INFECTIOUS DISEASES

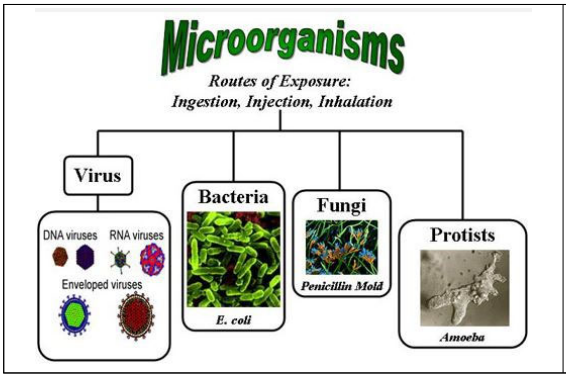
	Disease	Pathogens	
1	**Bacillary dysentery**	bacteria	Shigella
2	**Cholera**	bacteria	Vibrio cholerae
3	**Epidemic encephalitis**	various	HSV, rabies virus, bacteria, fungi, parasites
4	**Leptospirosis**	bacteria	Leptospira
5	**Malaria**	parasite	Plasmodium
6	**Mumps**	virus	Mumps virus
7	**Schistosomiasis**	parasite	Schistosomes
8	**Typhoid fever**	bacteria	Salmonella typhi
9	**Viral hepatitis**	virus	Hepatitis A/B/C/D/E viruses

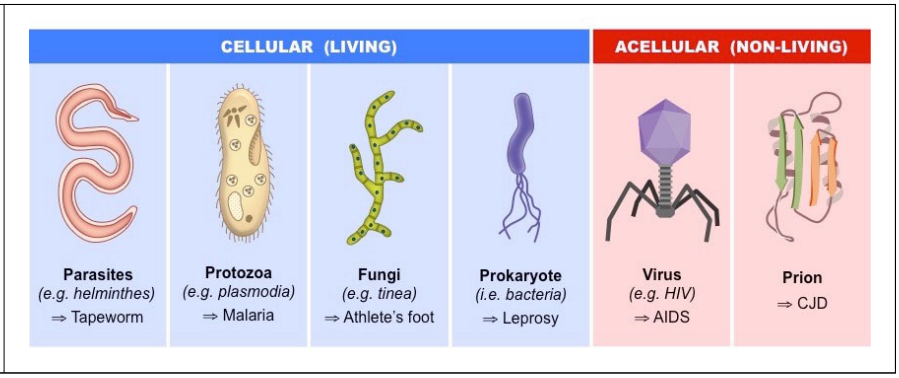
Virus	Bacteria	Parasite	Various
• Mumps • Viral hepatitis	• Bacillary dysentery • Cholera • Leptospirosis • Typhoid fever	• Malaria • Schistosomiasis	• Epidemic encephalitis

Infection

- An infection occurs when another organism enters the body and causes disease.
- The microorganisms that cause infections are very diverse and can include viruses, bacteria, fungi, and parasites.

Virus	Virus is a pathogenic microscopic organism. Viruses cannot multiply on their own, so they have to invade a 'host' cell.
Bacteria	Bacteria are microscopic, single-celled organisms that exist in both inside and outside other organisms.
Fungi	Pathogenic fungi are yeasts and moulds which can infect humans.
Parasite	Parasites are organisms that live on other organisms.





There are three main classes of parasites that can cause disease in humans: protozoa, helminths, and ectoparasites. Protozoa are microscopic, one-celled organisms that can be free-living or parasitic in nature.

Infection	Inflammation
the invasion and multiplication of a pathogen within the body	the body's protective response against infection.

Infectious diseases are disorders caused by organisms such as bacteria, viruses, fungi, or parasites. Which of the following diseases is NOT caused by bacteria?

A. Dysentery
B. Cholera
C. Leptospirosis
D. Mumps

Parasites are organisms that live off other organisms, or hosts, to survive. Which of the following is the parasitic infection?

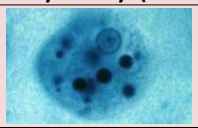
A. Cholera, Leptospirosis
B. Mumps, Hepatitis
C. Malaria, Schistosomiasis
D. Dysentery, Typhoid fever

1. BACILLARY DYSENTERY

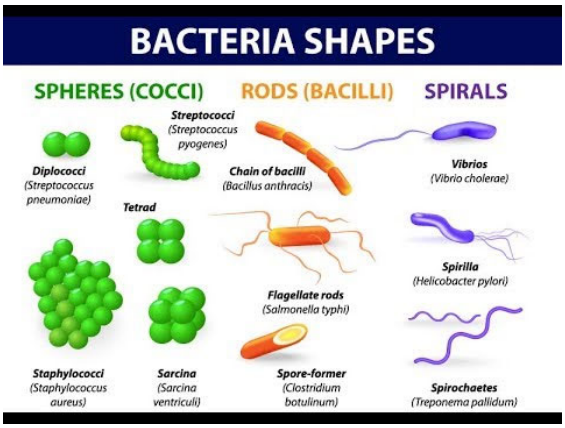
- **Dysentery** is a type of gastroenteritis that results in diarrhea with **blood**. Other symptoms may include fever, abdominal pain, and a feeling of incomplete defecation. Complications may include dehydration.
- Most people who experience dysentery develop either bacterial dysentery or amebic dysentery. Bacterial dysentery is caused by infection with bacteria from Shigella, Campylobacter, Salmonella, or enterohemorrhagic E. coli. Diarrhea from Shigella is also known as shigellosis.

Bacteria → Dysentery	Ameba → dysentery
Shigella, Campylobacter, Salmonella, E. coli	Entamoeba histolytica

- Risk factors include contamination of food and water with feces due to poor sanitation. The underlying mechanism involves inflammation of the intestine, especially of the colon.
- Efforts to prevent dysentery include hand washing and food safety measures while traveling in areas of high risk. While the condition generally resolves on its own within a week, drinking sufficient fluids such as oral rehydration solution is important.

	Bacillary dysentery (Shigellosis)	Amoebic dysentery (Amoebiasis)
		
Pathogen	a bacterial disease caused by a species of bacteria known as Shigella	caused by an invasive protozoa parasite called Entamoeba histolytica
Incubation	Short (less than 1 week)	long (3 weeks or more)
Fever	common	only in complications
Loose motions	more than 10 episodes of loose motions per day	will have 6-8 episodes of loose motions per day
Stool	small amount of stool, fresh blood colored, odorless stool	copious amount of stool, stool has a dark color and an offensive odor
Treatment	treated with antibiotics	treated with antiprotozoal drugs

- **Shigellosis** is an infection of the intestines caused by Shigella bacteria. Symptoms generally start one to two days after exposure and include diarrhea, fever, abdominal pain, and feeling the need to pass stools even when the bowels are empty. The diarrhea may be **bloody**. Symptoms typically last five to seven days and it may take several months before bowel habits return entirely to normal. Complications can include reactive arthritis, sepsis, seizures, and hemolytic uremic syndrome.
- Globally shigellosis occurs in at least 80 million people and results in about 700,000 deaths a year. Most cases occur in the developing world.
- Treatment consists mainly of replacing fluids and salts lost because of diarrhea. Replacement by mouth is satisfactory for most people, but some may need to receive fluids intravenously. Antibiotics should only be used in severe cases or for certain populations with mild symptoms (elderly, immunocompromised, food service industry workers, child care workers).



Bugs causing diarrhea

Bloody diarrhea	Watery diarrhea
Campylobacter / E histolytica / Enterohemorrhagic E coli / Enteroinvasive E coli / Salmonella / Shigella / Y enterocoliticia	C difficile / C perfringens / Enterotoxigenic E coli / Protozoa (Giardia, Cryptosporidium) / V cholerae / Viruses (rota, noro)

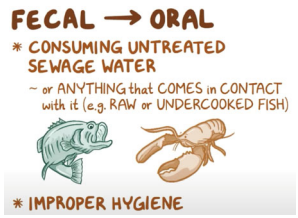
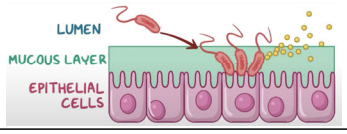
Bacterial dysentery is the most common type of dysentery. Which of the following is NOT a cause of bacterial dysentery?

A. Entamoeba histolytica
B. Shigella
C. Campylobacter
D. Salmonella

Which of the following does NOT cause bloody diarrhea?

A. Campylobacter
B. Vibrio cholerae
C. Shigella
D. Entamoeba histolytica

2. CHOLERA

Pathogen	Transmission	Uses its Flagella to	Pathology
 Vibrio Cholerae		1. Move towards intestinal walls 2. Propel through the mucous layer 3. Attach to Villi on surface of Epithelial cells 	• Contagious infection → multiply & produce toxins in the intestine → Gastroenteritis & Watery diarrhea • Rapid dehydration → Fatal

- **Cholera** is an infection of the small intestine by some strains of the bacterium **Vibrio cholerae**. Symptoms may range from none, to mild, to severe. The classic symptom is large amounts of **watery diarrhea** that lasts a few days. Vomiting and muscle cramps may also occur. Diarrhea can be so severe that it leads within hours to severe dehydration and electrolyte imbalance. This may result in sunken eyes, cold skin, decreased skin elasticity, and wrinkling of the hands and feet. Dehydration can cause the skin to turn bluish. Symptoms start two hours to five days after exposure.

- Cholera is caused by a number of types of Vibrio cholerae, with some types producing more severe disease than others. It is spread mostly by **unsafe water** and **unsafe food** that has been contaminated with human feces containing the bacteria. **Undercooked seafood** is a common source. Humans are the only animal affected. **Risk factors** for the disease include poor sanitation, not enough clean drinking water, and poverty. There are concerns that rising sea levels will increase rates of disease. Cholera can be diagnosed by a stool test.

Symptoms	Diagnosis & Treatment
• Vomiting & Diarrhea → Severe dehydration → Depletion of electrolytes (Na^+, K^+, Cl^-, HCO_3) • Flecks of mucous layer of intestine → **"rice-water" diarrhea**  • NO fever, pain, or cramping • Incubation time for Vibrio Cholerae → hours to 2-3 days • Severe dehydration: disorientation, swollen tongue, cold and clammy skin, dry mouth, sunken eyes, shriveled/dry hands & feet	**Diagnosis:** • Rapid dipstick test, Stool culture **Treatment:** • Replace lost water & electrolytes (rehydration salts) • **Mild-Moderate:** may resolve in 3-7 days / **Severe:** antibiotics

Cholera is an infection of the small intestine by some strains of the bacterium Vibrio cholerae. Symptoms may range from none, to mild, to severe. The classic symptom is a large amounts of:

A. very constipated stool
B. lumpy and sausage-like stool
C. bloody diarrhea
D. watery diarrhea

Which of the following infectious diseases is transmitted via contaminated water and shellfish and manifests with voluminous "rice-water" diarrhea?

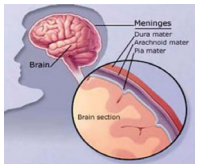
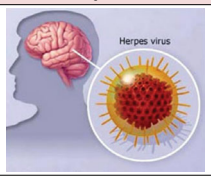
A. Cholera
B. Shigella
C. Leptospirosis
D. Schistosomiasis

Cholera requires immediate treatment because the disease can cause death within hours. What is the most important initial treatment protocol?

A. Antibiotic
B. Antiviral
C. Rehydration and electrolyte replacement
D. BRAT diet

The most common error in caring for patients with cholera is to underestimate the speed and volume of fluids required. In most cases, cholera can be successfully treated with oral rehydration therapy (ORT), which is highly effective, safe, and simple to administer.

3. EPIDEMIC ENCEPHALITIS

	Meningitis	Encephalitis
Image		
Definition	inflammation of the meninges (membranes that surround the brain)	inflammation of the brain itself
Fever, leukocytosis	often	often
Mental status alteration	often	nearly always
Seizure	uncommon	often
Meningeal irritation*	often	sometimes
Focal neurologic findings**	half of patients develope focal findings later on	hallmark feature

*nuchal rigidity, photophobia / **weakness, visual disturbance, aphasia, cerebellar findings, behavior change

Menigitis	Encephalitis	Myelitis
inflammation of the meninges	inflammation of brain parenchyma (tissue)	inflammation of the spinal cord
• headache • nuchal rigidity	• altered consciousness • seizures • focal neurologic signs • abnormal reflexes • brain stem effects	• flaccid paralysis • sensory loss
	Meningo-encephalitis	**Encephalo-myelitis**

- **Encephalitis** is inflammation of the brain. The severity can be variable with **symptoms** including headache, fever, confusion, a stiff neck, and vomiting. Complications may include seizures, hallucinations, trouble speaking, memory problems, and problems with hearing.
- **Causes** of encephalitis include viruses such as herpes simplex virus and rabies as well as bacteria, fungi, or parasites. Other causes include autoimmune diseases and certain medications. In many cases the cause remains unknown.
- Risk factors include a weak immune system. Diagnosis is typically based on symptoms and supported by blood tests, medical imaging, and analysis of cerebrospinal fluid.

Which of the following is the correct definition of Encephalitis?

A. inflammation of the meninges
B. inflammation of brain parenchyma (tissue)
C. inflammation of both the meninges and the brain tissue
D. inflammation of the spinal cord

Encephalitis is inflammation of the brain. Which of the following is NOT a cause of Epidemic encephalitis?

A. autoimmune diseases
B. herpes simplex virus
C. rabies virus
D. measles virus

Encephalitis is inflammation of the brain itself. Meningitis is an infection of the meninges, the membranes that surround the brain and spinal cord. Which of the following is a hallmark feature of encephalitis versus meningitis?

A. fever
B. leukocytosis
C. headache
D. focal neurologic findings

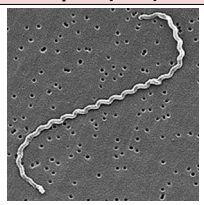
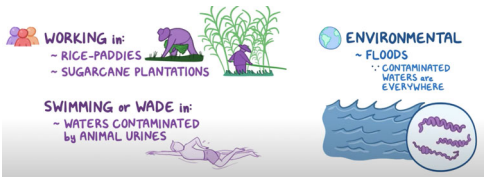
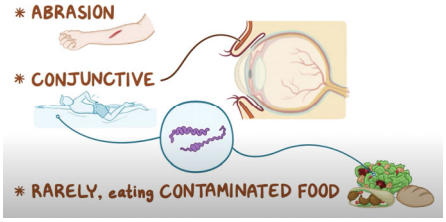
4. LEPTOSPIROSIS

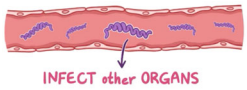
Zoonotic diseases (Zoonosis): infectious disease transmitted between animals and humans

Pathogens	Disease	Transmission and Source
Leptospira	Leptospirosis	Animal urine
Borrelia burgdorferi	Lyme disease	Ixodes ticks (live on deer and mice)
Bartonella	Cat scratch disease	Cat scratch

- **Leptospirosis** is a blood infection caused by the bacteria **Leptospira**. Signs and symptoms can range from none to mild (headaches, muscle pains, and fevers) to severe (bleeding in the lungs or meningitis). **Weil's disease**, severe form of leptospirosis, causes the infected individual to become jaundiced (skin and eyes become yellow), develop kidney failure, and bleed.
- More than ten genetic types of Leptospira cause disease in humans. Both wild and domestic animals can spread the disease, most commonly **rodents**. The bacteria are spread to humans through **animal urine**, or water and soil contaminated with **animal urine**, coming into contact with the eyes, mouth, nose or breaks in the skin. Diagnosis is typically by testing for antibodies against the bacteria or finding bacterial DNA in the blood.

Developing countries	occurs most commonly in farmers and low-income people who live in areas with poor sanitation.
Developed countries	occurs during heavy downpours and is a risk to sewage workers and those involved in outdoor activities in warm and wet areas.

Leptospira = Lepto (thin) + Spira (coil)	Risk factors	Infection via:
 Spiral bacteria → Leptospirosis		

Pathophysiology	Symptoms		Treatment
1. Immune response to bacteremia  2. Weil disease (more serious) - spread to almost all organs	**1st phase (non-specific)**	**2nd phase (Weil disease)**	• Penicillin • Doxycycline
	• muscle pain • headache • chills • fever • conjunctivitis	• Depends on affected organs • Liver (jaundice) • Kidney (renal failure) • Lungs (cough, dyspnea) • Meningitis (fever, stiff neck)	

Which of the following diseases is caused by gram-negative spirochete spread to humans through water and soil contaminated with animal urine?

A. Cholera
B. Leptospirosis
C. Schistosomiasis
D. Mumps

Leptospirosis is an infectious disease caused by Leptospira bacteria. These bacteria can be found worldwide in soil and water. What is the shape of Leptospira?

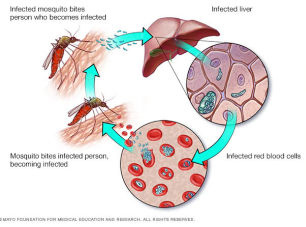
A. sphere shape
B. rod shape
C. spiral shape
D. filamentous shape

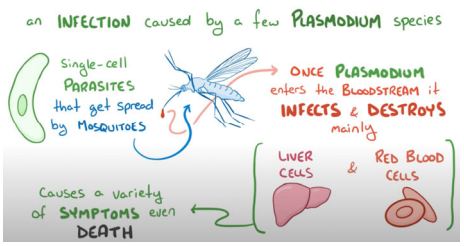
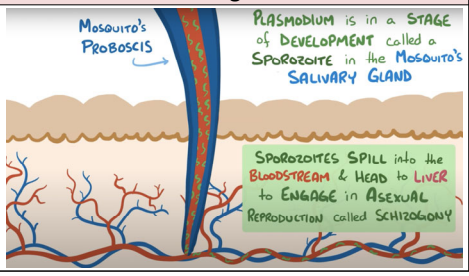
What is the severe form of leptospirosis which causes the infected individual to become jaundiced, develop kidney failure, and bleed?

