ANA test
Skin rash observation
Coombs' test
Urine analysis
Test for various antibodies

*Treatment:*
NSAIDS
Protective clothing
Cytotoxic drugs
Hydroxychloroquine

*Monitor the patient for:*
Seizures
Infection
Hemolytic anemia
Myocarditis
Infection
Renal failure

Scleroderma: connective tissue disease that is diffuse.

*Symptoms:*
Wheezing
Heartburn
Raynaud's phenomenon

Skin thickness changes
Weight loss
Joint pain
SOB
Hair loss
Bloating

*Tests:*
Monitor skin changes
Chest x-ray
Antinuclear antibody test
ESR increased

*Monitor the patient for:*
Renal failure
Heart failure
Pulmonary fibrosis

Rheumatoid Arthritis: inflammatory autoimmune disease that affects various tissues and joints.

*Symptoms:*
Fever
Fatigue
Joint pain and swelling
ROM decreased
Hand/Feet deformities
Numbness
Skin color changes

*Tests:*
Rheumatoid factor tests
C-reactive protein
Synovial fluid exam
X-rays of involved joints
ESR increased

*Treatment:*
Physical therapy
Moist heat
Anti-inflammatory drugs
Corticosteroids
Anti-malarial drugs
Cox-2 inhibitors
Splinting

Juvenile Rheumatoid Arthritis: inflammatory disease that occurs in children.

*Types:*
Pauciarticular JRA- 50%
Polyarticular JRA- 40%
Systemic JRA- 10%

*Symptoms:*
Painful joints
Eye inflammation
Fever
Rash
Temperature changes (joints)
Poor AROM

*Tests:*
ANA test
HLA antigen test
CBC
Physical exam of joints
X-rays of joints
Eye exam
RA factor test

*Treatment:*
Physical therapy
Corticosteroids
NSAIDS
Infliximab
Hydrochloroquine
Methotrexate

Paget's disease: abnormal bone development that follows bone destruction.

*Symptoms:*
Joint pain
Bow legged appearance
Hearing loss
Neck and back pain
Headaches
Sharp bone pain

*Tests:*
Increased alkaline phophatase levels

X-rays- abnormal bone development.
Bone scan

*Treatment:*
NSAIDS
Calcitonin
Plicamycin
Etidronate
Tiludronate
Surgery

*Monitor the patient for:*
Spinal deformities
Hear loss
Paraplegia
Heart failure
Fractures

Osteoarthritis: chronic condition affecting the joint cartilage that may result in bone spurs being formed in the joints.

*Symptoms:*
Join pain
Morning stiffness
Limited AROM
Weight bearing increases symptoms

*Tests:*
X-ray
Passive testing of joints

*Treatment:*
Physical therapy
Cox 2 inhibitors
NSAIDS
Joint injections
Aquatic exercises
Surgery

Gout: uric acid development in the joints causing arthritis.

*Stages:*
Asymptomatic
Acute
Intercritical
Chronic

*Symptoms:*
Joint edema

Fever
Lower extremity and/or upper extremity joint pain

*Tests:*
Uric acid in the urine
Synovial biopsy
Synovial analysis

*Monitor the patient for:*
Kidney stones
Kidney disorders

Fibromyalgia: joint, muscle and soft tissue pain in numerous locations. Presence of tender points and soft tissue pain.

*Symptoms:*
Fatigue
Body aches
Poor exercise capacity
Muscle/Joint pain

*Tests:*
Rule-out diagnosis.

*Treatment:*
Anti-depressants
Physical therapy
Stress Management
Massage
Support group

Duchenne muscular dystrophy: Genetically X-linked recessive type of muscular dystrophy that starts in the lower extremities. Dystrophin-protein dysfunction.

*Symptoms:*
Falls
Fatigue
Muscle weakness
Gait dysfunction
Scoliosis
Joint contractures

*Tests:*
CPK levels increased
Cardiac testing
EMG

Muscle biopsy testing

*Treatment:*

Physical therapy

Braces

Mobility assistance

*Monitor the patient for:*

Contractures

Pneumonia

Respiratory failure

CHF

Cardiomyopathy

Limited mobility

Ankylosing spondylitis: Vertebrae of the spine fuse.

*Symptoms:*

Limited AROM

Back and neck pain

Joint edema

Fever Weight loss

*Tests:*

X-ray spine

CBC

ESR test

NSAIDS

Surgery

HLA-B27 antigen test

*Monitor the patient for:*

Pulmonary fibrosis

Aortic valve stenosis

Uveitis

Compartment syndrome: impaired blood flow and nerve dysfunction caused by nerve and blood vessel compression.

*Symptoms:*

Severe pain

Weakness

Skin color changes

*Tests:*

Muscular length testing

*Treatment:*

Surgery

Physical Therapy

Osteosarcoma: bone tumor that is malignant and found in adolescents.

*Symptoms:*

Bone pain

Fractures

Swelling

*Tests:*

CT scan

X-ray

Biopsy

Bone scan

*Treatment:*

Chemotherapy

Surgery

## *Sample Questions*

1. A nurse is reviewing a patient's medication during shift change. Which of the following medication would be contraindicated if the patient were pregnant? Note: More than one answer may be correct.

A: Coumadin
B: Finasteride
C: Celebrex
D: Catapress
E: Habitrol
F: Clofazimine

2. A nurse is reviewing a patient's PMH. The history indicates photosensitive reactions to medications. Which of the following drugs has not been associated with photosensitive reactions? Note: More than one answer may be correct.

A: Cipro
B: Sulfonamide
C: Noroxin
D: Bactrim
E: Accutane
F: Nitrodur

3. A patient tells you that her urine is starting to look discolored. If you believe this change is due to medication, which of the following patient's medication does not cause urine discoloration?

A: Sulfasalazine

B: Levodopa

C: Phenolphthalein

D: Aspirin

4. You are responsible for reviewing the nursing unit's refrigerator. If you found the following drug in the refrigerator it should be removed from the refrigerator's contents?

A: Corgard

B: Humulin (injection)

C: Urokinase

D: Epogen (injection)

5. A 34 year old female has recently been diagnosed with an autoimmune disease. She has also recently discovered that she is pregnant. Which of the following is the only immunoglobulin that will provide protection to the fetus in the womb?