A. Weil disease
B. Lyme disease
C. Toxoplasmosis
D. Syphilis

5. MALARIA

- Malaria is a **mosquito-borne** infectious disease that affects humans and other animals. Malaria causes **symptoms** that typically include fever, tiredness, vomiting, and headaches. In severe cases it can cause yellow skin, seizures, coma, or death. Symptoms usually begin 10-15 days after being bitten by an infected mosquito. If not properly treated, people may have recurrences of the disease months later. In those who have recently survived an infection, reinfection usually causes milder symptoms. This partial resistance disappears over months to years if the person has no continuing exposure to malaria.
- Malaria is caused by single-celled microorganisms of the **Plasmodium** group. The disease is most commonly spread by an infected female **Anopheles mosquito**. The mosquito bite introduces the parasites from the mosquito's saliva into a person's blood. The parasites travel to the liver where they mature and reproduce. Five species of Plasmodium can infect and be spread by humans. Most deaths are caused by P. falciparum, whereas P. vivax, P. ovale, and P. malariae generally cause a milder form of malaria. The species P. knowlesi rarely causes disease in humans.
- Malaria is typically diagnosed by the microscopic examination of blood using blood films, or with antigen-based rapid diagnostic tests. Methods that use the polymerase chain reaction to detect the parasite's DNA have been developed, but are not widely used in areas where malaria is common due to their cost and complexity.

Organism	Transmission	Symptoms	Treatment
Plasmodium P. vivax/ovale P. falciparum P. malariae		Malaria fever, headache, anemia, splenomegaly • **P. vivax/ovale:** 48-hr cycle (tertian; includes fever on first day and third day, thus fevers are actually 48-hr apart); dormant form (hypnozoite) in liver • **P. falciparum:** severe; irregular fever patterns; parasitized RBCs occlude capillaries in brain (cerebral malaria), kidneys, lungs • **P. malariae:** 72-hr cycle (quartan)	• **Begin with** chloroquine, which blocks Plasmodium heme polymerase; if resistant, use mefloquine or atovaquone/proguanil • **If life-threatening**, use intravenous quinidine • **Vivax/ovale:** add primaquine for hypnozoite

Infection	Stages	Two phases
		Liver: Exoerythrocytic phase Red Blood Cells: Erythrocytic phase HEMOLYTIC ANEMIA - the DESTRUCTION of RBCs * EXTREME FATIGUE * HEADACHES * JAUNDICE * SPLENOMEGALY  Symptoms caused primarily by the rupture of RBCs

In all types of malaria the periodic febrile response is caused by rupture of mature schizonts.

	P. vivax & P. ovale	P. falciparum	P. malariae	P. knowlesi
Time between fever paroxysms	48 hours (tertian fever)	48 or 24 hours (variable)	72 hours (quartan fever)	24 hours

Malaria parasites are micro-organisms that belong to the genus _____. There are more than 100 species of _____, which can infect many animal species such as reptiles, birds, and various mammals. Five species of _____ have long been recognized to infect humans in nature.

A. Plasmodium
B. Leptospira
C. Schistosomes
D. Borrelia burgdorferi

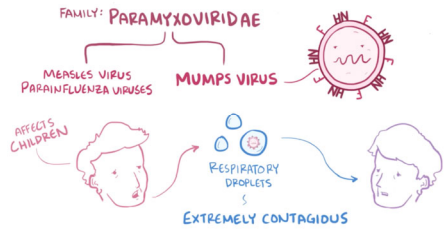
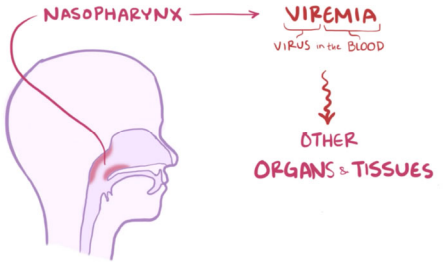
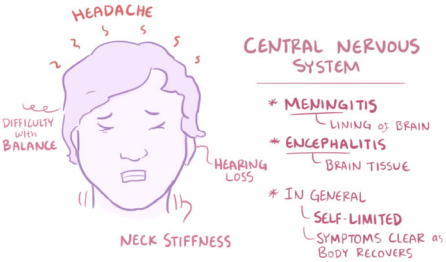
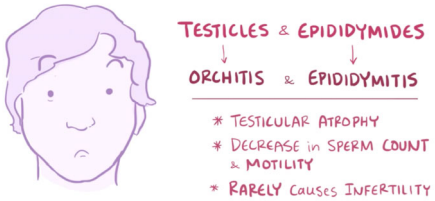
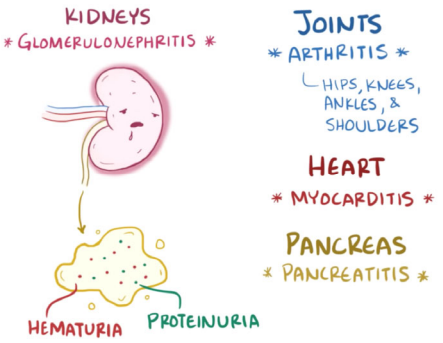
Malaria is a serious disease caused by a parasite that commonly infects a certain type of mosquito which feeds on humans. Which of the following acupuncture point and herb are used for malaria?

A. PC5, Yin Chen
B. DU9, Chang Shan
C. PC5, Qing Hao
D. DU9, Cao Guo

The 2015 Nobel Prize in Physiology or Medicine was awarded to Professor Youyou Tu for her key contributions to the discovery of artemisinin. Artemisinins are among the most potent antimalarial agents, effective against nearly all asexual and sexual parasite stages.

6. MUMPS

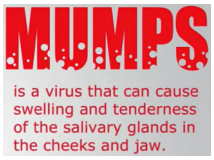
- Mumps is a viral disease caused by the **mumps virus**. Initial signs and symptoms often include fever, muscle pain, headache, poor appetite, and feeling generally unwell. This is then usually followed by **painful swelling of one or both parotid salivary glands**.
- Symptoms typically occur 16 to 18 days after exposure and resolve after 7 to 10 days. Symptoms are often more severe in adults than in children. About a third of people have mild or no symptoms. Complications may include meningitis (15%), pancreatitis (4%), inflammation of the heart, permanent deafness, and testicular inflammation, which uncommonly results in infertility. Women may develop ovarian swelling, but this does not increase the risk of infertility.

Mumps	Parotid salivary	Viremia
		
Complications 1	**Complications 2**	**Complications 3**
		

Symptoms	Treatment
• The most obvious symptom is swelling of the salivary glands, giving the patient a "hamster-like" face. • Once the virus has entered the CSF (cerebrospinal fluid), it can spread to other parts of the body, such as the brain, pancreas, or testicles, ovaries.	• There's no specific anti-viral treatment for mumps. • Drinking plenty of fluids may help to relieve the symptoms of mumps. (Avoid fruit juices as they stimulate the production of saliva) • In most cases, people recover from mumps within 2 weeks.

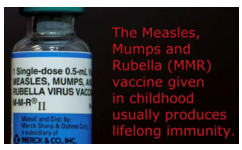
Mumps is a contagious disease that is caused by a virus. It typically starts with a few days of fever, headache, muscle aches, tiredness, and loss of appetite. Then most people will have swelling of their _____.

A. sweat glands
B. salivary glands
C. adrenal glands
D. lymph glands



The CDC recommends children get two doses of MMR vaccine, starting with the first dose at 12 through 15 months of age, and the second dose at 4 through 6 years of age. This protects against three diseases:

A. mad cow disease, mumps, rubella
B. malaria, mumps, rubella
C. measles, mumps, rubeola
D. measles, mumps, rubella



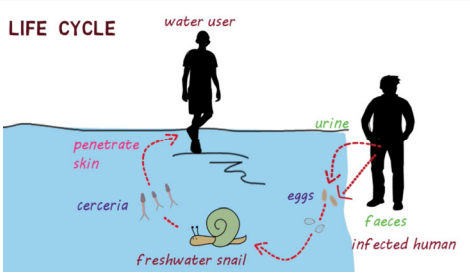
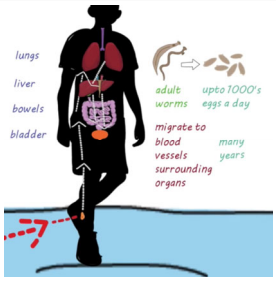
Measles	German measles
Rubeola (9-day measles)	Rubella (3-day measles)

7. SCHISTOSOMIASIS

- **Schistosomiasis**, also known as **snail fever** and **bilharzia**, is a disease caused by parasitic flatworms called **schistosomes (blood flukes)**. The urinary tract or the intestines may be infected. Symptoms include abdominal pain, diarrhea, bloody stool, or blood in the urine. Those who have been infected for a long time may experience liver damage, kidney failure, infertility, or bladder cancer. In children, it may cause poor growth and learning difficulty.

Schistosoma haematobium	Schistosoma mansoni	Schistosoma japonicum	Schistosoma mekongi	Schistosoma quineensis
Africa, Middle East	Africa, South America	China, Southeast Asia	Cambodia, Laos	Central Africa
→ urinary & genital disease	→ bowel & liver disease			

- The disease is spread by contact with **fresh water** contaminated with the parasites. These parasites are released from infected **freshwater snails**. The disease is especially common among children in developing countries, as they are more likely to play in contaminated water. Other high-risk groups include farmers, fishermen, and people using unclean water during daily living. It belongs to the group of helminth infections. Diagnosis is by finding eggs of the parasite in a person's urine or stool. It can also be confirmed by finding antibodies against the disease in the blood.
- **Diagnosis:** identification of eggs in stools, antibody detection, polymerase chain reaction (PCR)
- **Treatment:** Praziquantel and Oxamniquine are available for the treatment of schistosomiasis. (Kill adult worms → no eggs)

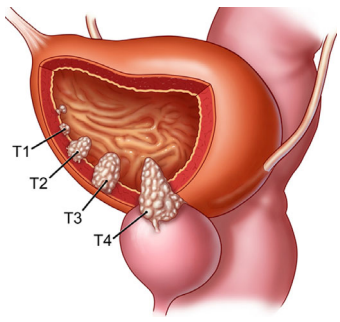
Life cycle	Manifestations	
	Short term	Long term
 	• When cerceria penetrate skin → itchy rash (swimmer's itch, fisherman's itch) • Katayama fever: 4 weeks after first exposure → fever + diarrhea, rash, respiratory → self limiting	trapped eggs → more serious • Bladder: hardening, obstruction, cancer → blood in the urine • Intestine: abdominal pain, diarrhea, blood in stool • Liver: scarring obstruction → enlargement of liver and spleen

Schistosomiasis, also known as bilharzia, is a disease caused by parasitic worms. Although the worms that cause schistosomiasis are rarely found in North America, people are infected worldwide. In terms of impact this disease is second only to malaria as the most devastating parasitic disease. The parasites that cause schistosomiasis live in certain types of _____.

A. freshwater piranha
B. freshwater snails
C. freshwater catfish
D. salt water shrimp

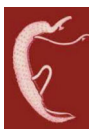
BLADDER CANCER

- The most common malignant tumor of the urinary tract; usually **transitional cell carcinoma**.
- **Risk factors** include smoking, exposure to aniline (rubber) dyes, and chronic bladder infections (eg, schistosomiasis).
- Symptoms: Gross painless hematuria is the most common symptom. Other symptoms, such as frequency, urgency, and dysuria, may also be seen.
- **Diagnosis:** Cystoscopy with biopsy is diagnostic.
- **Treatment:** depends on the extent of spread beyond the bladder mucosa. Noninvasive stage I: Transurethral resection of the bladder tumor (TURBT). If high risk (histologic grade or invasion), treat with intrave-sicular chemotherapy (eg, bacillus Calmette-Guerin). If very low risk, observe or give a single close of intravesicular chemotherapy. / Invasive cancers without metastases: Aggressive surgery, radiation therapy, or both. / Distant metastases: Chemotherapy alone.



Risk factors for bladder cancer include smoking, family history, prior radiation therapy, frequent bladder infections, and exposure to certain chemicals. The most common type is transitional cell carcinoma and other types include squamous cell carcinoma and adenocarcinoma. Which of the following infections may cause bladder cancer, especially of the squamous cell type?

A. Schistosomes (blood flukes)
B. Opisthorchis viverrini (liver flukes)
C. Helicobacter pylori
D. Human papilloma virus



Schistosoma eggs induces a chronic inflammatory state in the bladder wall resulting in tissue fibrosis. Higher levels of N-nitroso compounds has been detected in urine samples with schistosomiasis. N-Nitroso compounds have been implicated in the schistosomiasis related bladder cancer.

8. TYPHOID FEVER

- **Salmonella** is a genus of rod-shaped (bacillus) Gram-negative bacteria of the family Enterobacteriaceae. More than 2,500 serotypes have been described for Salmonella; but, because they are rare, scientists know very little about most of them. Less than 100 serotypes account for most human infections. **Typhoid fever** and **paratyphoid fever** are life-threatening illnesses caused by Salmonella serotype Typhi and Salmonella serotype Paratyphi, respectively.

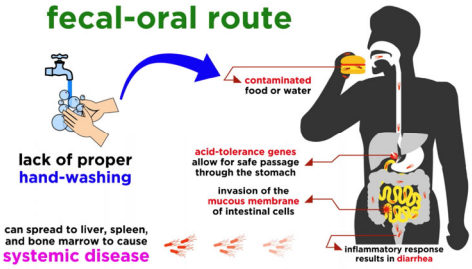
Typhoid fever	Paratyphoid fever
caused by Salmonella Typhi	caused by Salmonella Paratyphi

- **Typhoid fever**, also known simply as **typhoid**, is a bacterial infection due to a specific type of **Salmonella** that causes symptoms. Symptoms may vary from mild to severe, and usually begin 6 to 30 days after exposure. Often there is a gradual onset of a **high fever** over several days. This is commonly accompanied by weakness, abdominal pain, constipation, diarrhea, headaches, and mild vomiting. Some people develop a skin rash with rose colored spots. In severe cases, people may experience confusion. Without treatment, symptoms may last weeks or months. Diarrhea is uncommon. Other people may carry the bacterium without being affected; however, they are still able to spread the disease to others. It can remain in gallbladder and cause a carrier state. Typhoid fever is a type of enteric fever, along with paratyphoid fever.

Sustained high fever (103-104℉) + stomach pain, diarrhea/constipation, cough, weakness, headache, rose spots

- The cause is the bacterium Salmonella enterica subsp. enterica serovar Typhi growing in the intestines and blood. Typhoid is spread by eating or drinking food or water contaminated with the feces of an infected person. Risk factors include poor sanitation and poor hygiene. Those who travel in the developing world are also at risk. **Only humans can be infected**. Symptoms are similar to those of many other infectious diseases. Diagnosis is by either culturing the bacteria or detecting their DNA in the blood, stool, or bone marrow. Bone-marrow testing is the most accurate.

Transmission



Clinical presentation

- Fever + Abdominal Pain
- Symptom onset occurs ***5 to 21 Days after ingestion***
  - Depends on age, health, gastric acidity, number of organisms
- **1st Week:** "Stepwise" fever
- **2nd Week:** Abdominal Pain, "Rose Spots"
- **3rd Week:** Intestinal Bleeding, Hepatosplenomegaly, Intestinal Perforation

Rose Spots: *Small (1-5mm), blanchable papules*

Symptoms:
- Diarrhea and constipation occur with equal frequency
- Headaches, disordered sleep patterns
- *Typhoid encephalopathy*: Altered mental status, confusion and delirium, acute psychosis

Diagnosis & Treatment

Diagnosis:
- *Suspect if*
  - *Exposure to endemic area*
  - *3 days or more of fever and GI symptoms*
- Blood and stool cultures; bone marrow
- *Empiric diagnosis*

Treatment:
- Depends on local resistance patterns
- Multidrug resistance (MDR) and extensively drug-resistant (XDR) strains
- 1st Line: Fluoroquinolones, Azithromycin, Ceftriaxone, or Carbapenems
- For severe illness: Dexamethasone

Other consideration

- **Relapse**
  - *2-3 Weeks after resolution of fever*
  - Risk of relapse depends on antibiotic used
- **Chronic Carriage**
  - Asymptomatic
  - 1-5% of Patients
  - Excretion of organism for more than 12 months after resolution of acute illness
  - Risk Factors:
    - Adult Women
    - Biliary Tract Disease (ex. cholelithiasis)
- **Prevention**
  - Fresh water, sanitation and hygiene
  - Vaccination

- **Mary Mallon** (1869 - 1938), also known as **Typhoid Mary**, was an Irish-born cook believed to have infected 53 people, three of whom died, with typhoid fever, and the first person in the United States identified as an **asymptomatic carrier** of the disease. Because she persisted in working as a cook, by which she exposed others to the disease, she was twice forcibly quarantined by authorities, and died after a total of nearly three decades in isolation.

Mallon in 1909

Typhoid fever spreads through contaminated food and water or through close contact with someone who's infected. What is the caused of Typhoid fever?

A. Salmonella Enteritidis
B. Salmonella Typhimurium
C. Salmonella Newport
D. Salmonella Typhi

- **Salmonella Enteritidis** is the most common strain of Salmonella in our food supply. The increased prevalence in poultry products made Salmonella Enteritidis a food-safety issue in the 1970s. **Salmonella Typhimurium** is the second most common serotype associated with foodborne illness and the third most frequently identified with chicken. **Salmonella Newport** is currently the third most common Salmonella serotype associated with foodborne illness. **Salmonella Javiana** is the fourth most common serotype associated with foodborne illness.

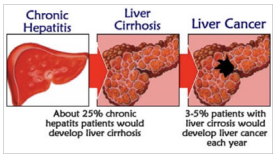
9. VIRAL HEPATITIS

- **Hepatitis** is inflammation of the liver tissue. Some people with hepatitis have no symptoms, whereas others develop yellow discoloration of the skin and whites of the eyes (jaundice), poor appetite, vomiting, tiredness, abdominal pain, and diarrhea. Hepatitis is acute if it resolves within six months, and chronic if it lasts longer than six months. Acute hepatitis can resolve on its own, progress to chronic hepatitis, or (rarely) result in acute liver failure. Chronic hepatitis may progress to scarring of the liver (cirrhosis), liver failure, and liver cancer.
- **Causes:** Hepatitis is most commonly caused by the **viruses hepatitis** A, B, C, D, and E. **Other causes** include heavy alcohol use, certain medications, toxins, other infections, autoimmune diseases, and non-alcoholic steatohepatitis (NASH). Hepatitis A and E are mainly spread by contaminated food and water. Hepatitis B is mainly sexually transmitted, but may also be passed from mother to baby during pregnancy or childbirth and spread through infected blood. Hepatitis C is commonly spread through infected blood such as may occur during needle sharing by intravenous drug users. Hepatitis D can only infect people already infected with hepatitis B.
- **Treatment:** Hepatitis A, B, and D are preventable with immunization. Medications may be used to treat chronic viral hepatitis. Antiviral medications are recommended in all with chronic hepatitis C, except those with conditions that limit their life expectancy. There is no specific treatment for NASH; however, physical activity, a healthy diet, and weight loss are recommended. Autoimmune hepatitis may be treated with medications to suppress the immune system. A liver transplant may be an option in both acute and chronic liver failure.

Hepatitis	Incubation	Transmission	Onset	Vaccine	Chronic
A	15-50 days	Fecal-oral	Abrupt	Yes	No
B	45-160 days	Bloodborne	Insidious	Yes	Depends on age group (6-10% in adults; higher in children)
C	14-180 days	Bloodborne	Insidious	No	75-85%
D	Unknown	Percutaneous or mucosal contact with infectious blood	Insidious	No*	Unknown
E	15-60 days	Fecal-oral	Abrupt	No	No

Hepatitis is inflammation of the liver tissue. What is the most common cause of hepatitis?

A. Alcohol use
B. Toxins
C. Viruses
D. Autoimmune diseases



Which of the following viral hepatitis are transmitted through exposure to infected blood or sexual contact?

A. Hepatitis A and E
B. Hepatitis B and C
C. Hepatitis C and E
D. Hepatitis A and B

- **Hepatitis ___ and ___ viruses** cause acute and chronic infections that can lead to liver cirrhosis and hepatocellular carcinoma (HCC).

Which of the following viral hepatitis are transmitted through fecal-oral route?

A. Hepatitis A and E
B. Hepatitis B and C
C. Hepatitis C and E
D. Hepatitis A and B

Hepatitis D, also known as the hepatitis delta virus, is an infection that causes the liver to become inflamed. Hepatitis D occurs only among people who are infected with _____ virus.

A. Hepatitis A
B. Hepatitis B
C. Hepatitis C
D. Hepatitis D

Which of the following viral hepatitis is NOT preventable with immunization?

A. Hepatitis A
B. Hepatitis B
C. Hepatitis C
D. Hepatitis D

- *There is no vaccine for Hepatitis D, but it can be prevented in persons who are not already HBV-infected by Hepatitis B vaccination.

_____ infection during pregnancy, especially in the third trimester, is characterized by a more severe infection that sometimes results in fulminant hepatitis, increasing maternal and fetal mortality and morbidity.

A. Hepatitis A
B. Hepatitis B
C. Hepatitis C
D. Hepatitis E

RESPIRATORY DISEASES

	Disease	Definition
10	**Bronchial asthma**	a chronic inflammatory disease of the airways that causes coughing, wheezing, and dyspnea
11	**Bronchitis**	an inflammation of the lining of bronchial tubes, which carry air to and from the lungs
12	**Pneumococcal pneumonia**	a type of bacterial pneumonia that is caused by Streptococcus pneumoniae
13	**Pneumothorax**	a collapsed lung; occurs when air leaks into the space between the lung and chest wall
14	**Bronchopulmonary carcinoma**	a malignant neoplasm of the lung arising from the bronchus or lungs
15	**Pulmonary tuberculosis**	a potentially serious infectious bacterial disease that mainly affects the lungs

Respiratory Rate

The normal breathing rate for an adult is typically between 12 and 20 breaths per minute.

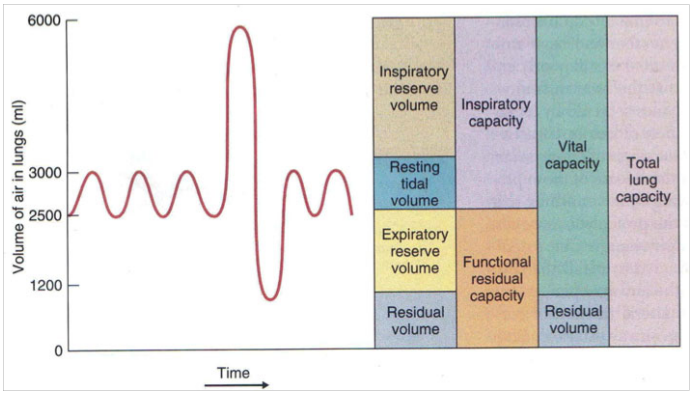
Apnea	Bradypnea	Tachypnea
		

Hypoventilation	Hyperventilation
slow, shallow breathing → causes CO_2 to build up in the blood (acidosis)	rapid, deep breathing → causes CO_2 to be blown off (akalosis)

Many conditions and situations can bring on hyperventilation, including: anxiety disorder, panic attack, asthma, stress, hard exercise, emphysema or another lung disease, side effects from certain drugs, high altitude, having a head injury, or shock. What is the definition of hyperventilation?

A. slow, deep breathing
B. slow, shallow breathing
C. rapid, deep breathing
D. rapid, shallow breathing

Why does breathing into a paper bag help?
Breathing into a paper bag is a technique that can help you regulate hyperventilation. It works by putting some of the lost carbon dioxide back into your lungs and body. This helps to balance oxygen flow in your body. **Caution:** Do not use a plastic bag. Do not breathe continuously into a paper bag. Take 6 to 12 natural breaths, with a paper bag held over your mouth and nose, then remove the bag from your nose and mouth.



Pulmonary Function Tests (PFTs)

The measurments most often used in PFTs are FEV1, FVC, and TLC.

FEV_1 (forced expiratory volume 1)	FVC (forced vital capacity)	TLC (total lung capacity)
forced expiratory volume in 1 second	the amount of air that can be forcibly exhaled from the lungs after taking the deepest breath	the volume of air in the lungs upon the maximum effort of inspiration

↓

Obstructive pattern	Restrictive pattern
COPD (chronic bronchitis, emphysema), asthma, bronchiectasis	interstitial lung disease, inflammatory/fibrosing lung disease
↓FEV_1/FVC ratio, ↑TLC	↑FEV_1/FVC ratio, ↓TLC

10. BRONCHIAL ASTHMA

Obstructive disorders	Restrictive disorders
• **Characterized by:** reduction in airflow. • So, shortness of breath → in exhaling air. (the air will remain inside the lung after full expiration) 1. COPD 2. Asthma 3. Bronchiectasis	• **Characterized by** a reduction in lung volume. • So, Difficulty in taking air inside the lung. (DUE TO stiffness inside the lung tissue or chest wall cavity) 1. Interstitial lung disease. 2. Scoliosis 3. Neuromuscular cause 4. Marked obesity

Obstructive pattern	Restrictive pattern
Reduction in airflow → Cannot get the air out	Reduction in lung volume → Cannot get the air in
• COPD (irreversible) • Asthma (reversible) • Bronchectasis	• Interstitial lung disease • Pulmonary fibrosis • Asbestosis, Silicosis
↓FEV_1/↑FVC = ↓	↓FEV_1/↓↓FVC = ↑

Obstructive lung diseases are characterized by a reduction in airflow, particularly the FEV_1 and the FEV_1/FVC. Which of the following does NOT belong to obstructive lung diseases?

A. Chronic bronchitis
B. Emphysema
C. Asthma
D. Pulmonary fibrosis

Asthma = an obstructive disease characterized by intermittent airway inflammation and hyperactivity

	Extrinsic asthma	Intrinsic asthma
Cause	Type 1 hypersensitivity (immediate)	Non-immune
Trigger	hypersensitivy to environmental antigen (eg, pollen)	cold weather / aspirin (aspirin-induced asthma) / exercise (exercise-induced asthma) / stress / URIs (RSV, parainfluenza)
IgE mediated	Yes	No

Symptoms	• Presents with intermittent wheezing, coughing, chest tightness, or shortness of breath • Symptoms may be seasonal or may follow exposure to triggers (eg, URIs, dust, pet dander, cold air) or occur with exercise
Exam	• Acute asthma exacerbation: during attacks, patients classically demonstrate a prolonged expiratory pahse that is sometimes accompaned by wheezing or cough • Chronic intermittent asthma: exam may be normal if the patient is not having an exacerbation
Differential	• **Not all that wheezes is asthma!** Rue out foreign body aspiration, endobronchial mass, laryngeal spasm or irritation, and CHF • In patients with chronic cough, think about asthma as well as allergic rhinitis, postnasal drip, or GERD

Type	Symptoms	Medications	
Mild intermittent	• **day:** <2 times/week • **night:** once/month or less	SABA* PRN (as needed)	• no daily medications
Mild persistent	• **day:** >2 times/week (but not daily) • **night:** 2-4 nights/month		• low-dose inhaled corticosteroids
Moderate persistent	• **day:** daily • **night:** >1 time/week		• low- to medium-dose inhaled corticosteroids + LABA**
Severe persistent	• **day:** continuous • **night:** frequent		• high-dose inhaled corticosteroids + LABA + possible PO steroids

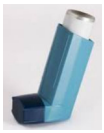
*SABA = short-acting beta-agonist, **LABA = long-acting beta-agonist

Beta-blockers site of action (remember of 1 heart , 2 lungs)
Beta-1 = 1 heart
Beta-2 = 2 lungs

Adrenoceptors: vasomotor function of alpha vs. beta (remember of AC-BD):
Alpha = Constrict.
Beta = Dilate.

Which of the following medications is used as the most common quick-relief drug for treating asthma attacks?

A. Short-acting β agonist (SABA)
B. Long-acting β agonist (LABA)
C. Low-dose inhaled corticosteroids
D. High-dose inaheled corticosteroids



Short-acting
β-agonists:
Albuterol
Fenoterol
Terbutaline

Long-acting
β-agonists:
Salmeterol
Formoterol

- **Beta-agonist:** A bronchodilator medicine that opens the airways by relaxing the muscles around the airways that may tighten during an asthma attack or in COPD (chronic obstructive pulmonary disease). Beta-agonists can be administered by inhalers or orally.

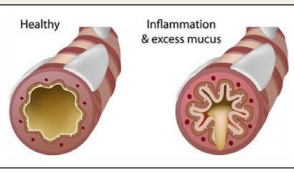
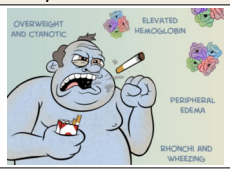
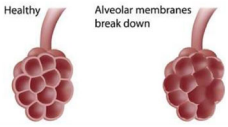
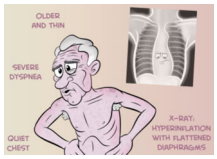
11. BRONCHITIS

Bronchitis is an inflammation of the lining of the bronchial tubes, which carry air to and from the lungs. People who have bronchitis often cough up thickened mucus, which can be discolored. Bronchitis may be either acute or chronic.

Acute bronchitis	Chronic bronchitis
• Cough that lasts a few days or weeks • Productive cough produces yellow or green mucus • Fever, chills	• Cough that last 3 months of a year for 2 successive years • Productive cough produces clear mucus or white • Wheezing, pressure or tightness in chest, fatigue

Chronic Obstructive Pulmonary Disease

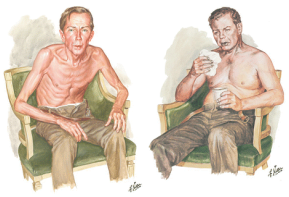
- Defined as chronic airflow obstruction that is not fully reversible. It is often accompanied by chronic cough and sputum production.
- A combination of emphysema and chronic bronchitis, COPD generally involves the destruction of lung parenchyma. Both chronic bronchitis and emphysema often coexist.
- This results in ↓elastic recoil, which leads to air trapping. TLC↑ asa result of rising residual volume (RV).

Chronic bronchitis ("Blue bloaters")	Emphysema ("Pink puffers")
Clinical diagnosis: daily productive cough for three months or more, in at least two consecutive years	**Pathologic diagnosis:** permanent enalrgement and destruction of airspaces distal to the terminal brochiole
 	 
Why Blue bloaters: Because of the presence of cyanosis of the skin and mucous membranes. Hypoxemia occurs early in the disease.	**Why Pink puffers:** Because of their color and the way they breathe through pursed lips on expiration. Hypoxemia occurs late in the disease.
Dyspnea: occurs later in the disease course.	**Dyspnea:** occurs early in the disease course, pursed lip breathing
Hypoxemia & Hypercapnia: early in the disease course (→ blue bloaters)	**Hypoxemia & Hypercapnia:** later during disease course (→ pink puffers)

Symptoms	• Patient complain of cough, excessive sputum production, dyspnea, and wheezing. Dyspnea is usually progressing. • Look for a **history of smoking** or exposure to biomass fuels such as indoor wood fires in the developing worlds.
Treatment	• Inhaled β-agonists (albuterol) and anticholinergics (ipratropium): short-acting agents for less severe symptoms; long-acting agents for more severe symptoms • O_2 therapy: indicated for patients with an O_2 saturation (SaO_2) < 88%, a partial pressure of oxygen (PaO_2) < 55 mmHg, or a partial pressure of oxygen (PaO_2) 55-60 mmHg + evidence of cor pulmonale (right heart failure from pulmonary hypertension caused by chronic hypoxia)

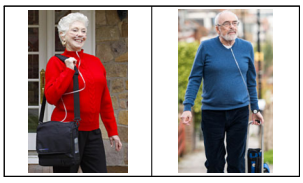
Chronic obstructive pulmonary disease (COPD) is a chronic inflammatory lung disease that causes obstructed airflow from the lungs. Symptoms include breathing difficulty, cough, mucus production and wheezing. _____ and _____ are lung conditions under the term COPD.

A. Emphysema, Chronic bronchitis
B. Acute bronchitis, Chronic bronchitis
C. Asthma, Chronic bronchitis
D. Asthma, Emphysema



A patient with shortness of breath and cough is subsequently diagnosed with COPD. Which of the following has been shown to prolong survival rate in COPD patients?

A. Inhaled beta-agonists
B. Inhaled corticosteroids
C. Inhaled anti-cholinergics
D. Oral corticosteroids
E. Home oxygen therapy



- Oxygen therapy and smoking cessation are shown to reduce mortality in patients with COPD. All of the other answer choices provide symptomatic relief and do not prolong survival.

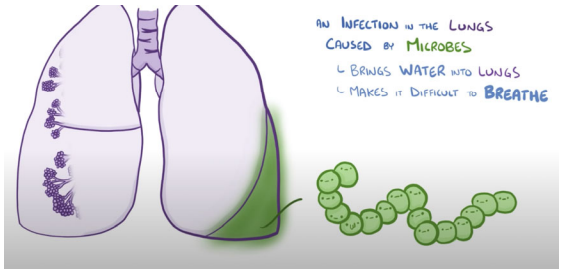
Which of the following diseases is defined as chronic cough and sputum production for at least 3 months per year for two consecutive years?

A. Emphysema
B. Chronic bronchitis

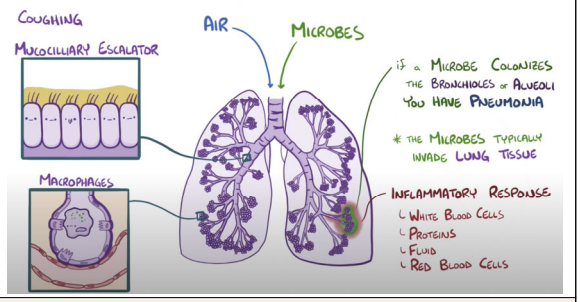
12. PNEUMOCOCCAL PNEUMONIA

Pneumonia	Pnumonitis
inflammation in the lungs	
infection caused by bacteria and other germs	a type of allergic reaction
virus, bacteria, fungi	chemical, bird feather, wood dust, radiation

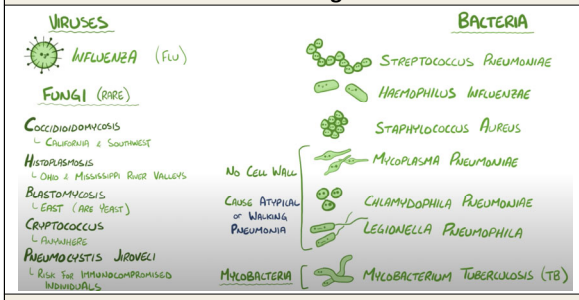
Pneumonia



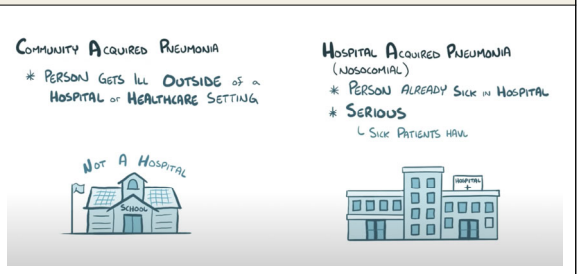
Pathophysiology



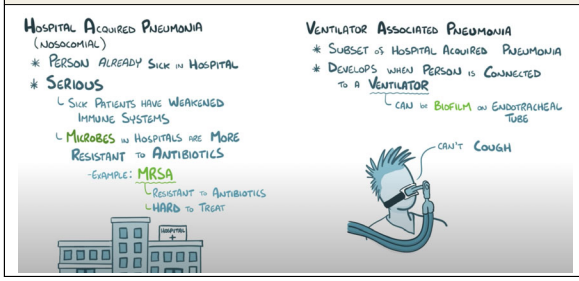
Pneumonia causing microbes



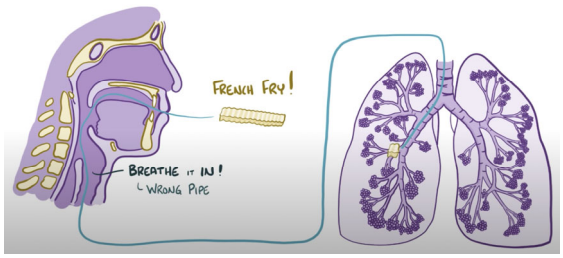
CAP vs HAP



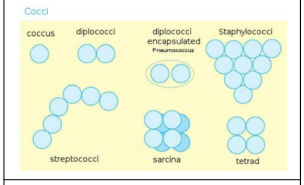
HAP



Aspiration pneumonia

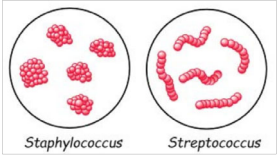


- **Pneumococcal pneumonia** is a type of bacterial pneumonia that is caused by **Streptococcus pneumoniae** (which is also called pneumococcus). It is the **most common** bacterial pneumonia found in adults, the most common type of community-acquired pneumonia, and one of the common types of pneumococcal infection.
- The symptoms of pneumococcal pneumonia can occur suddenly, typically presenting as a severe chill, later including a severe fever, cough, shortness of breath, rapid breathing, and chest pains. Other symptoms like nausea, vomiting, headache, fatigue, and muscle aches could also accompany the original symptoms.
- Pneumococcal Vaccination: Pneumococcal disease is common in young children, but older adults are at greatest risk of serious illness and death. There are 2 kinds of vaccines that help prevent pneumococcal disease: PCV13, PPSV23. CDC recommends pneumococcal vaccination for all children younger than 2 years old and all adults 65 years or older. In certain situations, other children and adults should also get pneumococcal vaccines.