A: IgA

B: IgD

C: IgE

D: IgG

6. A second year nursing student has just suffered a needlestick while working with a patient that is positive for AIDS. Which of the following is the most important action that nursing student should take?

A: Immediately see a social worker

B: Start prophylactic AZT treatment

C: Start prophylactic Pentamide treatment

D: Seek counseling

7. A thirty five year old male has been an insulin-dependent diabetic for five years and now is unable to urinate. Which of the following would you most likely suspect?

A: Atherosclerosis

B: Diabetic nephropathy

C: Autonomic neuropathy

D: Somatic neuropathy

8. You are taking the history of a 14 year old girl who has a (BMI) of 18. The girl reports inability to eat, induced vomiting and severe constipation. Which of the following would you most likely suspect?

A: Multiple sclerosis

B: Anorexia nervosa

C: Bulimia

D: Systemic sclerosis

9. A 24 year old female is admitted to the ER for confusion. This patient has a history of a myeloma diagnosis, constipation, intense abdominal pain, and polyuria. Which of the following would you most likely suspect?

A: Diverticulosis

B: Hypercalcaemia

C: Hypocalcaemia

D: Irritable bowel syndrome

10. Rho gam is most often used to treat____ mothers that have a ____ infant.

A: RH positive, RH positive

B: RH positive, RH negative

C: RH negative, RH positive

D: RH negative, RH negative

11. A new mother has some questions about (PKU). Which of the following statements made by a nurse is not correct regarding PKU?

A: A Guthrie test can check the necessary lab values.

B: The urine has a high concentration of phenylpyruvic acid

C: Mental deficits are often present with PKU.

D: The effects of PKU are reversible.

12. A patient has taken an overdose of aspirin. Which of the following should a nurse most closely monitor for during acute management of this patient?

A: Onset of pulmonary edema

B: Metabolic alkalosis

C: Respiratory alkalosis

D: Parkinson's disease type symptoms

13. A fifty-year-old blind and deaf patient has been admitted to your floor. As the charge nurse your primary responsibility for this patient is?

A: Let others know about the patient's deficits
B: Communicate with your supervisor your concerns about the patient's deficits.
C: Continuously update the patient on the social environment.
D: Provide a secure environment for the patient.

14. A patient is getting discharged from a SNF facility. The patient has a history of severe COPD and PVD. The patient is primarily concerned about their ability to breath easily. Which of the following would be the best instruction for this patient?

A: Deep breathing techniques to increase O2 levels.
B: Cough regularly and deeply to clear airway passages.
C: Cough following bronchodilator utilization
D: Decrease CO2 levels by increase oxygen take output during meals.

15. A nurse is caring for an infant that has recently been diagnosed with a congenital heart defect. Which of the following clinical signs would most likely be present?

A: Slow pulse rate
B: Weight gain
C: Decreased systolic pressure
D: Irregular WBC lab values

16. A mother has recently been informed that her child has Down's syndrome. You will be assigned to care for the child at shift change. Which of the following characteristics is not associated with Down's syndrome?

A: Simian crease
B: Brachycephaly
C: Oily skin
D: Hypotonicity

17. A patient has recently experienced a (MI) within the last 4 hours. Which of the following medications would most like be administered?

A: Streptokinase
B: Atropine
C: Acetaminophen
D: Coumadin

18. A patient asks a nurse, "My doctor recommended I increase my intake of folic acid. What type of foods contain folic acids?"

A: Green vegetables and liver
B: Yellow vegetables and red meat
C: Carrots
D: Milk

19. A nurse is putting together a presentation on meningitis. Which of the following microorganisms has noted been linked to meningitis in humans?

A: S. pneumonia

B: H. influenza

C: N. meningitis

D: Cl. difficile

20. A nurse is administering blood to a patient who has a low hemoglobin count. The patient asks how long to RBC's last in my body? The correct response is.

A: The life span of RBC is 45 days.

B: The life span of RBC is 60 days.

C: The life span of RBC is 90 days.

D: The life span of RBC is 120 days.

21. A 65 year old man has been admitted to the hospital for spinal stenosis surgery. When does the discharge training and planning begin for this patient?

A: Following surgery

B: Upon admit

C: Within 48 hours of discharge

D: Preoperative discussion

22. A child is 5 years old and has been recently admitted into the hospital. According to Erickson which of the following stages is the child in?

A: Trust vs. mistrust

B: Initiative vs. guilt

C: Autonomy vs. shame

D: Intimacy vs. isolation

23. A toddler is 16 months old and has been recently admitted into the hospital. According to Erickson which of the following stages is the toddler in?

A: Trust vs. mistrust

B: Initiative vs. guilt

C: Autonomy vs. shame

D: Intimacy vs. isolation

24. A young adult is 20 years old and has been recently admitted into the hospital. According to Erickson which of the following stages is the adult in?

A: Trust vs. mistrust

B: Initiative vs. guilt

C: Autonomy vs. shame

D: Intimacy vs. isolation

25. A nurse is making rounds taking vital signs. Which of the following vital signs is abnormal?

A: 11 year old male – 90 b.p.m, 22 resp/min. , 100/70 mm Hg

B: 13 year old female – 105 b.p.m., 22 resp/min., 105/60 mm Hg

C: 5 year old male- 102 b.p.m, 24 resp/min., 90/65 mm Hg

D: 6 year old female- 100 b.p.m., 26 resp/min., 90/70mm Hg

26. When you are taking a patient's history, she tells you she has been depressed and is dealing with an anxiety disorder. Which of the following medications would the patient most likely be taking?

A: Elavil
B: Calcitonin
C: Pergolide
D: Verapamil

27. Which of the following conditions would a nurse not administer erythromycin?

A: Campylobacterial infection
B: Legionnaire's disease
C: Pneumonia
D: Multiple Sclerosis

28. A patient's chart indicates a history of hyperkalemia. Which of the following would you not expect to see with this patient if this condition were acute?

A: Decreased HR
B: Paresthesias
C: Muscle weakness of the extremities
D: Migranes

29. A patient's chart indicates a history of ketoacidosis. Which of the following would you not expect to see with this patient if this condition were acute?