Pneumonia is an infection that inflames the air sacs in one or both lungs. A variety of organisms, including bacteria, viruses and fungi, can cause pneumonia. What is the most common cause of bacterial pneumonia in adults?

A. Streptococcus pneumoniae
B. Hemophilus influenzae
C. Staphylococcus aureus
D. Mycoplasma pneumoniae

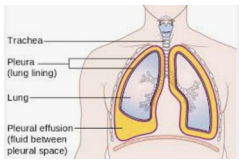


Common causes of pneumonia

Neonates (< 4 Wks.)	Children (4 Wks.–18 Yrs.)	Adults (18–40 Yrs.)	Adults (40–65 Yrs.)	Elderly
Group B streptococci *E. coli*	Viruses (RSV) *Mycoplasma* *C. trachomatis* (infants–3 yr.) *C. pneumoniae* (school-aged children) *S. pneumoniae*	*Mycoplasma* *C. pneumoniae* *S. pneumoniae*	*S. pneumoniae* *H. influenzae* Anaerobes Viruses *Mycoplasma*	*S. pneumoniae* Influenza virus Anaerobes *H. influenzae* Gram-negative rods

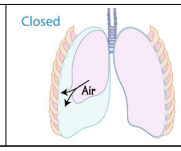
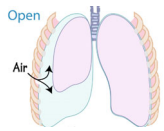
Redrawn and modified from: Le T and Bhushan V. *First Aid for the USMLE Step 1 2015*

13. PNEUMOTHORAX



- The **pleural cavity** also known as the **pleural space**, is the thin fluid-filled space between the two pulmonary pleurae (known as visceral and parietal) of each lung.
- **Pneumothorax** is a collapsed lung. A pneumothorax occurs when air leaks into the space between your lung and chest wall. This air pushes on the outside of your lung and makes it collapse. Pneumothorax can be a complete lung collapse or a collapse of only a portion of the lung.
- **Pleural effusion**, sometimes referred to as "water on the lungs," is the build-up of excess fluid between the layers of the pleura outside the lungs. The pleura are thin membranes that line the lungs and the inside of the chest cavity and act to lubricate and facilitate breathing.

Pneumothorax	Pleural effusion
Accumulation of air in the pleural space	Accumulation of fluid in the pleural space
chest injury, lung disease, mechanical ventilation, tall and thin male	congestive heart failure, cancer, pneumonia, pulmonary embolism

Closed (internal) pneumothorax		Open (external) pneumothorax	
a cut cannot be seen from outside		a cut can be seen from outside	
• Spontaneous pneumothorax (rupture of a bleb or bulla in tall, thin individuals) • Fractured rib • Not fatal (except flail chest)		• Unilateral is not fatal: still have the normal lung (might bleed to death, but not the lung) • Bilateral is fatal • Tension pneumothorax is medical emergency	

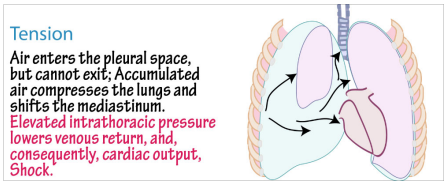
Spontaneous pneumothroax	Tension pneumothroax
accumulation of air in the pleural space	usually occurs in setting of trauma or lung infection
occurs most frequently in tall, thin, young males because of rupture of apical blebs	Air is capable of entering pleural space but not exiting. Trachea deviates away from affected lungs

Signs and Symptoms: Unilateral chest pain and dyspnea, unilateral chest expansion, ↓tactile fremitus, hyperresonance, diminished breath sounds, all on the affected side. **Tension pneumothorax:** hypotension, hypoxia, trachea deviates away from the affected side (deviation to the opposite side)

Pneumothorax in Acupuncture Practice: Points most frequently associated with pneumothorax events in the Chinese literature are: Jianjing (GB 21; 30%), Feishu (BL 13; 15%), Quepen (ST 12; 10%), and Tiantu (Ren 22; 10%); infrequent events occurred at Ganshu (BL 18), Jiuwei (Ren 15), Juque (Ren 14), Jianzhen (SI9), Quyuan (SI 13), and Dingchuan (EX-B1). Peuker & Grönemeyer identify risk points ST 11 (Qishe) and ST 12 (Quepen), LU 2 (Yunmen), ST 13 (Qihu), KI 27 (KI 22-27), and ST 12-18. However, any points needled in the thoracic body region risk penetrating the lung, including the front, back, or lateral body, the lower neck, shoulder and scapular region as well as the chest, ribs and just below the ribs.

Which of the following types of pneumothorax is a life-threatening condition that develops when air is trapped in the pleural cavity under positive pressure, displacing mediastinal structures and compromising cardiopulmonary function?

A. Spontaneous pneumothorax
B. Tension pneumothorax



A spontaneous pneumothorax is the sudden onset of a collapsed lung without any apparent cause, such as a traumatic injury to the chest or a known lung disease. A collapsed lung is caused by the collection of air in the space around the lungs. Which of the following is a risk factor for spontaneous pneumothorax?

A. Tall and thin adolescent males
B. Tall and obese elderly males
C. Tall and obese elderly females
D. Tall and thin adolescent females

A tall and thin adolescent male patient complaining of chest pain is being evaluated for right-sided chest pain. The pain suddenly started today while watching a movie. On physical examination, you notice diminished breath sounds and hyperresonance on the right. The most common risk factor for this condition is:

A. Short stature
B. Exposure to asbestos
C. Pneumonia
D. Smoking

- Tall and thin adolescent males are typically at greatest risk, but females can also have spontaneous pneumothorax.
- Other risk factors include smoking, family history, Marfan disease, and activities such as scuba diving, high altitudes and flying.

A 50-year-old hospitalized patient being treated with mechanical ventilation is evaluated after becoming dyspneic. History reveals that the tidal volume was increased this morning. Physical examination is remarkable for hypotension, distended neck veins, and tracheal deviation to the right. The most likely additional finding is:

A. Diminished breath sounds on the right
B. Hyperresonance only on the right
C. Diminished breath sounds only on the left
D. Diminished breath sounds bilaterally

- This patient most likely has a left-sided pneumothorax. **Immediate needle decompression** of the chest is indicated. It is most commonly a result of blunt or penetrating trauma. A history of mechanical ventilation or central venous catheter placement are common since these are classic causes of tension pneumothoraces in the hospital.

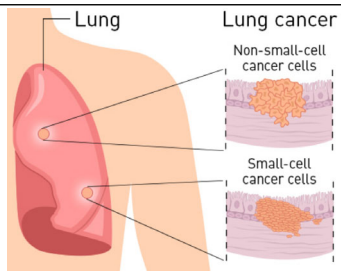
14. BRONCHOPULMONARY CARCINOMA

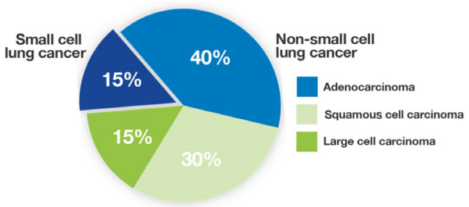
Primary cancer	Secondary (metastatic) cancer
defined as the original site (organ or tissue) where cancer began.	cancer cells break away from where they first formed (primary cancer)

Bronchogenic carcinoma	Pulmonary carcinoma
a malignant neoplasm of the lung arising from the epithelium of the bronchus or bronchiole.	a malignant lung tumor characterized by uncontrolled cell growth in tissues of the lung.

Carcinoma	Sarcoma	Adenocarcinoma
forms in the skin or tissue cells that line the body's internal organs, such as the kidneys and liver.	grows in the body's connective tissue cells, which include fat, blood vessels, nerves, bones, muscles, deep skin tissues and cartilage.	a type of cancer that starts in the mucous glands inside of organs like the lungs, colon, or even breasts.

- **Lung cancer** is a group of diseases defined by what type of lung tissue the abnormal cells originated in. This is known as the "histology" of the cells.
- There are **2 main types** of lung cancer:
  - Non-small cell lung cancer (NSCLC) - 85%
  - Small cell lung cancer (SCLC) - 15%
- These broad classifications, based on histology, can greatly affect an individual's approach and response to treatment.

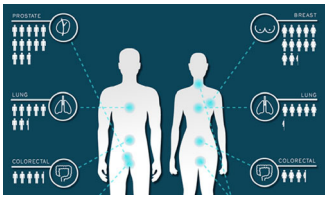




Subtype	Characteristics	Treatment
Small cell lung cancer (SCLC)	Highly related to **cigarette exposure.** Usually **centrally** located; often presents as **disseminated disease.**	**Chemotherapy;** chemoradiation for limited-stage disease.
Non–small cell lung cancer (NSCLC)	**Adenocarcinoma:** The most common lung cancer; has a **peripheral** location. More common in women than in men. **Adenocarcinoma, bronchoalveolar subtype:** Multiple nodules, bilateral lung infiltrates, and metastases late in the disease course. **Squamous cell carcinoma:** Presents **centrally** and is often **cavitary.** **Large cell carcinoma:** Least common.	**Potentially curable with resection of localized disease, but only modestly responsive to chemotherapy.** Patients are classified into 1 of 3 clinical groups at the time of diagnosis: **Stages I and II:** Early-stage disease. Candidacy for surgical resection. **Locally or regionally advanced disease** (supraclavicular or mediastinal lymphadenopathy or chest wall/pleural/pericardial invasion): Combination chemotherapy and radiation; surgery is not indicated. **Distant metastases:** The goal of chemotherapy or radiation is **palliation.**

What is the most common cause of cancer deaths in North America?

A. Lung cancer
B. Breast cancer
C. Colorectal cancer
D. Stomach cancer



- Lung cancer is the biggest cancer killer in both men and women in North America.
- Cigarette smoking is the #1 cause of lung cancer. It is linked to 80% to 90% of all lung cancers

Cigarette smoking is the number one risk factor for lung cancer. In the United States, cigarette smoking is linked to about 80% to 90% of lung cancer deaths. According to the U.S. Environmental Protection Agency (EPA), _____ causes about 20,000 cases of lung cancer each year, making it the second leading cause of lung cancer.

A. Workplace chemicals
B. Air pollution
C. Radon
D. Radiation therapy

- Radon is a naturally-occurring radioactive gas that can cause lung cancer. Radon gas is inert, colorless and odorless. Radon exposure increases the risk for lung cancer. Radon is the leading cause of lung cancer in non-smokers and the second leading cause of lung cancer in smokers.

There are two main types of lung cancer: small cell lung cancer (SCLC) and non-small cell lung cancer (NSCLC). _____ is the most common type of lung cancer, accounting for about 80% to 85% of all cases of lung cancer.

A. Small cell lung cancer (SCLC)
B. Non-small cell lung cancer (NSCLC)

Non-small-cell lung carcinoma (NSCLC) is any type of epithelial lung cancer other than small cell lung carcinoma (SCLC). NSCLC accounts for about 85% of all lung cancers. There are three primary types of non-small cell lung cancer. This does NOT include:

A. Adenocarcinoma
B. Squamous cell carcinoma
C. Large cell carcinoma
D. Basal cell carcinoma

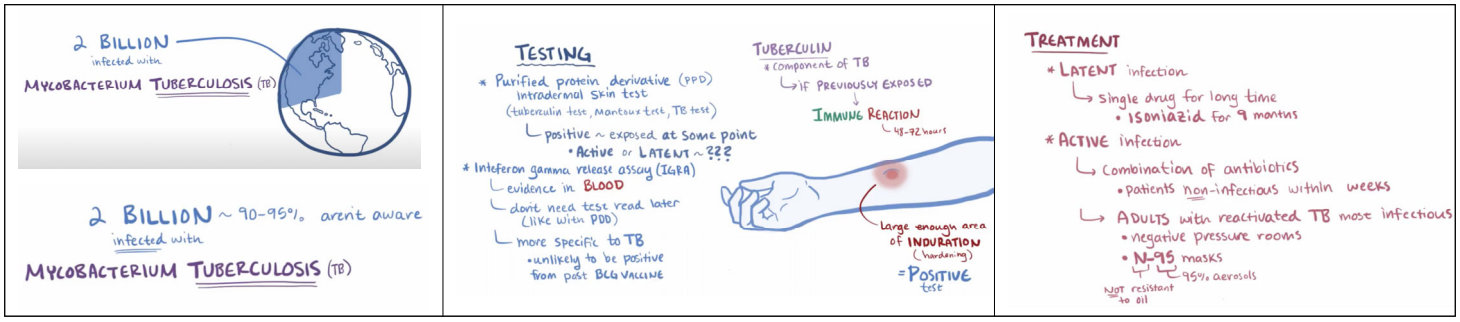
- There are three main types of skin cancer: basal cell carcinoma, squamous cell carcinoma and melanoma. Basal cell carcinoma accounts for more than 90% of all skin cancers in the United States and is the most common of all cancers.

15. PULMONARY TUBERCULOSIS

- Tuberculosis (TB) is an infectious disease usually caused by **Mycobacterium tuberculosis** bacteria. Tuberculosis generally affects the lungs, but can also affect other parts of the body. Most infections show no symptoms, in which case it is known as **latent tuberculosis**. About 10% of latent infections progress to active disease which, if left untreated, kills about half of those affected. The classic symptoms of active TB are a chronic cough with blood-containing mucus, fever, night sweats, and weight loss. It was historically called consumption due to the weight loss. Infection of other organs can cause a wide range of symptoms.
- Tuberculosis (TB) is primarily an airborne disease (spread person-to-person through the air) when people who have active TB in their lungs. People with latent TB do not spread the disease. **Active infection occurs** more often in people with HIV/AIDS and in those who smoke. Diagnosis of active TB is based on chest X-rays, as well as microscopic examination and culture of body fluids. Diagnosis of latent TB relies on the **tuberculin skin test (TST, PPD, Mantoux)** or **blood tests (IGRA)**.

Active TB (primary, secondary)	Latent TB
symptoms, sputum cluture (+) or TST(+), X-ray(+), contagious, multidrug	no symptoms, TST(+), X-ray(-), not contagious, single drug

- It is recommended that healthcare professionals, including acupuncturists, have a yearly physical that includes testing for tuberculosis. The term "tuberculin skin tests" (TSTs) is used instead of purified protein derivative (PPD) in most up-to-date CDC information. *CNT 7th Edition, p.177*



A 40-year-old male presents with one month of fever, chills, night sweats, and a persistent cough that is productive of bloody sputum especially in the morning. The patient recently emigrated from Iraq and his chest x-ray reveals bilateral patchy infiltrates in the lower lobes. An acid-fast smear is positive. Which of the following is the most appropriate diagnosis and treatment?

A. Latent tuberculosis / isoniazid monotherapy
B. Primary tuberculosis / isoniazid monotherapy
C. Primary tuberculosis / multidrug therapy
D. Latent tuberculosis / multidrug therapy

- **Primary pulmonary tuberculosis** (think constitutional symptoms, hemoptysis, and bilateral patchy infiltrates on CXR) should be treated with a multidrug regimen. Tuberculosis should immediately be on your differential when you see the risk factors "from a developing country, from a war-zone, homeless, HIV+, or incarcerated" in the question stem.
- The first-line therapy for primary pulmonary TB is **"RIPE" therapy**: Rifampin, Isoniazid, Pyrazinamide, and Ethambutol. The multidrug regimen is used to prevent drug resistance. The side-effects of the RIPE drugs: **isoniazid** and peripheral neuropathy (prevent with pyridoxine) and hepatotoxicity (monitor liver function tests); **rifampin** and orange coloration of body fluids; **pyrazinamide** with hepatotoxicity and precipitation of gout attacks; and **ethambutol** and optic neuritis.

A 25-year-old male presents for a preventative health evaluation and tuberculosis screening prior to college matriculation. A tuberculin skin test (TST) is placed and the patient returns 48 hours later. Past medical history is unremarkable. A review of systems is negative. On physical examination, you appreciate a 16 mm diameter induration at the site of tuberculin (PPD) placement. Chest X-ray is unremarkable. What is the most appropriate diagnosis and treatment?

A. Latent tuberculosis / nine-months of isoniazid
B. Latent tuberculosis / nine-months of multidrug therapy
C. Primary tuberculosis / nine-months of isoniazid
D. Primary tuberculosis / nine-months of multidrug therapy

- The PPD (purified protein derivative) test is the subcutaneous injection of tuberculin antigen to screen for latent TB. The test is read **48-72 hours** later and patients presenting outside of this time window should have the test repeated. A PPD is read based on palpable induration at the site of application; the degree of erythema is not a diagnostic factor but is often mistaken for one. The PPD test is positive if:

> 15 mm	> 10 mm	> 5 mm
general public without known risk factors	residents and empolyees of long-term care facilities, IV drug abusers, recent immigrants	HIV+, recent contact with active TB, immunocompromised

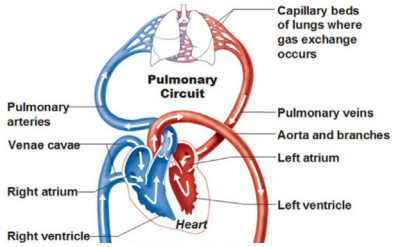
- A positive PPD should be followed with a chest X-ray to rule-out primary pulmonary tuberculosis. A positive PPD in an asymptomatic patient with a negative chest X-ray is diagnostic of **latent TB**. Latent TB is treated with a 9 month course of single-agent isoniazid (don't confuse this with active TB treatment which requires a multidrug regimen).
- An alternative screening test is the **IGRA** (Interferon Gamma Release Assay), which is preferred in persons who have a history of BCG vaccination (common in immigrants but not administered in the U.S.) because BCG vaccination can cause a false positive PPD but it does not interfere with IGRA.

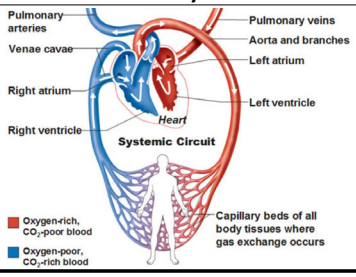
CARDIOVASCULAR DISEASES

	Disease	Definition
16	**Congestive heart failure**	a condition in which the heart can't pump enough blood to meet the body's needs
17	**Chronic lung heart disease**	a condition that most commonly arises out of complications from pulmonary hypertension
18	**Hypertension**	a condition in which the force of the blood against the artery walls is too high
19	**Ischemic heart disease**	a damage or disease in the heart's major blood vessels
20	**Panic attack**	a sudden episode of intense fear or anxiety and physical symptoms
21	**Rheumatic fever**	a disease that can result from inadequately treated strep throat or scarlet fever
22	**Rheumatic heart disease**	a condition in which permanent damage to heart valves is caused by rheumatic fever
23	**Viral myocarditis**	an Inflammation of the middle layer of the heart wall caused by viral infection

HEART AS A DOUBLE PUMP

Pulmonary Circuit	Systemic Circuit
R♥ → Lungs → L♡	**L♡ → Body → R♥**





Pulmonary arteries	Pulmonary veins	Systemic arteries	Systemic veins
O_2 poor	O_2 rich	O_2 rich	**O_2 poor**

Arteries and veins are two of the body's main type of blood vessels. Which TWO blood vessels carry deoxygenated blood?

A. Pulmonary arteries
B. Pulmonary veins
C. Systemic veins
D. Systemic arteries

Artery	Vein
carries blood **away from** the heart	carries blood **back to** the heart

Arteries	Veins
1. Carry blood from the heart, carry oxygenated blood (except pulmonary artery)	1. Carry blood to the heart, carry deoxygenated blood (except pulmonary vein)
2. Normally bright red in color	2. Normally dark red in color
3. Elastic walls that expand with surge of blood	3. Thin walls/less elastic
4. No valves	4. Valves
5. Can feel a pulse	5. No pulse

Which of the following statements is TRUE regarding the artery and vein?

A. All arteries carry oxygen-rich blood
B. All veins carry oxygen-poor blood
C. Vein carries blood back to the lung
D. Arteries contain valves preventing back flow
E. Artery carries blood away from the heart

Cardiac Output (CO)	=	Stroke Volume (SV)	×	Heart Rate (HR)
Total amount of blood perfusing the body tissues every minute		Amount of blood perfusing the tissues with every heartbeat		Number of times that the heart beats every minute

Average heart rate = 70 bpm
Average stroke volume = 70−80 ml/beat
Average cardiac output = 5,500 ml/minute

Cardiac output is the term that describes the amount of blood your heart pumps each minute. What is the average cardiac output?

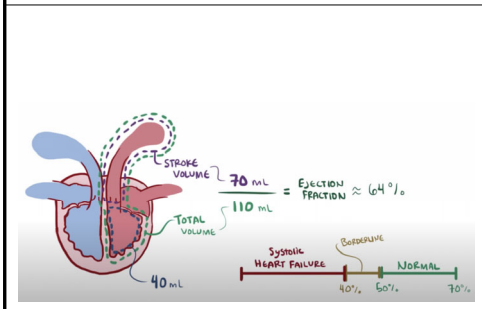
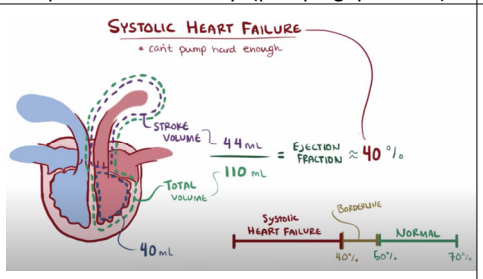
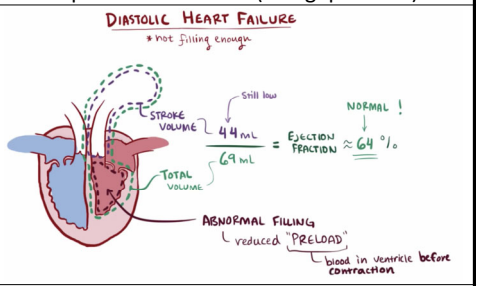
A. 1 liter/second
B. 5 liters/minute
C. 5 liters/second
D. 10 liters/minute

Cardiac biomarkers are substances that are released into the blood when the heart is damaged or stressed. Which of the following cardiac biomarkers is the most sensitive and specific test for myocardial damage?

A. Total Creatine Kinase
B. Myoglobin
C. CK-MB
D. Troponin I

16. CONGESTIVE HEART FAILURE

Heart Failure (HF) = Congestive Heart Failure (CHF)
The heart is unable to pump sufficiently to maintain blood flow to meet the body's needs

Normal Ejection Fraction	Systolic HF	Diastolic HF
50-70%	impaired contractility (pumping problem)	impaired relaxation (filling problem)
		
	inability of the heart to contract enough to provide blood flow forward	inability to the left ventricle to relax normally, resulting in fluid backing up into the lungs
	Ischemic heart disease, Prior MI, chronic HTN	Older, women, obesity, HTN, A-fib
	S/Sx: poor exercise tolerance, exertional dyspnea, easy fatigabiltiy	

An ejection fraction is the volumetric fraction of fluid ejected from a chamber with each contraction. Which of the following diagnostic tests is an ultrasound of the heart that measures the estimation of heart function, such as cardiac output or ejection fraction?

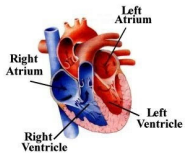
A. Electrocardiogram
B. Holter Monitor
C. Magnetic Resonance Imaging
D. Echocardiogram

Systolic Heart Failure is defined as weakned pumping function of the heart. Common causes include ischemic heart disease, long-standing hypertension, alcohol, and viral or idiopathic cardiomyopathy in younger patient. Which of the following ejection fraction indicates systolic heart failure?

A. 40%
B. 55%
C. 65%
D. 70%

Diastolic Heart Failure means the lower left ventricle is not able to fill properly with blood during the diastolic phase, reducing the amount of blood pumped out to the body. Hypertension with left ventricular hypertrophy is the most common cause. Which of the following defines diastolic heart failure?

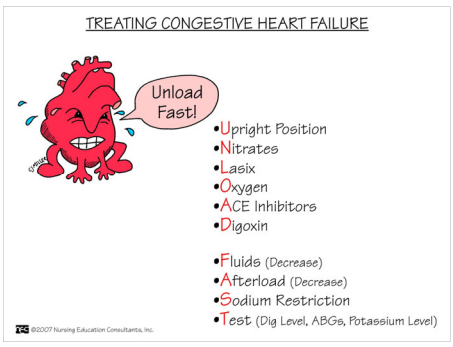
A. **H**eart **F**ailure with **r**educed **E**jection **F**raction (HFrEF)
B. **H**eart **F**ailure with **p**reserved **E**jection **F**raction (HFpEF)

Right-sided Heart Failure		Left-sided Heart Failure
back up blood to body		back up blood to lungs
↓blood to lungs		↓blood to body
peripheral edema, JVD, hepatomegaly		pulmonary edema, orthopnea, paroxysmal nocturnal dyspnea

Left-sided Heart Failure is usually caused by coronary artery disease (CAD), a heart attack or long-term high blood pressure. Right-sided Heart Failure generally develops as a result of advanced Left-sided Heart Failure or pulmonary hypertension. Which of the following symptoms is LEAST likely to present as right-sided heart failure?

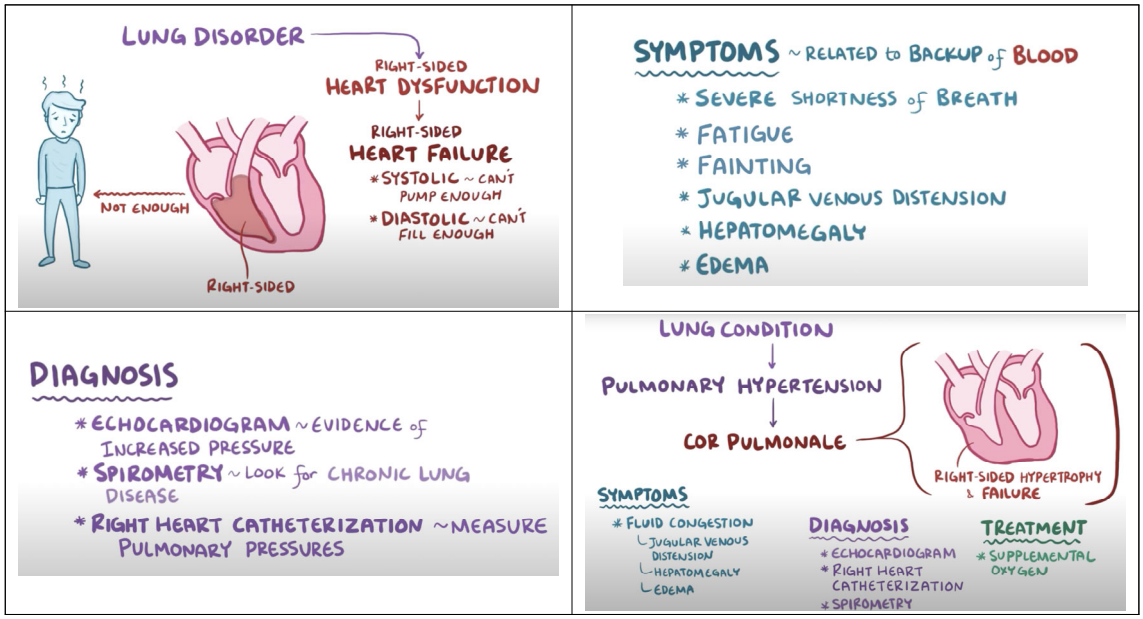
A. Jugular venous distension
B. Hepatomegaly
C. Pulmonary edema
D. Peripheral edema

Cor pulmonale is a condition that most commonly arises out of complications from high blood pressure in the pulmonary arteries (pulmonary hypertension). It's also known as right-sided heart failure because it occurs within the right ventricle of the heart.



17. CHRONIC LUNG HEART DISEASE

Cor	←	Pulmonale
Heart dysfunction		Lung dysfunction



Pulmonary heart disease, also known as cor pulmonale, is the enlargement and failure of the _____ ventricle of the heart as a response to increased vascular resistance (such as from pulmonic stenosis) or high blood pressure in the lungs.

A. Right
B. Left

The symptoms/signs of pulmonary heart disease (cor pulmonale) can be non-specific and depend on the stage of the disorder, and can include blood backing up into the systemic venous system, including the hepatic vein. As pulmonary heart disease progresses, most individuals will develop symptoms like: shortness of breath, wheezing, cyanosis, ascites, jaundice, enlargement of the liver, raised jugular venous pressure (JVP), third heart sound, intercostal recession, repsence of abnormal heart sounds.

Please	Read	His	Text
Peripheral edema	Raise JVP	Hepatomegaly	Tricuspid incompetence

A 50-year-old patient with a past medical history of chronic bronchitis presents with chest pain and shortness of breath. Physical examination is remarkable for peripheral edema, jugular venous distension, and enlargement of the liver. Chest x-ray shows right ventricular hypertrophy and prominent pulmonary artery. What is the most likely diagnosis?

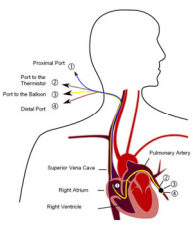
A. Pulmonary embolism
B. Cor pulmonale
C. Left ventricular hypertrophy
D. Cardiac tamponade

Cor pulmonale is often the result of COPD and/or pulmonary hypertension. The diagnosis of pulmonary heart disease is not easy as both lung and heart disease can produce similar symptoms.

A 45-year-old male with a past medical history of COPD presents with dyspnea and fatigue. On physical exam, you note an intensified pulmonic component of the second heart sound, hepatomegaly, jugular venous distension, and peripheral edema. V/Q scan is normal. EKG reveals evidence of right ventricular hypertrophy. The most likely diagnosis is:

A. Pulmonary embolism
B. Adult respiratory distress syndrome
C. Pulmonary hypertension
D. Interstitial lung disease

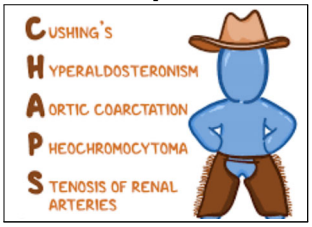
- Pulmonary blood pressure is normally a lot lower than systemic blood pressure. Normal pulmonary artery pressure is 8-20 mmHg at rest. If the pressure in the pulmonary artery is greater than 25 mmHg at rest or 30 mmHg during physical activity, it is abnormally high and is called pulmonary hypertension.
- Common causes of **pulmonary hypertension** are COPD, obstructive sleep apnea, interstitial lung disease, HIV, collagen vascular disease, and pulmonary embolism. Patients present with shortness of breath, fatigue, non-productive cough, angina pectoris, and syncope.
- While the **echocardiogram** is a useful tool, it cannot be used to officially diagnose PAH and treatment should not be initiated based on estimated pulmonary artery pressures from the echo. A **right heart catheterization** is currently the only way to officially diagnose pulmonary arterial hypertension.



18. HYPERTENSION

BLOOD PRESSURE CATEGORY	SYSTOLIC mm Hg (upper number)		DIASTOLIC mm Hg (lower number)
NORMAL	LESS THAN 120	and	LESS THAN 80
ELEVATED	120 – 129	and	LESS THAN 80
HIGH BLOOD PRESSURE (HYPERTENSION) STAGE 1	130 – 139	or	80 – 89
HIGH BLOOD PRESSURE (HYPERTENSION) STAGE 2	140 OR HIGHER	or	90 OR HIGHER
HYPERTENSIVE CRISIS (consult your doctor immediately)	HIGHER THAN 180	and/or	HIGHER THAN 120

Primary (Essential) HTN (95%)	Secondary HTN (5%)
No universally established cause known	Secondary to other potentially rectifiable causes



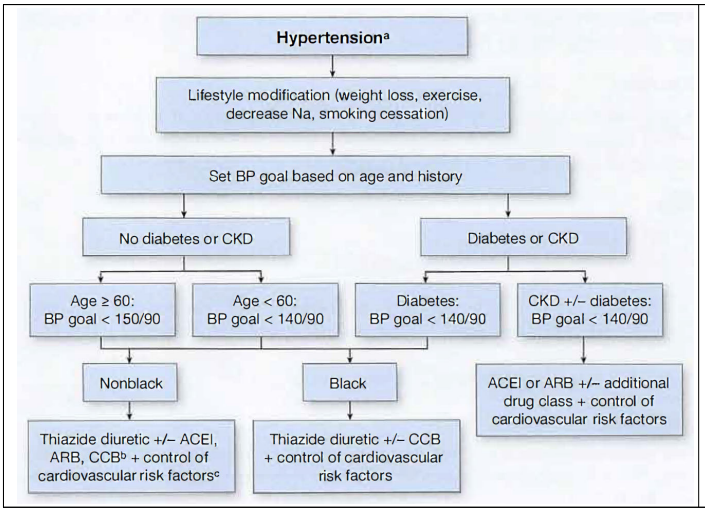
Blood pressure measurements fall into four general categories: Normal BP, Elevated BP, Stage 1 HTN, and Stage 2 HTN. Stage 2 hypertension is a systolic pressure of ____mmHg or higher or a diastolic pressure of ____mmHg or higher.

A. 130 / 80
B. 140 / 90
C. 160 / 100
D. 180 / 120

A 52-year-old man presents to his primary care physician's office for routine care. He has hypertension, hypercholesterolemia, and type 2 diabetes mellitus, and has smoked one pack of cigarettes per day for the past 30 years. Medications include hydrochlorothiazide, atorvastatin, and glipizide. There is a family history of myocardial infarction in the maternal grandfather at age 60. The patient has undergone screening for colon and prostate cancer. Physical examination reveals a pleasant, obese man who is 175cm (5'9") tall and weighs 108kg (238lb). His blood pressure is 155/81mmHg, heart rate is 78/min, respiratory rate is 14/min, and temperature is 36.8°C (98.3°F). Which action would most reduce the patient's stroke risk?

A. Blood glucose reduction
B. Smoking cessation
C. Serum cholesterol reduction
D. Blood pressure reduction
E. Weight loss

Hypertension is the most important controllable risk factor for stroke, and the stroke risk attributable to this patient's high blood pressure is larger than any other factor. The other answers, although important for improving the patient's health and longevity, are less tightly correlated to reducing stroke risk.



ABCD treatment in HTN

ACE inhibitors	Enalapril / Captopril
Beta blockers	Atenolol / Propanolol
Calcium channel blockers	Amlodipine / Diltiazem
Diuretics	Furosemide / Hydrochlorothiazide

Hypertension can lead to many serious health problems, such as heart attack, heart failure, stroke, and kidney disease. Treating hypertension early is important in preventing these and other problems. The classes of blood pressure medications include EXCEPT:

A. Angiotensin-converting enzyme inhibitors
B. Beta blockers
C. Calcium channel blockers
D. Diuretics
E. Anticoagulants

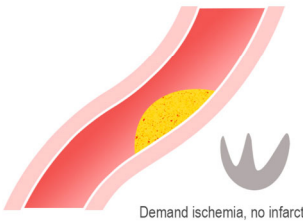
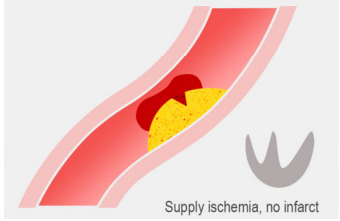
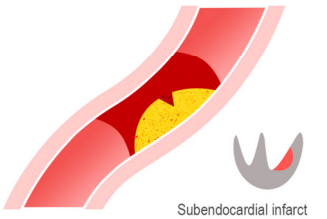
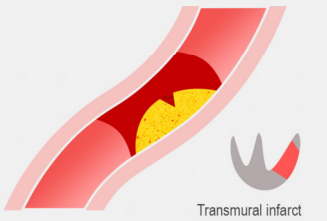
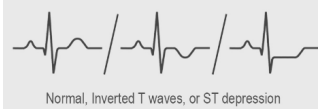
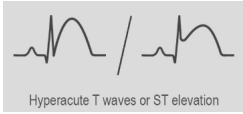
The AB/CD British Hypertension Society guidelines predict that the blood-pressure response to antihypertensive agents **A** (angiotensin-converting enzyme inhibitors and angiotensin receptor blockers) or **B** (beta blockers) drugs is better in those aged <55 years, whereas that to agents **C** (calcium channel blockers) or **D** (diuretics) agents is better in those aged ≥55 years.