A: Vomiting
B: Extreme Thirst
C: Weight gain
D: Acetone breath smell

30. A patient's chart indicates a history of meningitis. Which of the following would you not expect to see with this patient if this condition were acute?

A: Increased appetite
B: Vomiting
C: Fever
D: Poor tolerance of light

31. A nurse if reviewing a patient's chart and notices that the patient suffers from conjunctivitis. Which of the following microorganisms is related to this condition?

A: *Yersinia pestis*
B: *Helicobacter pyroli*
C: *Vibrio cholera*
D: *Hemophilus aegyptius*

32. A nurse if reviewing a patient's chart and notices that the patient suffers from Lyme disease. Which of the following microorganisms is related to this condition?

A: *Borrelia burgdorferi*
B: *Streptococcus pyrogens*
C: *Bacilus anthracis*
D: *Enterococcus faecalis*

33. A fragile 87 year-old female has recently been admitted to the hospital with increased confusion and falls over last 2 weeks. She is also noted to have a mild left hemiparesis. Which of the following tests is most likely to be performed?

A: FBC (full blood count)
B: ECG (electrocardiogram)
C: Thyroid function tests
D: CT scan

34. A 84 year-old male has been loosing mobility and gaining weight over the last 2 months. The patient also has the heater running in his house 24 hours a day, even on warm days. Which of the following tests is most likely to be performed?

A: FBC (full blood count)
B: ECG (electrocardiogram)
C: Thyroid function tests
D: CT scan

35. A 20 year-old female attending college is found unconscious in her dorm room. She has a fever and a noticeable rash. She has just been admitted to the hospital. Which of the following tests is most likely to be performed first?

A: Blood sugar check
B: CT scan
C: Blood cultures
D: Arterial blood gases

36. A 28 year old male has been found wandering around in a confused pattern. The male is sweaty and pale. Which of the following tests is most likely to be performed first?

A: Blood sugar check
B: CT scan
C: Blood cultures
D: Arterial blood gases

37. A mother is inquiring about her child's ability to potty train. Which of the following factors is the most important aspect of toilet training?

A: The age of the child
B: The child ability to understand instruction.
C: The overall mental and physical abilities of the child.
D: Frequent attempts with positive reinforcement.

38. A parent calls the pediatric clinic and is frantic about the bottle of cleaning fluid her child drank 20 minutes. Which of the following is the most important instruction the nurse can give the parent?

A: This too shall pass.
B: Take the child immediately to the ER
C: Contact the Poison Control Center quickly
D: Give the child syrup of ipecac

39. A nurse is administering a shot of Vitamin K to a 30 day-old infant. Which of the following target areas is the most appropriate?

A: Gluteus maximus
B: Gluteus minimus
C: Vastus lateralis
D: Vastus medialis

40. A nurse has just started her rounds delivering medication. A new patient on her rounds is a 4 year-old boy who is non-verbal. This child does not have on any identification. What should the nurse do?

A: Contact the provider
B: Ask the child to write their name on paper.
C: Ask a co-worker about the identification of the child.
D: Ask the father who is in the room the child's name.

41. A nurse is observing a child's motor, sensory and speech development. The child is 7 months old. Which of the following tasks would generally not be observed?

A: Child recognizes tone of voice.
B: Child exhibits fear of strangers.
C: Child pulls to stand and occasionally bounces.
D: Child plays patty-cake and imitates.

42. A nurse is observing a child's motor, sensory and speech development. The child is 5 months old. Which of the following tasks would generally not be observed?

A: Child sits with support.
B: Child laughs out loud.
C: Child shifts weight side to side in prone.
D: Child transfers objects between hands.

43. A nurse is caring for an adult that has recently been diagnosed with renal failure. Which of the following clinical signs would most likely not be present?

A: Hypotension
B: Heart failure
C: Dizziness
D: Memory loss

44. A nurse is caring for an adult that has recently been diagnosed with hypokalemia. Which of the following clinical signs would most likely not be present?

A: Leg cramps

B: Respiratory distress

C: Confusion

D: Flaccid paralysis

45. A nurse is caring for an adult that has recently been diagnosed with metabolic acidosis. Which of the following clinical signs would most likely not be present?

A: Weakness

B: Dysrhythmias

C: Dry skin

D: Malaise

46. A nurse is caring for an adult that has recently been diagnosed with metabolic alkalosis. Which of the following clinical signs would most likely not be present?

A: Vomiting

B: Diarrhea

C: Agitation

D: Hyperventilation

47. A nurse is caring for an adult that has recently been diagnosed with respiratory acidosis. Which of the following clinical signs would most likely not be present?

A: $CO_2$ Retention

B: Dyspnea

C: Headaches

D: Tachypnea

48. A nurse is caring for an adult that has recently been diagnosed with respiratory alkalosis. Which of the following clinical signs would most likely not be present?

A: Anxiety attacks
B: Dizziness
C: Hyperventilation cyanosis
D: Blurred vision

49. A nurse is reviewing a patient's medication list. The drug Pentoxifylline is present on the list. Which of the following conditions is commonly treated with this medication?

A: COPD
B: CAD
C: PVD
D: MS

50. A patient has been on long-term management for CHF. Which of the following drugs is considered a loop dieuretic that could be used to treat CHF symptoms?

A: Ciprofloxacin
B: Lepirudin
C: Naproxen
D: Bumex

51. A patient has recently been diagnosed with polio and has questions about the diagnosis. Which of the following systems is most affected by polio?

A: PNS
B: CNS
C: Urinary system
D: Cardiac system

52. A nurse is educating a patient about right-sided heart deficits. Which of the following clinical signs is not associated with right-sided heart deficits?

A: Orthopnea
B: Dependent edema
C: Ascites
D: Nocturia

53. A nurse is reviewing a patient's medication. Which of the following is considered a potassium sparing dieuretic?

A: Esidrix
B: Lasix
C: Aldactone
D: Edecrin

54. A nurse is reviewing a patient's medication. The patient is taking Digoxin. Which of the following is not an effect of Digoxin?

A: Depressed HR

B: Increased CO

C: Increased venous pressure

D: Increased contractility of cardiac muscle

55. A patient has been instructed by the doctor to reduce their intake of Potassium. Which types of foods should not worry about avoiding?