19. ISCHEMIC HEART DISEASE

- What is **ischemic heart disease?** It's the term given to heart problems caused by narrowed heart arteries. When arteries are narrowed, less blood and oxygen reaches the heart muscle. This is also called coronary artery disease (CAD). This can ultimately lead to heart attack.
- The primary cause of ischemic heart disease is atherosclerotic occlusion of the coronary arteries. Major risk factors include age, family history (particularly of early CAD in a first-degree relative, as defined by significant disease in male relatives before age 55 or in female relatives before age 65), smoking, diabetes, hypertension, and hyperlipidemia.

Major risk factors for ischemic heart disease:
- Age > 65
- Male gender
- Family history
- Hypertension
- Smoking
- Hyperlipidemia
- Diabetes mellitus

Ischemic Heart Disease	Myocardial Infarction
Limitation of blood flow to the heart causes ischemia (reduced blood flow → cell starvation) of the heart's muscle cells.	The heart's muscle cells may die from lack of oxygen and this is called a myocardial infarction (commonly referred to as a heart attack).

Stable angina	Unstable angina	NSTEMI	STEMI
Angina pain develops when there is increased demand in the setting of a stable atherosclerotic plaque. The vessel is unable to dilate enough to allow adequate blood flow to meet the myocardial demand.	The plaque ruptures and a thrombus forms around the ruptured plaque, causing partial occlusion of the vessel. Angina pain occurs at rest or progresses rapidly over a short period of time.	During an NSTEMI, the plaque rupture and thrombus formation causes partial occlusion to the vessel that results in injury and infarct to the subendocardial myocardium.	A STEMI is characterized by complete occlusion of the blood vessel lumen, resulting in transmural injury and infarct to the myocardium, which is reflected by ECG changes and a rise in troponins.
			
			
Normal Troponins	Normal Troponins	↑Troponins	↑Troponins

Diagnosis	• **Initial workup:** Elevated cardiac biomarkers (troponin, CK-MB), ECG changes (ST-segment elevation or depression, Q waves) in the distribution of the coronary arteries; check a CXR for other causes of chest pain. Non ST-segment elevation MI (NSTEMI) can be distinguished from unstable angina by the presence of elevated cardiac biomarkers. • **Stress testing:** Exercise, dobutamine, or vasodilator stress; ECG, echocardiography, or radionuclide imaging to assess perfusion • **Cardiac catheterization:** Defines anatomy and the location and severity of lesions. ST-segment elevation MI (STEMI) is a high-risk MI that requires emergency catheterization for reperfusion.
Treatment	• **Acute coronary syndrome:** □ Initial treatment includes anticoagulation (LMWH, unfraction-ated heparin), aspirin, nitroglycerin, O2 and a beta-blocker in hemodynamically stable patients. Antiplatelet agents (clopidogrel, prasugrel, ticagrelor) are often used as well if a percutaneous stent is placed. □ STEMIs or NSTEMIs with high-risk features should be managed by percutaneous coronary intervention. If possible, an ACEI should be started before discharge. • **Angina:** beta-blockers (↓HR, ↑myocardial perfusion time, ↓cardiac workload), long-acting nitrate or calcium channel blocker (CCB) can be added.

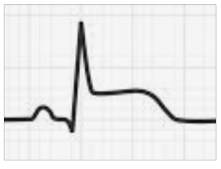
Acute coronary syndrome is a term used to describe a range of conditions associated with sudden reduced blood flow to the heart.

Chest pain with physical exertion, predictable	**EKG:** normal	**Cardiac enzymes:** normal →
Chest pain during rest, unpredictable	**EKG:** normal / inverted T / ST depression	**Cardiac enzymes:** normal →
Partial thrombus occlusion, mild myocardial necrosis	**EKG:** normal / inverted T / ST depression	**Cardiac enzymes:** elevated →
Complete thrombus occlusion, severe myocardial necrosis	**EKG:** ST elevation	**Cardiac enzymes:** elevated →

Angina is the result of narrowed coronary arteries. Unlike angina, MI can cause permanent heart damage. <u>Non ST-segment elevation MI (NSTEMI)</u> can be distinguished from <u>unstable angina</u> by:

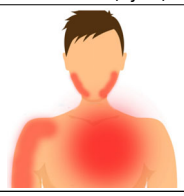
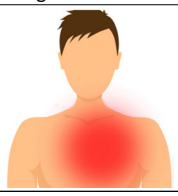
A. EKG changes
B. ↑Cardiac biomarkers
C. Types of chest pain
D. Tongue and Pulse

A 65-year-old male presents to the emergency room with chief complaints of substernal, crushing, chest pain radiating to the left arm. Past medical history is significant for hypertension and hyperlipidemia. The EKG is shown in the picture to the right. Lab shows elevated Troponin I. What is the most likely diagnosis?



A. Stable angina
B. Unstable angina
C. NSTEMI
D. STEMI

20. PANIC ATTACK

Heart attack	Panic attack
chest pain/discomfort, shortness of breath, sweating, nausea/vomiting, lightheadedness	
squeezing pain and pressure in the chest	sharp pain in the middle of the chest, fast heartbeat
sudden onset or onset during physical exertion	sudden onset or onset due to extreme stress
pain that radiates to the arm, jaw, or shoulder blades	pain that gets better over time
	

A 25-year-old college student presents to the office after recurrent attacks of chest pain. He says that the attacks are random and are associated with sweating, dizziness, and a general sensation that he is dying. He tells you that this started two months ago while sitting in a classroom. He has stopped going to class for the past month because he is afraid an attack will happen again and escape will be difficult. He denies use of drugs or alcohol. Physical examination and diagnostic testing are normal. The most likely diagnosis is:

A. Malingering
B. Factitious disorder
C. Panic disorder
D. Myocardial infarction

- **Panic disorder** is characterized by unexpected and repeated episodes of intense fear accompanied by physical symptoms that are similar to MI: chest pain, palpitations, shortness of breath, dizziness, diaphoresis, or depersonalization. At least one month of concern about having additional attacks, behavior changes, or worry about an implication of an attack ("fear of dying, losing control, or going crazy") are also required to make the diagnosis. It is commonly accompanied with agoraphobia because patients worry of another attack where help will not be available or escape is not possible.

Malingering	refers to deliberate behavior for a known external gain.
Factitious disorder	refers to intentional fabrication to produce physical or psychological signs of symptoms in order to assume the 'sick role'.

A 22-year-old patient is brought to the office complaining of difficulty catching her breath, sweating, chest pain, and a pounding heart. The symptoms started one hour ago and lasted 15 minutes. She states that she felt like she was dying at the time. She admits to having similar episodes unexpectedly during the past couple of months and avoiding certain places where she may not have any help in case an additional episode occurs. The most appropriate long-term treatment is:

A. Sertraline
B. Lorazepam
C. Imipramine
D. Buspirone

Effective For Sadness Panic Compulsions
Escitalopram Fluoxetine Sertraline Paroxetine Citalopram

Side effects of SSRI → Stomach upset, Sexual dysfunction, Serotonin syndrome, Suicidal thoughts

- Selective serotonin reuptake inhibitors (SSRIs) are generally used as first-line pharmacologic agents in panic disorder. This includes citalopram (Celexa®), escitalopram (Lexapro®), fluoxetine (Prozac®), paroxetine (Paxil®), and sertraline (Zoloft®).
- Lorazepam (Ativan®) has potential for abuse and should not be used for long-term therapy.
- Imipramine (Tofranil®) is a TCA and used to be first line therapy. They are now second line treatment because of their adverse effects.
- Buspirone (Buspar®) is an anxiolytic agent used for general anxiety disorder.

A 67-year-old female presents with complaints of nausea, vomiting, and mild epigastric pain for the past four hours. She reports that she has been volunteering at a preschool and that several children have been absent due to a self-limited diarrheal illness. Past medical history is significant for diabetes mellitus, hypertension, and hyperlipidemia, and tobacco abuse. Her physical examination is pertinent only for mild epigastric discomfort to deep palpation. In addition to fluid replacement, the most appropriate next step in the management of this patient is:

A. Ondansetron and Pantoprazole
B. EKG and serial cardiac enzymes
C. Gastroenterololgy consult
D. Reassurance and discharge

- Patients with **atypical** symptoms of myocardial infarction should be admitted to rule out this process even if they have a diagnosis that is more likely (gastroenteritis as seen in this case).
- This is especially true in diabetics and women, who often present on the boards with epigastric pain and nausea along with nonspecific findings on EKG (diffuse T-wave inversions and ST depressions). The work up involves serial cardiac enzymes and EKGs. Troponin I should be drawn at presentations and drawn again every six hours until three results are negative. Fluid replacement is standard therapy in a patient with gastroenteritis.
- In a patient with **multiple cardiac risk factors** your suspicion for acute coronary syndrome must be very high, even in the setting of **atypical** cardiac symptoms like epigastric pain, nausea, and vomiting. This is especially true in diabetics and women, both of whom often have atypical coronary symptoms.

21. RHEUMATIC FEVER

Streptococcus is a genus of gram-positive coccus (plural cocci) or spherical bacteria. Two of them cause most of the strep infections in people: **group A streptococcus (GAS)** and **group B streptococcus (GBS)**. **GAS** and **GBS** are similar types of bacteria, but they cause different types of infections.	
GAS	• Group A strep causes: Strep throat (a sore, red throat, white spots on tonsils), Scarlet fever (red rashes, an illness that follows strep throat), Impetigo (skin infection), Toxic shock syndrome, Cellulitis and necrotizing fasciitis (flesh-eating disease).
GBS	• Group B strep can cause blood infections, pneumonia and meningitis in newborns. A screening test during pregnancy can tell if you have it. If you do, intravenous (IV) antibiotics during labor can save your baby's life. • Strep B can cause urinary tract infections, blood infections, skin infections and pneumonia in adults.

Viruses are the most common cause of a sore throat. However, strep throat is an infection in the throat and tonsils caused by bacteria called _____.

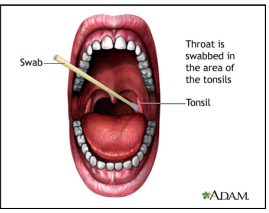
A. Group A Streptococcus
B. Group B Streptococcus
C. Staphylococcus
D. Streptobacilli

- Group A strep is not usually part of the normal bacterial flora. It is the bacteria that causes "strep throat" that is detected using a rapid strep test or a throat culture.
- **Streptococcus pyogenes**, also known as the group A streptococci (GAS), causes a wide variety of diseases in humans.

Strep throat, caused by bacteria, is one type of sore throat that can be treated. It isn't handled in the same way as sore throats caused by colds and other viruses, so your doctor will likely do what's called a "rapid strep test" to be sure it's strep. If the test is positive, doctors most often prescribe penicillin or amoxicillin (Amoxil) to treat strep throat. Antibiotics will help prevent a serious but rare problem called _____.

A. Lyme disease
B. Rheumatic fever
C. Huntington chorea
D. Sickle-cell disease

- Fewer than 3% of people who have strep throat also get rheumatic fever. Rheumatic fever is most common among children aged 5 to 15, but adults may have the condition as well. It usually takes about 2 to 4 weeks after strep throat or scarlet fever for rheumatic fever to develop. Rheumatic fever is thought to be caused by a response of the immune system.
- A **rapid strep test** involves swabbing the throat and running a test on the swab. The test quickly shows if group A strep is causing the illness. If the test is positive, doctors can prescribe antibiotics. If the test is negative, but a doctor still suspects strep throat, then the doctor can take a **throat culture** swab.



JONES CRITERIA

Mnemonic: "JONES CAFE PAL"

Major Criteria

J	Joint Involvement
O	**O** looks like a heart = myocarditis
N	Nodules, subcutaneous
E	Erythema marginatum
S	Sydenham chorea

Minor Criteria

C	CRP Increased
A	Arthralgia
F	Fever
E	Elevated ESR
P	Prolonged PR Interval
A	Anamnesis of Rheumatism
L	Leukocytosis

Diagnosis

Throat cultures growing GABHS OR Elevated anti-streptolysin O titers

+

2 Major criteria
OR
1 Major criterion and 2 Minor criteria

Rheumatic fever (RF) is an inflammatory disease that can involve the heart, joints, skin, and brain. The disease typically develops two to four weeks following an infection of the throat by the bacterium Streptococcus pyogenes. Signs and symptoms include fever, heart murmur, multiple painful joints, involuntary muscle movements, and occasionally a characteristic non-itchy rash. The revised _____ are guidelines decided on by the American Heart Association to help doctors diagnose rheumatic fever.

A. Jacob criteria
B. Joseph criteria
C. Joshua criteria
D. Jones criteria

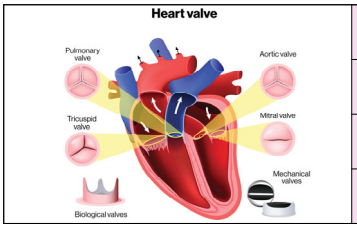
Modified Jones criteria were first published in 1944 by T. Duckett Jones, MD. They have been periodically revised by the American Heart Association in collaboration with other groups. According to revised Jones criteria, the diagnosis of rheumatic fever can be made when two of the major criteria, or one major criterion plus two minor criteria, are present along with evidence of streptococcal infection.

22. RHEUMATIC HEART DISEASES

Rheumatic heart disease is a condition in which permanent damage to heart valves is caused by **rheumatic fever**. The heart valve is damaged by a disease process that generally begins with a strep throat caused by bacteria called Streptococcus, and may eventually cause rheumatic fever.

Rheumatic fever	• Rheumatic fever is caused by group A beta-hemolytic Streptococcus pyogenes. This organism produces a pharyngitis that is followed by rheumatic fever in about 0.3% to 3% of cases and occurs several weeks after the pharyngitis resolves.
Rheumatic heart disease	• Rheumatic heart disease is a chronic condition that results years after acute rheumatic fever. Rheumatic heart disease chronically manifests as **congestive heart failure** from valvular involvement. • Most commonly the **mitral valve** is affected, resulting in mitral stenosis or mitral regurgitation. Less commonly, the aortic valve can be involved; tricuspid valve involvement is rare, but reported. • In approximately 50% of cases of rheumatic heart disease, the patient does not give a history of having rheumatic fever as a child.

Most common	Second most common	Rare	Practically never
Mitral valve	Aortic valve	Tricuspid valve	Pulmonary valve



Tricuspid valve	located between the right atrium and the right ventricle.
Mitral (bicuspid) valve	located between the left atrium and the left ventricle.
Pulmonary valve	located between the right ventricle and the pulmonary artery.
Aortic valve	located between the left ventricle and the aorta.

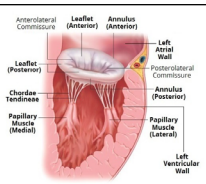
The mitral valve is located on the left side of the heart, between the left atrium and the left ventricle. This valve has ____ leaflets that allow blood to flow from the lungs to the heart.

A. 1
B. 2
C. 3
D. 4

Untreated strep throat or other infections with strep bacteria that progress to rheumatic fever can cause heart valve disease. When the body tries to fight the strep infection, one or more heart valves may be damaged or scarred in the process. Which of the following heart valves is most often affected?

A. Tricuspid valve
B. Pulmonary valve
C. Bicuspid valve
D. Aortic valve

TYPES OF VALVE DAMAGE	
Fibrosis of valve leaflets	**Fibrosis of chordae tendineae**
↓	↓
Stenosis (reduction of diameter)	**Regurgitation** (improper closure)



Rheumatic fever can cause permanent damage to the heart (rheumatic heart disease). It usually occurs 10 to 20 years after the original illness, but severe cases of rheumatic fever can cause damage to the heart valves while the child still has symptoms. Which of the following heart valve disorders is the most common result of rheumatic fever?

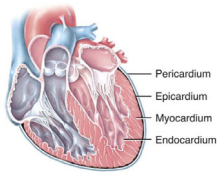
A. Mitral stenosis
B. Mitral regurgitation
C. Aortic stenosis
D. Aortic regurgitation

- The main cause of mitral valve stenosis is an infection called rheumatic fever, which is related to strep infections. Rheumatic fever — now rare in the United States, but still common in developing countries — can scar the mitral valve. Left untreated, mitral valve stenosis can lead to serious heart complications.

23. VIRAL MYOCARDITIS

myo	card	itis
muscle	heart	inflammation

- The **wall of heart** is composed of three distinct layers. From superficial to deep they are: epicardium, myocardium, endocardium. **Myocardium** is the muscular center layer of the heart between the outer layer (epicardium) and the inner layer (endocardium).
- **Myocarditis** is an inflammation of the heart muscle (myocardium). Myocarditis can affect your heart muscle and your heart's electrical system, reducing your heart's ability to pump and causing rapid or abnormal heart rhythms (arrhythmias).

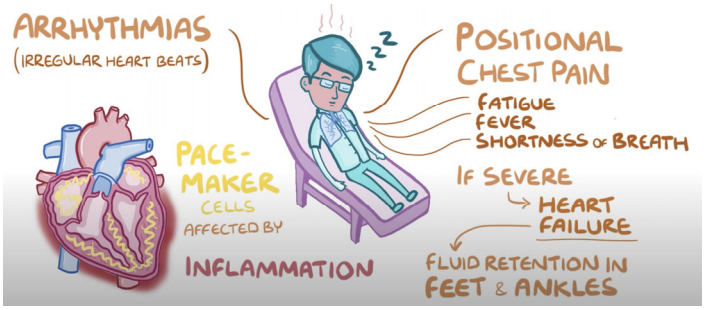


CAUSES	**Infective**	**Viral infections**	Coxsackie B infection is the main cause in North America, leads to Lymphocytic myocarditis
		Trypanosoma cruzi	Single-celled protozoan, causes Chagas disease in South America, leads to necrosis of heart muscle cells
		Trichinella	Roundworms move from intestines to various parts of the body (including Heart)
		Lyme disease	Caused by bacteria Borrelia Burgdorferi, spread by deer ticks
		Toxoplasma Gondii	Single-celled parasite harboured by cats
	Non-infective	**SLE (Lupus)**	Autoimmune disease, cause inflammation of the myocardium
		Polymyositis	Generalized inflammation of the muscles due to autoimmune attack
		Drug-associated	Adverse drug reaction inflames the heart, leads to hypersensitivity myocarditis
		Giant-cell	Unknown cause, macrophages fuse together to form single giant cell

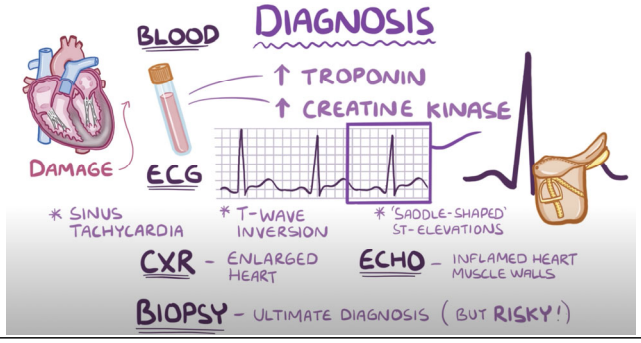
Causes

Infective	**Viral infections**
	Trypanosoma cruzi
	Trichinella
	Lyme disease
	Toxoplasma Gondii
Non-infective	**SLE (Lupus)**
	Polymyositis
	Drug-associated
	Giant-cell

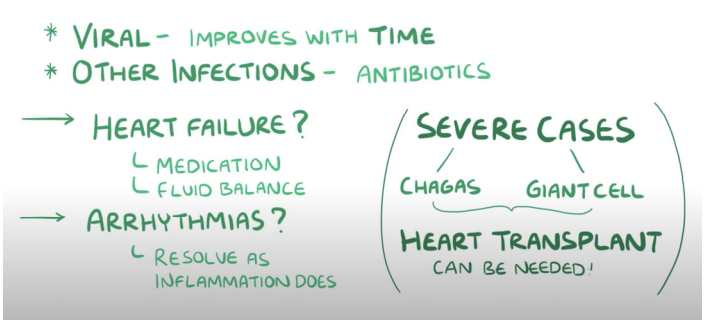
Signs and Symptoms



Diagnosis



Treatment (Depends on cause)



Myocarditis is a common cause of dilated cardiomyopathy. The most common causes of infectious myocarditis are viruses. What is the most common viral culprit of myocarditis?

A. Rubella virus
B. Epstein-Barr virus
C. Adenovirus
D. Coxsackievirus

North America	South America
Coxsackievirus	Trypanosoma cruzi

- Viral infection is the most common cause of myocarditis. Coxsackievirus B is the most common viral culprit of myocarditis. In one study, 34% of patients with myocarditis and idiopathic dilated cardiomyopathy had enteroviral RNA present.
- **Chagas disease** is caused by Trypanosoma cruzi, a protozoan parasite that can cause acute myopericarditis as well as chronic fibrosing myocarditis. Chagas disease is the most common cause of non-ischemic cardiomyopathy in Latin America.

Coxsackieviruses A	tend to infect the skin and mucous membranes, causing herpangina, hand-foot-and-mouth (HFM) disease, and acute hemorrhagic conjunctivitis (AHC).
Coxsackieviruses B	tend to infect the heart, pleura, pancreas, and liver, causing pleurodynia, myocarditis, pericarditis, and hepatitis.

GASTROINTESTINAL DISEASES

	Disease	Definition
24	**Acute pancreatitis**	a sudden inflammation of the pancreas that may be mild or life threatening but usually subsides
25	**Chronic gastritis**	a mucus-lined layer of the stomach is inflamed or irritated over a longer period of time
26	**Peptic ulcer disease**	a condition in which painful sores or ulcers develop in the lining of the stomach or the duodenum
27	**Hepatocirrhosis**	a replacement of liver tissue by fibrosis, scar tissue and regenerative nodule
28	**Hepatic carcinoma**	a malignancy of the liver that occurs in patients with underlying chronic liver disease and cirrhosis
29	**Stomach carcinoma**	a gastric cancer occurs when cancer cells form in the lining of the stomach
30	**Ulcerative colitis**	an inflammatory bowel disease (IBD) that affects the innermost lining of the colon and rectum

CHIEF CELLS vs. PARIETAL CELLS

Chief cells	Parietal cells	
Pepsinogen	**Gastric acid (HCl)**	**Intrinsic factor**
Protein digestion	↓stomach pH	absorption of vitamin B_{12}
		↓
		Autoimmune destruction of parietal cells → Pernicious anemia

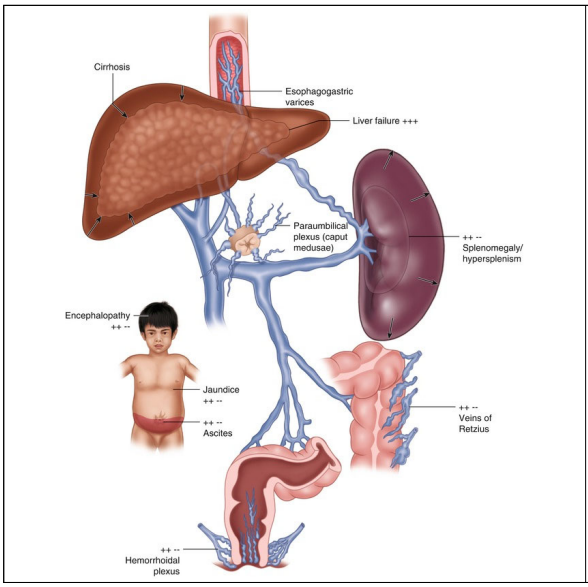
Intrinsic factor (IF) is a glycoprotein produced by the _____ of the stomach. It is necessary for the absorption of vitamin B12 later on in the _____ of the small intestine.

A. Parietal cells, Duodenum
B. Parietal cells, Jejunum
C. Parietal cells, Ileum
D. Chief cells, Ileum

Pernicious anemia is a disease in which not enough red blood cells are produced due to a deficiency of _____. Pernicious anemia refers to anemia that results from lack of intrinsic factor. Lack of intrinsic factor is most commonly due to an autoimmune attack on the cells that create it in the stomach.

A. Vitamin B12
B. Vitamin B3
C. Vitamin B1
D. Vitamin C

PORTOSYSTEMIC ANASTOMOSES



- The **portal vein** or hepatic portal vein (HPV) is a blood vessel that carries blood from the gastrointestinal tract, gallbladder, pancreas and spleen to the liver. This blood contains nutrients and toxins extracted from digested contents.
- **Portosystemic anastomosis** (connection between two blood vessels) includes all the connections made between veins of the portal circulation and the systemic circulation.
- **Portal hypertension** is abnormally high blood pressure in the portal vein and its branches. Cirrhosis is the most common cause in Western countries.
- In portal hypertension, as in the case of cirrhosis of the liver, the anastomoses become congested and form venous dilatations. Such dilatation can lead to esophageal varices, caput medusae, and anorectal varices. The varices become fragile and can bleed easily.

Site of anastomosis	Clinical sign	Portal ↔ Systemic
Esophagus	Esophageal varices	L gastric ↔ Esophageal
Umbilicus	Caput medusae	Paraumbilical ↔ small epigastric veins
Rectum	Anorectal varices	Superior rectal ↔ middle/inferior rectal

Mnemonic: Varices of gut, butt, and caput are commonly seen with portal HTN.

Portal hypertension is a term used to describe elevated pressures in the portal venous system (a major vein that leads to the liver). Increased pressure in the portal vein causes varices (large veins) to the following sites EXCEPT:

A. Esophagus
B. Umbilicus
C. Rectum
D. Leg

- Varicose veins developing as a result of weakened one-way valves in veins. Varicose veins are more common in women than in men and are linked with heredity. Other related factors are pregnancy, obesity, menopause, aging, prolonged standing, leg injury and abdominal straining.
- Treatment can be either conservative or surgical.

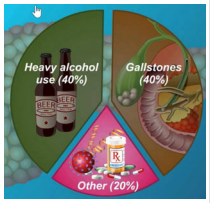
24. ACUTE PANCREATITIS

Acute pancreatitis	Chronic pancreatitis
• Leakage of pancreatic enzymes into pancreatic and peripancreatic tissue → Autodigestion	• Irreversible parenchymal destruction leading to pancreatic dysfunction and insufficiency
• Abrupt onset of severe pain	• Persistent, recurrent episodes of severe pain.
• **Gallstones (40%)**, **alcohol abuse (40%)**, hypercalcemia, hypertriglyceridemia, trauma, drug side effects (thiazide diuretics), viral infections, post-ERCP, scorpion bites	• **Alcohol abuse** (90%), gallstones, CF, smoking, pancreatic divisum, family history
• **Severe epigastric pain (radiating to the back)**; nausea, vomiting, weakness, fever, shock. • Flank discoloration (**Grey Turner's sign**) and periumbilical discoloration (**Cullen's sign**) may be evident on examination.	• Recurrent episodes of **persistent epigastric pain**; anorexia, nausea, constipation, flatulence, **steatorrhea**, weight loss, **diabetes mellitus**.

ACUTE PANCREATITIS

Diagnosis	• **↑amylase**, **↑lipase**, **↓calcium** if severe; **"sentinel loop"** or **"colon cutoff sign"** on AXR. • Abdominal ultrasound or CT may show an enlarged pancreas with stranding, abscess, hemorrhage, necrosis, or pseudocyst
Treatment	• Removal of the offending agent if possible. • Supportive care, including IV fluids/electrolyte replacement, analgesia, bowel rest, NG suction, nutritional support, and O_2. • Treat severe necrotizing pancratitis with IV antibiotics, respiratory support, and surgical debridement.
Prognosis	• Roughly 85-90% are mild and self-limited; 10-15% are severe, requiring ICU admission. Mortality may approach 50% in severe cases.
Complications	• **Pancreatic pseudocyst**, **fistula formation**, hypocalcemia, renal failure, pleural effusion, chronic pancreatitis, sepsis. • Mortality secondary to acute pancreatitis can be predicted with Ranson's criteria

- ⊙ Process whereby pancreatic enzymes destroy its own tissue → A_____
- ⊙ Two most common causes of acute pancreatitis → A_____, G_____
- ⊙ The most common cause of chronic pancreatitis → A_____
- ⊙ Two enzymes elevated in persons with acute pancreatitis → A_____, L_____
- ⊙ In acute pancreatitis, abdominal pain that radiates to the → B_____
- ⊙ Ecchymosis or discoloration seen in acute pancreatitis → G_____, C_____
- ⊙ Chronic pancreatitis has a classic triad of → Diabetes + Steatorrhea + Pancreatic calicifications on CT



Mnemonic:
"I GET SMASHED"

A 30-year-old female presents with a one-day history of severe epigastric pain. The pain radiates to the back and the patient admits that she had consumed 15 alcoholic beverages the previous day. Vital signs reveal a BP 100/70 mmHg and HR 120/min. There is tenderness to palpation in the epigastrium and a positive Cullen's sign. Laboratory results reveal markedly elevated amylase and lipase. The patient is managed conservatively over the next 24 hours with no symptomatic improvement.

- ⊙ **What is the most likely diagnosis?** A. Acute pancreatitis B. Chronic pancreatitis
- ⊙ **What is the most appropriate next step in the work-up?** A. Ultrasound B. CT scan

- CT scan may be performed in acute pancreatitis if the diagnosis is not clear or if complications such as **pseudocysts**, necrosis, or hemorrhage are suspected.

A 50-year-old male with a history of alcohol abuse presents with abdominal pain that radiates to the back. He also complains that his stools have become extremely foul smelling and have an oily appearance. History reveals that he has been diagnosed with acute pancreatitis over ten times in the past ten years. Physical examination is remarkable for epigastric tenderness to palpation. Cullen's and Grey Turner's are negative. Laboratory studies reveal increased fasting serum glucose and normal serum amylase.

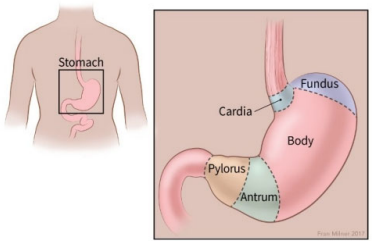
- ⊙ **What is the most likely diagnosis?** A. Acute parncreatitis B. Chronic pancreatitis
- ⊙ **What is the most likely finding on the CT scan?** A. Calcification of the pancreas B. Pancreatic pseudocysts

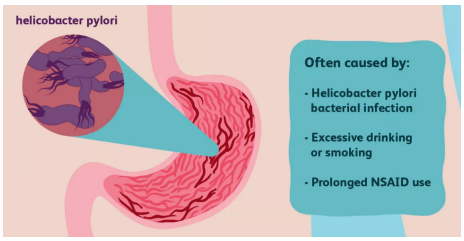
- Chronic pancreatitis is a progressive inflammation of the pancreas leading to permanent damage manifesting as steatorrhea and diabetes. Like acute pancreatitis, patients will complain of epigastric pain that radiates to the back. Chronic pancreatitis has additional features related to pancreatic insufficiency. This includes **diabetes**, **steatorrhea**, and weight loss. CT scan is the imaging test of choice and reveals **pancreatic calcification**. Serum lipase and amylase may be elevated but are often normal.
- Alcohol is the most common cause of chronic pancreatitis.
- Treatment is pain control, low fat diet, lipase supplements, and vitamin A, D, E, and K replacement.

25. CHRONIC GASTRITIS

Inflammation of the gastric mucosa. Subtypes are as follows:

Acute gastritis		• Rapidly developing, superficial lesions that are often due to NSAID use, alcohol, H pylori infection, and stress from severe illness (eg, burns, CNS injury).
Chronic gastritis	**Type A (10%)**	• Occurs in the fundus and is due to **autoantibodies to parietal cells**. Causes **pernicious anemia** and is associated with other autoimmune disorders. Associated with an ↑risk of gastric adenocarcinoma and carcinoid tumors.
	Type B (90%)	• Occurs in the antrum and may be caused by NSAID use or **H pylori infection**. Often asymptomatic, but associated with an ↑risk of PUD and gastric cancer.





- Acute Gastritis:
  - Drugs, toxins, alcohol, Ischemia.
  - Infections (H.pylori transient)
- Chronic Gastritis:
  - Autoimmune: Pernicious an. (autoantibody)
  - Chem: NSAIDs, Bile reflux, Alcohol.
  - Bacterial: Helicobacter pylori.

History/PE	• Patients may be asymptomatic or may complain of epigastric pain, nausea, vomiting, hematemesis, or melena.
Diagnosis	• Upper endoscopy to visualize the gastric mucosa. A double-contrast upper GI series can also be used but is less sensitive than EGD. • H pylori infection can be detected by the **urease breath test**, serum IgG antibodies (which point to a history of exposure, not current infection), H pylori stool antigen (indicates current infection), or endoscopic biopsy.
Treatment	• ↓intake of exacerbating agents. Antacids, sucralfate, H_2 blockers, and/or PPIs may help. • Administer triple therapy (amoxicillin, clarithromycin, omeprazole) to treat H pylori infection unless the patient is penicillin allergic, in which case metronidazole should be substituted for amoxicillin • Give prophylactic PPIs to patients at risk for stress ulcers (eg, ICU patients)

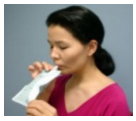
Gastritis is an inflammation of the protective lining of the stomach. Which one is not a common cause of gastritis?

A. Acetaminophen
B. Aspirin
C. Ibuprofen
D. Naproxen

_____ is a gram-negative, helically-shaped bacterium usually found in the stomach. _____ infection usually has no symptoms but sometimes causes gastritis or ulcers of the stomach or first part of the small intestine. The infection is also associated with the development of certain cancers occurring in less than 20% of cases.

A. Borrelia burgdorferi
B. Streptococcus pyogenes
C. Helicobacter pylori
D. Shigella

- H. pylori is a common type of bacteria that grows in the digestive tract and has a tendency to attack the stomach lining. It infects the stomachs of roughly 60% of the world's adult population. H. pylori infections are usually harmless, but they're responsible for the majority of ulcers in the stomach and small intestine.
- H. pylori often infect your stomach during childhood. While infections with this strain of bacteria typically don't cause symptoms, they can lead to diseases in some people, including peptic ulcers, and an inflammatory condition inside your stomach known as gastritis.
- The urea breath test is a rapid diagnostic procedure used to identify infections by Helicobacter pylori, a spiral bacterium implicated in gastritis, gastric ulcer, and peptic ulcer disease. It is based upon the ability of H. pylori to convert urea to ammonia and carbon dioxide.



A 40-year-old male presents with epigastric pain. The pain is burning and occasionally radiates to his back. He states that eating helps the pain temporarily, however, the pain is worsened 3-4 hours postprandially. Physical examination is unremarkable. Diagnostic studies reveal a positive urea breath test. Laboratory values are otherwise within normal limits. The next best step in management is:

A. indomethacin
B. colchicine
C. allopurinol
D. omeprazole, amoxicillin, clarithromycin

- Treatment of choice for H. pylori is triple therapy: amoxicillin, clarithromycin, and a proton pump inhibitor.
- Bismuth subsalicylate may be added to the regimen, or used to replace the PPI. While some sources state metronidazole can be used as first line, resistance is more common and not the best first choice.

26. PEPTIC ULCERS

Although commonly thought to result from stress, PUD is now known to result from damage to the gastric or duodenal mucosa caused by impaired mucosal defense and/or ↑acidic gastric contents. **H pylori** is the causative factor in **>90%** of duodenal ulcers and **70%** of gastric ulcers. Other risk factors include corticosteroid, NSAID, alcohol, and tobacco use. Males are affected more often than females.