A: Bananas

B: Tomatoes

C: Orange juice

D: Apples

56. A patient's chart indicates the patient is suffering from Digoxin toxicity. Which of the following clinical signs is not associated with digoxin toxicity?

A: Ventricular bigeminy

B: Anorexia

C: Normal ventricular rhythm

D: Nausea

57. A fourteen year old male has just been admitted to your floor. He has a history of central abdominal pain that has moved to the right iliac fossa region. He also has tenderness over the region and a fever. Which of the following would you most likely suspect?

A: Appendicitis

B: Acute pancreatitis

C: Ulcerative colitis

D: Cholecystitis

58. A thirteen-year old male has a tender lump area in his left groin. His abdomen is distended and he has been vomiting for the past 24 hours. Which of the following would you most like suspect?

A: Ulcerative colitis

B: Biliary colic

C: Acute gastroenteritis

D: Strangulated hernia

59. Which of the following is the key risk factor for development of Parkinson's disease dementia?

A: History of strokes

B: Acute headaches history

C: Edward's syndrome

D: Use of phenothiazines

60. A father notifies your clinic that his son's homeroom teacher has just been diagnosed with meningitis and his son spent the day with the teacher in detention yesterday. Which of the following would be the most likely innervention?

A: Isolation of the son

B: Treatment of the son with Aciclovir

C: Treatment of the son with Rifampicin

D: Reassure the father

61. A patient has recently been diagnosed with hyponatremia. Which of the following is not associated with hyponatremia?

A: Muscle twitching
B: Anxiety
C: Cyanosis
D: Sticky mucous membranes

62. A patient has recently been diagnosed with hypernatremia. Which of the following is not associated with hypernatremia?

A: Hypotension
B: Tachycardia
C: Pitting edema
D: Weight gain

63. Which of the following normal blood therapeutic concentrations is abnormal?

A: Phenobarbital 10-40 mcg/ml
B: Lithium .6 – 1.2 mEq/L
C: Digoxin .5 – 1.6 ng/ml
D: Valproic acid 40 – 100 mcg/ml

64. Which of the following normal blood therapeutic concentrations is abnormal?

A: Digitoxin 09 – 25 mcg/ml
B: Vancomycin 05 – 15 mcg/ml

C: Primidone 02 – 14 mcg/ml

D: Theophylline 10 – 20 mcg/ml

65. Which of the following normal blood therapeutic concentrations is abnormal?

A: Phenytoin 10 – 20 mcg/ml

B: Quinidine 02 – 06 mcg/ml

C: Haloperidol 05 – 20 ng/ml

D: Carbamazepine 5 – 25 mcg/ml

## *Answer Key*

1. (A) and (B) are both contraindicated with pregnancy.

2. (F) All of the others have can cause photosensitivity reactions.

3. (D) All of the others can cause urine discoloration.

4. (A) Corgard could be removed from the refigerator.

5. (D) IgG is the only immunoglobulin that can cross the placental barrier.

6. (B) AZT treatment is the most critical innervention.

7. (C) Autonomic neuropathy can cause inability to urinate.

8. (B) All of the clinical signs and systems point to a condition of anorexia nervosa.

9. (B) Hypercalcaemia can cause polyuria, severe abdominal pain, and confusion.

10. (C) Rho gam prevents the production of anti-RH antibodies in the mother that has a Rh positive fetus.

11. (D) The effects of PKU stay with the infant throughout their life.

12. (D) Aspirin overdose can lead to metabolic acidosis and cause pulmonary edema development.

13. (D) This patient's safety is your primary concern.

14. (C) The bronchodilator will allow a more productive cough.

15. (B) Weight gain is associated with CHF and congenital heart deficits.

16. (C) The skin would be dry and not oily.

17. (A) Streptokinase is a clot busting drug and the best choice in this situation.

18. (A) Green vegetables and liver are a great source of folic acid.

19. (D) Cl. difficile has not been linked to meningitis.

20. (D) RBC's last for 120 days in the body.

21. (B) Discharge education begins upon admit.

22. (B) Initiative vs. guilt- 3-6 years old

23. (A) Trust vs. Mistrust- 12-18 months old

24. (D) Intimacy vs. isolation- 18-35 years old

25. (B) HR and Respirations are slightly increased. BP is down.

26. (A) Elavil is a tricyclic antidepressant.

27. (D) Erythromycin is used to treat conditions A-C.

28. (D) Answer choices A-C were symptoms of acute hyperkalemia.

29. (C) Weight loss would be expected.

30. (A) Loss of appetite would be expected.

31. (D) Choice A is linked to Plague, Choice B is linked to peptic ulcers, Choice C is linked to Cholera.

32. (A) Choice B is linked to Rheumatic fever, Choice C is linked to Anthrax, Choice D is linked to Endocarditis.

33. (D) A CT scan would be performed for further investigation of the hemiparesis.

34. (C) Weight gain and poor temperature tolerance indicate something may be wrong with the thyroid function.

35. (C) Blood cultures would be performed to investigate the fever and rash symptoms.

36. (A) With a history of diabetes, the first response should be to check blood sugar levels.

37. (C) Age is not the greatest factor in potty training. The overall mental and physical abilities of the child is the most important factor.

38. (C) The poison control center will have an exact plan of action for this child.

39. (C) Vastus lateralis is the most appropriate location.

40. (D) In this case you are able to determine the name of the child by the father's statement, moreover you should not withhold the medication from the child following identification.

41. (D) These skills generally develop between 10-15 months.

42. (D) Transferring objects between hands is a 8-9 month skill.

43. (A) Hypertension is often related renal failure.

44. (D) Flaccid paralysis is an indication of Hyperkalemia.

45. (B) Dysrhythmias are associated with metabolic alkalosis.

46. (D) Hyperventilation occurs with metabolic acidosis. Hypoventilation occurs with metabolic alkalosis.

47. (D) Tachypnea is associated with respiratory alkalosis.

48. (C) Hyperventilation cyanosis is associated with respiratory acidosis.

49. (C) This drug is a hemorheological agent that helps blood viscosity.

50. (D) Bumex is considered a loop dieuretic.

51. (B) Polio is caused by a virus that attacks the CNS.

52. (A) Orthopnea is a left- sided heart failure clinical symptom.

53. (C) Aldactone (Spironolactone) is considered a potassium sparing diuretic.

54. (C) Digoxin decreases venous pressure.

55. (D) All the others are high in potassium.

56. (C) Ventricular rhythm may be premature with Digoxin toxicity.

57. (A) Appendicitis is most likely indicated in this case.

58. (D) A hernia is the most likely indicated in this case.

59. (D) Penothiazines are considered a risk factor for Parkinson's disease dementia.

60. (C) Rifampicin would be used in this case.

61. (D) Stick mucuous membranes are associated with hypernatremia.

62. (A) Hypotension would be associated with hyponatremia.

63. (C) The normal ranges for Digoxin is .7 – 1.4 ng/ml.

64. (C) The normal ranges of Primidone is 04 –12 mcg/ml.

65. (C) The normal ranges of Carbamazepine is 10 – 20 mcg/ml.

# *Valuable NCLEX Resource Links*

NCLEX Secrets

http://www.nclex-test.com

Internet Exam

http://www.internetexam.com

NCLEX Secrets

http://www.nclex-test.com

Nurse Success Courses

http://www.nursesuccess.com/

RN Express

http://www.rnexpress.com/

Online NCLEX Course

http://www.testpreparationsecrets.com/nclex

Hurst Review

http://www.hurstreview.com/

Delmar's Online Review

*http://www.nursingreview.com/*

## *Special Report– Quick Reference Lesion Review*

| | |
|---|---|
| Occipital Lobe | Homonymous hemianopsia, partial seizures with limited visual phenomena |
| Thalamus | Contralateral thalamus pain, contralateral hemisensory loss |
| Pineal gland | Early hydrocephalus, papillary abnormalities, Parinaud's syndrome |
| Internal capsule | Hemisensory loss, homonymous hemianopsia, contralateral hemiplegia |
| Basal ganglia | Contralateral dystonia, Contralateral choreoathetosis |
| Pons | Diplopia, internal strabismus, VI and VII involvement, contralateral hemisensory and hemiparesis loss, issilateral cerebellar ataxia |
| Broca's area | Motor dysphasia |
| Precentral gyrus | Jacksonian seizures, generalized seizures, hemiparesis |
| Superficial parietal lobe | Receptive dysphasia |
| Cerebellar hemisphere | Ipsilateral cerebellar ataxia with hypotonia, dysmetria, intention tremor, nystagmus to side of |

| | |
|---|---|
| | lesion |
| Midbrain | Loss of upward gaze, III involvement, ipsilateral cerebellar signs, diplopia |
| Angular gyrus | Finger agnosia, allochiria, agraphia, acalculia |
| Temporal lobe | Contralateral homonymous upper quadrantanopsia, partial complex seizures |
| Paracentral lobe | Urgency of micturition, incontinence, progressive spastic paraparesis |
| Third Ventricle | Hydrocephalus |
| Fourth Ventricle | Hydrocephalus, progressive spastic hemiparesis |
| Optic Chiasm | Bitemporal hemianopsia, optic atrophy |
| Uncus | Partial complex seizures |
| Superior temporal gyrus | Receptive dysphasia |
| Prefrontal area | Apathy, poor attention span, loss of judgement, release phenomena, distractible |
| Orbital surface frontal lobe | Paroxysmal atrial tachycardia |
| Hypothalmus | Amenorrhea, cachexia, hypopituitarism, hypothyrodism, impotence, diencephalic autonomic seizures |

## *Special Report- High Frequency Terms*

The following terms were compiled as high frequency NCLEX test terms. I recommend printing out this list and identifying the terms you are unfamiliar with. Then, use a medical dictionary or the internet to look up the terms you have questions about. Take one section per day if you have the time to maximize recall.

**A**

Acquired immunodeficiency syndrome
Acromegaly
Acute lymphoblastic leukemia
Acute myelogenous leukemia
Acute nonlymphocytic leukemia
Adenocarcinoma
Adjuvant disease
Agoraphobia
Alopecia
Alzheimer's dementia
Amebiasis
Amenorrhea
Amyloidosis
Anastomoses
Aneurysm
Angina pectoris
Angiogenesis
Anklyosing spondylitis
Anxiety
Appendicitis
Arterial disease
Arteriosclerosis
Arthralgia
Arthritis bacterial
Arthritis (Crohn's disease)
Arthritis (gouty)
Arthritis (Reiter's syndrome)
Arthritis (Rheumatoid arthritis
Atypical angina
Avascular necrosis
AZT

**B**

Barrett's oesophagus
Back pain (Sciatica)
Back pain (tumor)
Barlow's syndrome
Basal cell carcinoma
Behçet's disease
Benign prostate hypertrophy
Biliary disease
Bilirubin
Biliverdin
Blood cultures
Boerhaave's syndrome
Bornholm disease
Bowen's disease
Bradycardia
Braxton-Hicks contractions
Bronchiectasis
Budd-Chiari syndrome
Buerger's disease
Bulimia
Burkitt Lymphoma

**C**

CAD
Cancer (basal cell)
Cancer (pancreatic)
Cancer (prostate)
Cancer (squamous cell)
Candidiasis
Cardiac disease
Cardiac valvular disease
Carpal tunnel syndrome
Catecholamines
Cauda equina syndrome

Centriacinar emphysema
Charcot-Marie-Tooth disease
Chest pain
Chest x-ray
Cholecystectomy
Cholecystitis
Chondroma
Chronic lymphocytic leukemia
Chronic myelogenous leukemia
Chvostek's sign
Cirrhosis
Click-murmur syndrome
Clonidine
Coccygodynia
COLD
Colles' fracture
Combined hormone replacement
Computed tomography (CT) scan of head
Confusion
Conjunctivitis
Connective tissue disease
Conn's syndrome
Coombs' test
Cor pulmonale
Corticosteroids
CREST syndrome
Cretinism
Creutzfeldt-Jakob disease
Crohn's disease
Cushing's syndrome

**D**

Dactylitis
Degenerative heart disease
Dermatitis
Diabetes insipidus
Diabetes mellitus
Diabetic nephropathy
Dialysis
Diaphoresis
Dietary modification
Diffuse lymphoma
Digitalis
Dopamine
Down's syndrome
Duchenne muscular dystrophy
DVT
Dysmenorrhea
Dyspnea

**E**

Ecchymosis
Ectopic pregnancy
Electrocardiogram (ECG)
Embolism
Emphysema
Encephalopathy
Endocrine system
Epinephrine
Epstein-Barr virus
Erythropoietien
Erythema nodosum
Esophagitis
Ewing's sarcoma
Exophthalmos

**F**

Fabry's disease
Fallopian tube
Fallot's tetralogy
Fanconi's syndrome
Fatigue
Fecal incontinence
Fibrillation
Fibromyalgia syndrome
Fibrous ankylosis
Follicle-stimulating hormone
Fuch's corneal dystrophy
Full blood count (FBC)
Functional dyspepsia

**G**

Gamma globulin
Gangrene
Gaucher's disease

Gestatoin
Giant cell tumor
Gilbert's syndrome
Gliosis
Glucagon
Glucose tolerance test
Goodpasture's syndrome
Graves disease
Guillai-Barre' syndrome
Gynecomastia

**H**

Haemochromatosis
Hand-foot syndrome
Hashimoto's thyroiditis
Hartmann's solution
Heart failure
Heart rate
Helper T cells
Hemarthrosis
Hematuria
Hemophilia
Hemorrhage
Henoch-Schönlein syndrome
Heparin
Hepatic encephalopathy
Hepatitis (A-E)
Herpes zoster
Hiatal hernia
Hirschsprung's disease
HIV
Hodgkin's disease
Homans sign
Homocystinuria
Hormone replacement therapy
Huntington's chorea
Hurler's syndrome
Hunter's syndrome
Hyalinization
Hypercortisolism
Hyperglycemia
Hyperplasia
Hyperparathyroidism
Hypnotic preparations
Hypochromia
Hyponatremia
Hypothyroidism
Hypoxia
Hysterectomy

**I**

IBD Inflammatory bowel disease
IBS Irritable bowel syndrome
Immune serum globulin
Immunoglobulins (IgE, IgG, IgM)
Inderal
Induration
Infectious arthritis
Inflammatory bowel disease
Inhibitors
Interferon
Interleukin (I), (II)
Interstitial cystitis
Intramedullary tumors
Iridocyclitis
Ischemic Heart Disease
Isographs
Isotonic solution

**J**

Jaundice
Joint pain (gout)
Joint pain (psoriatic arthritis)
Joint sepsis
Jevenile rheumatoid arthritis

**K**

Kaposi's sarcoma
Kawasaki disease
Kehr's sign
Kernicterus
Ketoacidosis
Kidney failure
Kidney stones
Kleihauer test

Korsakoff's psychosis
Krabbe's disease
Kreim test
Kupffer's cells
Kussmaul's respirations

**L**

Labile hypertension
Lactation
Large cell carcinoma
Lesch-Nyhan syndrome
Leukemias
Leukopenia
Lewy body dementia
Lhermitte's sign
Lipoproteins
Lobar pneumonia
Low back pain
Low density lipoprotein
Lumbar pain
Lupus carditis
Lupus erythematosus
Lyme disease
Lymph nodes
Lymphocyctes
Lymphoid cells
Lymphotoxin

**M**

Macrophages
Malignant melanoma
Mallory-Weiss tear
Mantoux test
Marie-Strumpell disease
Mastodynia
Meckel's diverticulum
Medial cartilage tear
Melanoma
Menarche
Ménière's disease
Menorrhagia
Metabolic acidosis
Metabolic alkalosis
Metabolism
Metaplasia
Mid-stream specimen of urine
Mineral supplements
Mitral valve prolapse
Monocytes
Morpheamultiple myeloma
Multiple sclerosis
Munchausen's syndrome
Myalgias
Myopathy

**N**

Neck pain
Neomycin
Neoplasms
Neoplastic disease
Neurogenic back pain
Neurologic disorders
Neurotransmitters
Niemann-Pick disease
Night sweats
Nitrates
Nitroglycerin
Nocturnal angina
Non-Hodgkin's lymphoma
Norepinephrine
Nystagmus

**O**

Oat cell carcinoma
Obstipation
Ochronosis
Oliguria
Oncogenesis
Oophorectomy
Orthostatic hypotension
Osteitis deformans
Osteoarthritis
Osteoblastoma
Osteochondroma
Osteomyelitis
Osteopenia
Osteoporosis
Overlap syndrome

**P**

Paget's disease
Pain–joint
Pain-sources
Palmar erythema
Palpitations
Pancoast's tumors
Pancreatic carcinoma
Pancreatitis
Papilledema
Parathyroid hormone
Paraneoplastic syndromes
Paresthesia
Parkinson's disease
Paroxysmal
Pelvic inflammatory disease (PID)
Periarthritis
Pericarditis
Peripheral arterial disease
Perthes disease
Phagocytosis
Phrenic nerve
Pick's disease
Plasma cell myeloma
Pleural pain
Pneumonia
Polycythemia
Polyneuropathy
Polyuria
Posttraumatic stress disorder
Pregnancy
Prinzmetal's angina
Pruritus
Psoriatic arthropathy
Psychological support
Pulmonary edema
Purpura
Pyoderma
Pyrophosphate arthropathy

**Q**

Quadriceps

**R**

RA- Rheumatoid arthritis
Radiograph
Raynaud's disease
Reactive arthritis
Rectocele
Referred pain
Reidel's thyroiditis
Reiter's syndrome
Relaxin
Renal failure
Renal tuberculosis
Respiration
Reticuloendothelial
Retrovirus
Rheumatic chorea
Rheumatic fever
Rickets
Right ventricular failure

**S**

Sacral pain
Sacroilitis
Salpingitis
Sarcoma
Satiety
Sciatica
Scleroderma
Serotonin
Serum cholesterol
Serum urea and electrolytes concentration
Sengstaken-Blakemore tube
Sex hormones
Shoulder pain
Sickle cell anemia
Sinus bradycardia
Sinus tachycardia
Sjogren's syndrome
SLE- systemic lupu erythematosus

Smoking
Spastic colitis
Spondylotic
Stem cells
Stool culture
Stokes-Adams attacks
Swan-Ganz catheter
Syndesmophyte
Synovitis
Systemic disease
Systolic rate

**T**

T4 cell count
Takayasu disease
Tay-Sachs disease
T lymphocytes
Tendinitis
Tenesmus
Testosterone
Thoracic aneurysms
Thrombin
Thrombosis
Thyroid function tests
Thyroid gland
Tietze's syndrome
Tissue necrosis
Toxins
Tourette syndrome
Tracheal pain
Transfer factor
Trauma
Tuberculosis
Tumor-benign
Tumor-metastatic
Tumor markers
Turner syndrome

**U**

Ulceration
Ultrasound abdomen
Umbilical pain
Ureter obstruction
Urethritis
Urinary bladder
Urinary tract infection
Urogilinogen
Urologic pain
Urticaria
UTI
Uveitis

**V**

Vaginal bleeding
Vaginal lubricant
Vaginal oestrogen therapy
Vascular disorders
Venous insufficiency
Ventricular failure
Vertebral osteomyelitis
Vertigo
Visceral back pain
Visceral pericardium
Vital signs
Vomiting
Von Willebrand's disease

**W**

Weight gain
Wenckebach phenomenon
Wernicke's encephalopathy
Wet pleurisy
Wilson's disease
Wolff-Parkinson-White syndrome
Wright-Schober test

# *Definition of Root Words*

**A**

| | |
|---|---|
| abdomin/o | abdomen |
| acou/o | hearing |
| aden/o | gland |
| adenoid/o | adenoids |
| adren/o | adrenal gland |
| alveol/o | alveolus |
| amni/o | amnion |
| andro/o | male |
| angi/o | vessel |
| ankly/o | stiff |
| anter/o | frontal |
| an/o | anus |
| aponeur/o | aponeurosis |
| appendic/o | appendix |
| arche/o | beginning |
| arteri/o | artery |
| atri/o | atrium |
| aur/i | ear |
| aur/o | ear |
| aut/o | self |

**B**

| | |
|---|---|
| bacteri/o | bacteria |
| balan/o | glans penis |
| bi/o | life |
| blephar/o | eyelid |
| bronch/i | bronchus |
| bronch/o | bronchus |

**C**

| | |
|---|---|
| calc/i | calcium |
| cancer/o | cancer |
| carcin/o | cancer |
| cardi/o | heart |
| carp/o | carpals |
| caud/o | tail |
| cec/o | cecum |
| celi/o | abdomen |
| cephal/o | head |
| cerebell/o | cerebellum |
| cerebr/o | cerebrum |
| cervic/o | cervix |
| cheil/o | lip |
| cholangi/o | bile duct |

| | |
|---|---|
| chol/e | gall |
| chondro/o | cartilage |
| chori/o | chorion |
| chrom/o | color |
| clavic/o | clavicle |
| col/o | colon |
| colp/o | vagina |
| core/o | pupil |
| corne/o | cornea |
| coron/o | heart |
| cortic/o | cortex |
| cor/o | pupil |
| cost/o | rib |
| crani/o | cranium |
| cry/o | cold |
| cutane/o | skin |
| cyes/i | pregnancy |
| cyst/o | bladder |

**D**

| | |
|---|---|
| dacry/o | tear |
| dermat/o | skin |
| diaphragmat/o | diaphragm |
| dipl/o | double |
| dips/o | thirst |
| dist/o | distal |
| diverticul/o | diverticulum |
| dors/o | back |
| duoden/o | duodenum |
| dur/o | dura |

**E**

| | |
|---|---|
| ech/o | sound |
| electr/o | electricity |
| embry/o | embryo |
| encephal/o | brain |
| endocrin/o | endocrine |
| enter/o | intestine |
| epididym/o | epididymis |
| epiglott/o | epiglottis |
| episi/o | vulva |
| epitheli/o | epithelium |
| erythr/o | red |
| esophag/o | esophagus |
| esthesi/o | sensation |

**F**

| | |
|---|---|
| femor/o | femur |
| fet/i | fetus |
| fet/o | fetus |
| fibr/o | fibrous tissue |
| fibul/o | fibula |

**G**

| | |
|---|---|
| ganglion/o | ganglion |
| gastr/o | stomach |
| gingiv/o | gum |
| glomerul/o | glomerulus |
| gloss/o | tongue |
| glyc/o | sugar |
| gnos/o | knowledge |
| gravid/o | pregnancy |
| gynec/o | woman |

**H**

| | |
|---|---|
| hem/o | blood |
| hepat/o | liver |
| herni/o | hernia |
| heter/o | other |
| hidr/o | sweat |
| hist/o | tissue |
| humer/o | humerus |
| hydr/o | water |
| hymen/o | hymen |
| hyster/o | uterus |

**I**

| | |
|---|---|
| ile/o | ileum |
| ili/o | ilium |
| irid/o | iris |
| iri/o | iris |
| ischi/o | ischium |
| ischo/o | blockage |

**J**

| | |
|---|---|
| jejun/o | jejunum |

**K**

| | |
|---|---|
| kal/i | potassium |
| kary/o | nucleus |
| kerat/o | hard |
| kinesi/o | motion |
| kyph/o | hump |

**L**

| | |
|---|---|
| lacrim/o | tear duct |
| lact/o | milk |
| lamin/o | lamina |
| lapar/o | abdomen |
| later/o | lateral |
| lei/o | smooth |
| leuk/o | white |
| lingu/o | tongue |
| lip/o | fat |
| lith/o | stone |
| lob/o | lob/o |
| lord/o | flexed forward |
| lumb/o | lumbar |
| lymph/o | lymph |

**M**

| | |
|---|---|
| mamm/o | breast |
| mandibul/o | mandible |
| mast/o | breast |
| mastoid/o | mastoid |
| maxill/o | maxilla |
| meat/o | opening |
| melan/o | black |
| mening/o | meninges |
| menisc/o | meniscus |
| men/o | menstruation |
| ment/o | mind |
| metr/i | uterus |
| metr/o | uterus |
| mon/o | one |
| muc/o | mucus |
| myc/o | fungus |
| myel/o | spinal cord |
| my/o | muscle |

**N**

| | |
|---|---|
| nas/o | nose |
| nat/o | birth |
| necr/o | death |
| nephr/o | kidney |
| neur/o | nerve |
| noct/i | night |

**O**

| | |
|---|---|
| ocul/o | eye |
| olig/o | few |
| omphal/o | navel |
| onc/o | tumor |
| onych/o | nail |
| oophor/o | ovary |
| ophthalm/o | eye |
| opt/o | vision |
| orchid/o | testicle |
| orch/o | testicle |
| organ/o | organ |
| or/o | mouth |
| orth/o | straight |
| oste/o | bone |
| ot/o | ear |
| ox/i | oxygen |

## P

| | |
|---|---|
| pachy/o | thick |
| palat/o | palate |
| pancreat/o | pancreas |
| par/o | labor |
| patell/o | patella |
| path/o | disease |
| pelv/i | pelvis |
| perine/o | peritoneum |
| petr/o | stone |
| phalang/o | pharynx |
| phas/o | speech |
| phleb/o | vein |
| phot/o | light |
| phren/o | mind |
| plasm/o | plasma |
| pleur/o | pleura |
| pneumon/o | lung |
| poli/o | gray matter |
| polyp/o | small growth |
| poster/o | posterior |
| prim/i | first |
| proct/o | rectum |
| proxim/o | proximal |
| pseud/o | fake |
| psych/o | mind |
| pub/o | pubis |
| puerper/o | childbirth |
| pulmon/o | lung |
| pupill/o | pupil |
| pyel/o | renal pelvis |
| pylor/o | pylorus |
| py/o | pus |

## Q

| | |
|---|---|
| quadr/i | four |

## R

| | |
|---|---|
| rachi/o | spinal |
| radic/o | nerve |
| radi/o | radius |
| rect/o | rectum |
| ren/o | kidney |
| retin/o | retina |
| rhabd/o | striated |
| rhytid/o | wrinkles |
| rhiz/o | nerve |

## S

| | |
|---|---|
| sacr/o | sacrum |
| scapul/o | scapula |
| scler/o | sclera |
| scoli/o | curved |
| seb/o | sebum |
| sept/o | septum |
| sial/o | saliva |
| sinus/o | sinus |
| somat/o | body |
| son/o | sound |
| spermat/o | sperm |
| spir/o | breathe |
| splen/o | spleen |
| spondyl/o | vertebra |
| staped/o | stapes |
| staphyl/o | clusters |
| stern/o | sternum |
| steth/o | chest |
| stomat/o | mouth |
| strept/o | chain-like |
| super/o | superior |
| synovi/o | synovia |

## T

| | |
|---|---|
| tars/o | tarsal |
| ten/o | tendon |
| test/o | testicle |
| therm/o | heat |
| thorac/o | thorax |

| | |
|---|---|
| thromb/o | clot |
| thym/o | thymus |
| thyroid/o | thyroid gland |
| tibi/o | tibia |
| tom/o | pressure |
| tonsill/o | tonsils |
| toxic/o | poison |
| trachel/o | trachea |
| trich/o | hair |
| tympan/o | eardrum |

**U**

| | |
|---|---|
| uln/o | ulna |
| ungu/o | nail |
| ureter/o | ureter |
| urethr/o | urethra |
| ur/o | urine |
| uter/o | uterus |
| uvul/o | uvula |

**V**

| | |
|---|---|
| vagin/o | vagina |
| valv/o | valve |
| vas/o | vessel |
| ven/o | vein |
| ventricul/o | ventricle |
| ventro/o | frontal |
| vertebr/o | vertebra |
| vesic/o | bladder |
| vesicul/o | seminal vesicle |

## *Prefixes*

| | |
|---|---|
| an- | without |
| ante- | before |
| bi- | two |
| brady- | slow |
| dia- | through |
| dys- | difficult |
| endo- | within |
| epi- | over |
| eu- | normal |
| exo- | outward |
| hemi- | half |
| hyper- | excessive |
| hypo- | deficient |
| inter- | between |
| intra- | within |
| meta- | change |

| | |
|---|---|
| multi- | numerous |
| nulli- | none |
| pan- | total |
| para- | beyond |
| per- | through |
| peri- | surrounding |
| post- | after |
| pre- | before |
| pro- | before |
| sub- | below |
| supra- | superior |
| sym- | join |
| syn- | join |
| tachy- | rapid |
| tetra- | four |
| trans- | through |

# *Suffixes*

| | |
|---|---|
| -al | pertaining to |
| -algia | pain |
| -apheresis | removal |
| -ary | pertaining to |
| -asthenia | weakness |
| -capnia | carbon dioxide |
| -cele | hernia |
| -clasia | break |
| -clasis | break |
| -crit | separate |
| -cyte | cell |
| -desis | fusion |
| -drome | run |
| -eal | pertaining to |
| -ectasis | expansion |
| -ectomy | removal |
| -esis | condition |
| -genesis | cause |
| -genic | pertaining to |
| -gram | record |
| -graph | recording device |
| -ial | pertaining to |
| -iasis | condition |
| -iatrist | physician |
| -iatry | specialty |
| -ic | pertaining to |
| -ician | one that |
| -ictal | attack |
| -ior | pertaining to |
| -ism | condition of |
| -itis | inflammation |
| -lysis | separating |
| -malacia | softening |
| -meter | measure |
| -odynia | pain |
| -oid | resembling |
| -ology | study |
| -oma | tumor |
| -opia | vision |
| -opsy | view of |
| -orrhaphy | repairing |
| -orrhea | flow |
| -osis | condition |
| -otomy | cut into |
| -oxia | oxygen |
| -paresis | partial paralysis |
| -pathy | disease |
| -pepsia | digestion |
| -pexy | suspension |
| -phagia | swallowing, eating |
| -phobia | excessive fear of |
| -phonia | sound, voice |
| -physis | growth |
| -plasia | development |
| -plasm | a growth |
| -plegia | paralysis |
| -pnea | breathing |
| -poiesis | formation |
| -ptosis | sagging |
| -salpinx | fallopian tube |
| -sacoma | malignant tumor |
| -schisis | crack |
| -sclerosis | hardening |
| -stasis | standing |
| -stenosis | narrowing |
| -thorax | chest |
| -tocia | labor, birth |
| -tome | cutting device |
| -trophy | develop |
| -uria | urine |