History/PE	• Presents with chronic or periodic **dull, burning epigastric pain** that is often related to meals and can radiate to the back. • Patients may also complain of nausea, hematemesis ("coffee-ground" emesis), or blood in the stool • Examination is usually normal but may reveal **epigastric tenderness** and (+) stool guaiac. • Acute perforation presents with a rigid abdomen, rebound tenderness, and/or guarding.
Diagnosis	• **Rule out perforation** □ Gastric ulcers: AXR reveals free air under the diaphragm □ Duodenal ulcers: CT scan with contrast shows air in the retroperitoneal space. Order a CBC to detect GI bleeding. • **Upper endoscopy** with biopsy to confirm and to rule out activate bleeding or gastric adenocarcinoma (10% of gastric ulcers) • H pylori testing • In recurrent or refractory cases, check serum gastrin levels to screen for Zollinger-Ellison syndrome

Gastric ulcer	Duodenal ulcer
H pylori in > 70%	H pylori in > 90%
age 50s - 60s	age 30s - 40s
↑pain after food intake	↓pain after food intake
weight loss	weight gain

After a meal:	
Pain from Gastric ulcer ↓ Greater	Pain from Duodenal pain ↓ Decreases

A 58-year-old male with past medical history of chronic back pain presents with epigastric pain that started two weeks ago. The pain is gnawing in quality and eating food makes the pain worse.

What is the most likely diagnosis?

A. cholelithiasis
B. acute pancreatitis
C. duodenal ulcer
D. gastric ulcer

- Gastric ulcers commonly affect patients over 50. Pain is unchanged or made worse with eating. Most common complaint for PUD is gnawing or burning epigastric pain.

Which risk factor is the most common cause for this condition in the general population?

A. female gender
B. alcohol use
C. NSAID use
D. Helicobacter pylori infection

- Patients over 55+ and/or with alarming symptoms such as weight loss, dysphagia, new-onset anemia, hemorrhage, and early satiety should received upper endoscopy with biopsy.

A 35-year-old female presents with epigastric pain that started two weeks ago. The pain is burning in quality and relieved when she eats. She states that she has been awakened by the pain three times in the past five nights. She admits to social alcohol use. Physical exam is unremarkable.

What is the most likely diagnosis?

A. duodenal ulcer
B. gastric ulcer
C. acute pancreatitis
D. cholelithiasis

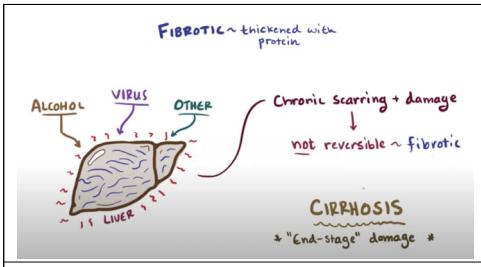
- Duodenal ulcers tend to have a cycle of symptom free periods for weeks followed by weeks of symptoms. Pain is relieved by eating but made worse hours later. Test questions may mention nocturnal pain due to sleep usually occurring hours after eating. Typical age group is in the 30s and 40s.

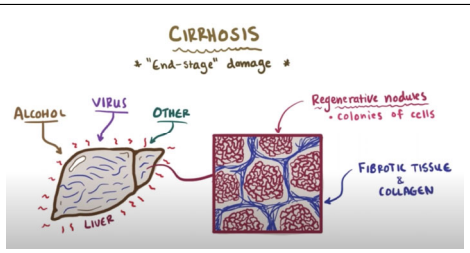
What is the most common risk factor of this condition?

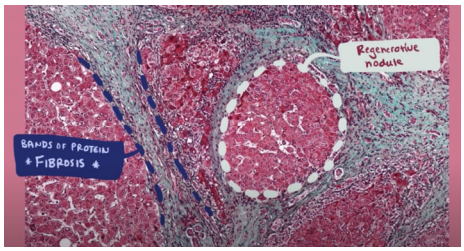
A. female gender
B. alcohol use
C. NSAID use
D. Helicobacter pylori infection
E. viral infection

- 90% of duodenal ulcers are associated with H. pylori. Patients under 50 years of age without alarming signs should undergo **urea breath test** or H. pylori antibody test. **Upper endoscopy with biopsy** is the most accurate diagnostic test.

27. HEPATOCIRRHOSIS



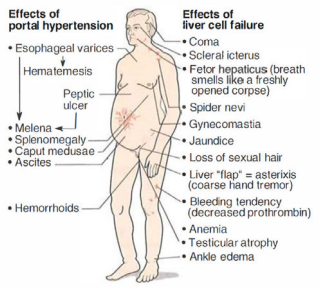




- Cirrhosis is a consequence of chronic liver disease characterized by replacement of liver tissue by **fibrosis**, **scar tissue** and **regenerative nodules** (lumps that occur as a result of a process in which damaged tissue is regenerated), leading to loss of liver function.
- Each time the liver is injured (by disease, excessive alcohol consumption or another cause) it tries to repair itself. → In the process, scar tissue forms. → As cirrhosis progresses, more and more scar tissue forms, making it difficult for the liver to function (decompensated cirrhosis). → Advanced cirrhosis is life-threatening.

Signs and Symptoms

Early (some Fibrosis) → compensated (still does its job)	Later (extensive fibrosis) → Decompensated (can't function)
asymptomatic, non-specific s/sx (eg, weight loss, weakness, fatigue)	Jaundice, pruritis, ascites, hepatic encephalopathy, easy bruising



Diagnosis

- Gold standard: liver biopsy
- Lab: ↑bilirubin, ↑liver enzymes (AST, ALT, ALP, GGT), ↓thrombocyte

Treatment

- Generally irreversible
- Prevent further damage: Treat underlying cause (hepatitis, alcohol)
- Liver transplant

Complications

Ascites	↑pressure in the portal vein → fluid to accumulate in abdomen
Spontaneous bacterial peritonitis	infection of the ascitic fluid → development of a bacterial infection in the peritoneum
Splenomegaly	Fluid backs up to spleen → enlarged spleen
Hepatorenal failure	portosystemic shunt → renal vasoconstriction → low filtration
Hepatic encephalopathy	↓liver function → ↓detoxification → ↑toxins (ammonia) in the brain → asterixis, coma
Gynecomastia	↓liver function → ↓estrogen metabolism → gynecomastia, spider angionata, palmar erythema
Jaundice	↓bilirubin conjugation → ↑unconjugated bilirubin → jaundice
Hypoalbuminemia	↓albumin production → hypoalbuminemia
Coagulation issues	impaired synthesis of clotting factors → coagulation issues → bleeding

Portal hypertension is an increase in the blood pressure within a system of veins called the portal venous system. Which of the following is the most common cause of portal hypertension?

A. Sarcoidosis
B. Cirrhosis
C. Schistosomiasis
D. Budd–Chiari syndrome

- The portal vein is a blood vessel that carries blood from the gastrointestinal tract, gallbladder, pancreas and spleen to the liver. This blood contains nutrients and toxins extracted from digested contents.
- Portal hypertension is abnormally high blood pressure in the portal vein and its branches. Cirrhosis is the most common cause in Western countries. Cirrhosis slows the blood flow and puts stress on the portal vein.

Cirrhosis is a late stage of scarring of the liver caused by many forms of liver diseases. Which of the following pathophysiology is most likely related with liver cirrhosis?

A. Portal hypertension
B. Pulmonary hypertension
C. Essential hypertension
D. White coat hypertension

A	B	C	D	E
Ascietes	**B**leeding	**C**aput medusae	**D**iminished liver function	**E**nlarged spleen

Venous Blood accumulates in portal system → pressure rises >12 mmHg → portosystemic shunts (blood is diverted away from portal system and backs up into systemic veins). Portosystemic Shunts occur at three points where the systemic and portal system connect:

Esophagus	Umbilicus	Rectum
→ Esophageal varies	→ Caput Medusae	→ Anorectal varices

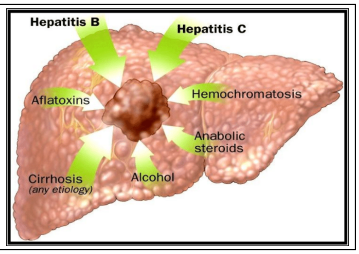
Patients with cirrhosis should be screened with an upper endoscopy every 1-2 years. This is to screen which of the following?

A. Gastritis
B. Peptic ulcer diseases
C. Esophageal varices
D. Caput medusae

Esophageal varices are a very common cause of bleeding in patients with cirrhosis and may lead to a life-threatening hypotension.

28. HEPATIC CARCINOMA

- **Liver cancer types:** Hepatocellular carcinoma (HCC, also called hepatoma), Fibrolamellar HCC, Cholangiocarcinoma (bile duct cancer), Angiosarcoma (also called hemangiocarcinoma), Secondary liver cancer (also known as a liver metastasis).
- **Hepatocellular carcinoma (HCC)**, also called hepatoma, is the most common type of liver cancer, accounting for approximately 75% of all liver cancers. HCC starts in the main type of liver cells, called hepatocellular cells. Most cases of HCC are the result of infection with hepatitis B or C, or cirrhosis of the liver caused by alcoholism.



HEPATOCELLULAR CARCINOMA

Definition	• One of the most common cancers worldwide despite its relatively low incidence in the developed countries. • Primary risk factors for the development of hepatocelluar carcinoma in the developed countries are cirrhosis from alcohol and chronic hepatitis (HCV). • In developing countries, aflatoxins (in various food sources) and HBV infection are major risk factors.

Risk factors			
Hepatits B, C	Alcoholism	Aflatoxin	Others: autoimmune, wilson's disease, hemochromatosis

History/PE	• Patients commonly present with **RUQ tenderness**, **abdominal distention**, and signs of chronic liver disease such as **jaundice**, **easy bruisability**, and **coagulopathy**. • Examination may reveal tender **enlargement** of the liver.
Diagnosis	• Often sugged by the presence of a mass on **ultrasound** or **CT scan** as well as by abnormal LFTs and significantly elevated alpha-fetoprotein (AFP) levels.
Treatment	• **Surgical:** Partial hepatectomy for single lesions < 5cm with no cirrhosis; orthotopic liver transplantation in patients with cirrhosis. • **Nonsurgical:** Transarterial chemoembolization (TACE) and/or sorafenib for advanced disease. • Monitor AFP levels to screen for recurrence.

Primary liver cancer is a malignant tumor that starts in the liver. What is the most common type of primary liver cancer?

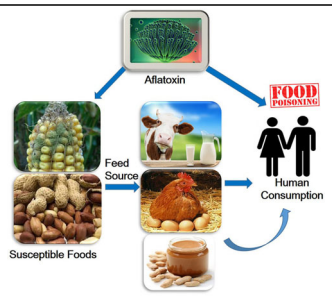
A. Cholangiocarcinoma
B. Hepatocellular carcinoma
C. Hemangiocarcinoma
D. Liver metastases from pancreatic cancer

Worldwide, the most common risk factor for liver cancer is chronic infection with _____ virus or _____ virus. These infections lead to cirrhosis of the liver and are responsible for making liver cancer the most common cancer in many parts of the world.

A. Hepatitis A, Hepatitis E
B. Hepatitis A, Hepatitis B
C. Hepatitis B, Hepatitis C
D. Hepatitis B, Hepatitis E

AFLATOXINS

- **Aflatoxins** are poisonous carcinogens and mutagens that are produced by certain molds (Aspergillus flavus and Aspergillus parasiticus) which grow in soil, decaying vegetation, hay, and grains. They are regularly found in improperly stored staple commodities such as cassava, chili peppers, cottonseed, millet, peanuts, rice, sesame seeds, sorghum, sunflower seeds, sweetcorn, tree nuts, wheat, and a variety of spices.
- Chronic low-level exposure to **aflatoxins**, particularly aflatoxin B_1, is associated with increased risk of developing liver cancer, impaired immune function, and malnutrition. Acute high-level exposure, which is less common, causes early symptoms of diminished appetite, malaise, and low fever.



Aflatoxins are a family of toxins produced by certain fungi that are found on agricultural crops such as corn, peanuts, cottonseed, and tree nuts. Exposure to aflatoxins is associated with an increased risk of _____ cancer.

A. lung
B. stomach
C. brain
D. liver

- The main fungi that produce aflatoxins are Aspergillus flavus and Aspergillus parasiticus, which are abundant in warm and humid regions of the world. Aflatoxin-producing fungi can contaminate crops in the field, at harvest, and during storage.
- The staple commodities regularly contaminated with aflatoxins include cassava, chilies, corn, cotton seed, millet, peanuts, rice, sorghum, sunflower seeds, tree nuts, wheat, and a variety of spices intended for human or animal consumption.

29. STOMACH CARCINOMA

Overview	• Stomach cancer begins when malignant cells form in the inner lining of the stomach. The disease usually grows slowly over many years. When gastric cancer is found very early, there is a better chance of recovery. Gastric cancer is often in an advanced stage when it is diagnosed. At later stages, gastric cancer can be treated but rarely can be cured. • Gastric cancer: malignant cells in stomach. Types depending on the types of cell that originates from: Adenocarcinoma (from columnar glandular epithelium), Lymphoma (from lymphocytes), Carcinoid tumor (from G-cells in stomach), Leiomyosarcoma (from smooth muscle cells) • Stomach cancers are about 90-95% adenocarcinomas. Adenocarcinoma is a type of cancer that starts in mucus-producing glandular cells of your body. • The Asian countries with a high-risk of stomach cancer, specifically Korea, Japan, China, and the Philippines, were selected due to their geographical proximity and cultural similarities.
Types	• Histologically, there are two major types of gastric adenocarcinoma: intestinal type or diffuse type. • **Intestinal type:** Differentiated cancer that originates from the intestinal metaplasia of gastric mucosal cells. Risk factors include a diet high in nitrites and salt and low in fresh vegetables (antioxidants), H pylori colonization, and chornic gastritis. • **Diffuse type:** Undifferentiated cancer not associated with H pylori infection or chronic gastritis. Risk factors are unknown; signet ring cells on biopsy are characteristic.
Hx/PE	• Early-stage disease is usually asymptomatic but may be associated with indigestion and loss of appetite. Lat-stage disease presents with abdominal pain, weight loss, and upper GI bleeding.
Diagnosis	• Upper endoscopy with biopsy is necessary to rule out other etiologies and confirm the diagnosis.
Treatment	• If detected early, treatment is surgical resection. Most patients present with late-stage, incurable disease. Five-year survival is <10% for advanced disease.

Gastric cancer occurs when cancer cells form in the lining of the stomach. Which of the following is the most common type of gastric cancer?

A. Adenocarcinoma
B. Lymphoma
C. Carcinoid tumor
D. Leiomyosarcoma

Certain viruses or bacteria may increase the risk of developing cancer. Which of the following microorganisms causes chronic inflammation and significantly increases the risk of developing gastric cancer?

A. Hepatitis B virus
B. Helicobacter pylori
C. Human papilloma virus
D. Human immunodeficiency virus

Microorganism	Cancer
Hepatitis B and Heptatitis C viruses	Liver cancer
Helicobacter pylori	Stomach cancer
Human papilloma virus	Cervical cancer
Human immunodeficiency virus	Lymphoma, Kaposi's sarcoma
Epstein-Barr virus	Lymphoma
Human T-cell lymphotropic virus	Lymphoma, Leukemia
Human herpes virus 8	Kaposi's sarcoma

A 50-year-old Asian female presents with unexplained weight loss over the past six months. History reveals that she has had intermittent epigastric pain for three months. Diagnostic studies reveal microcytic anemia. Upper endoscopy and biopsy are significant for gastric adenocarcinoma. Which of the following is a risk factor for this patient's condition?

A. Blood type O
B. Aflatoxins
C. Cyclophosphamide
D. Helicobacter pylori infection

- Gastric cancer will present with weight loss and epigastric pain. Endoscopy is the diagnostic test of choice. Other symptoms include dysphagia, early satiety, anorexia, nausea and vomiting. Commonly tested risk factors include low fiber diet, obesity, Epstein-Barr virus, high salt intake, N-nitroso compounds, smoked foods, smoking, alcohol, blood type A, gastric surgery, and H. pylori.
- Diagnosis is made with endoscopy with biopsy. Treatment is surgical resection.

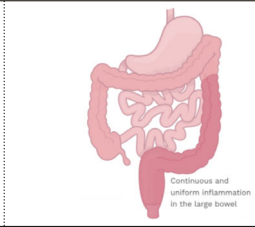
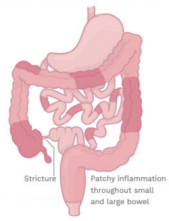
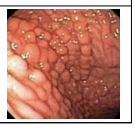
Nitrosamines are produced by the reaction of nitrites and secondary amines. Nitrites are used as food preservatives, e.g. cured meats. Secondary amines arise by the degradation of proteins. Nitrite and nitrosamine intake are associated with risk of _____ cancer and oesophageal cancer.

A. Liver
B. Breast
C. Stomach
D. Pancreas

- Nitrites in combination with amines or amides were proved to be carcinogenic to animals. Most nitrosamines can induce animal carcinogenesis by causing gene mutation and DNA adductions.
- Nitrates and nitrites are substances commonly found in cured meats. They can be converted by certain bacteria, such as H pylori, into compounds that have been shown to cause stomach cancer in lab animals.

30. ULCERATIVE COLITIS

IBS (Irritable Bowel Syndrome)	IBD (Inflammatory Bowel Disease)
• An idiopathic functional disorder characterized by chronic, intermittent abdominal pain and changes in bowel habits. • Half of all IBS patients who seek medical care have comorbid psychiatric disorders (eg, depression, anxiety, fibromyalgia)	• IBD is a term for two conditions (Crohn's disease and ulcerative colitis) that are characterized by chronic inflammation of the GI tract. • Most common in Caucasians and Ashkenazi Jews, with onset most frequently occuring in the teens to early 30s or in the 50s.

	Ulcerative Colitis	Crohn's Disease
Site of involvement	**Rectum** ↓ **Continuous**  Continuous and uniform inflammation in the large bowel **Mucosa**	**Ileocecal** ↓ **Skip lesions**  Stricture Patchy inflammation throughout small and large bowel **Transmural**
	• The rectum is always involved. May extend proximally in a **continuous** fashion • Inflammation and ulceration are limited to the mucosa and submucosa.	• May involve any portion of GI tract, particularly the ileocecal region, in a discontinuous pattern ("**skip lesions**"). The rectum is often spared. • Transmural inflammation is seen, sometimes leading to fistulas to other organs.
History/Exam	• **Bloody diarrhea**, lower abdominal cramps, tenesmus, urgency. • Examination may reveal orthostatic hypotension, tachycardia, abdominal tenderness, frank blood on rectal examination, and extraintestinal manifestations. • Bloody stool: common / Malnutrition: less common	• Abdominal pain, low-grade fever, **weight loss**, watery diarrhea. • Examination may reveal fever, abdominal tenderness or mass, perianal fissures or tags, fistulas, and extraintestinal manifestations. • Bloody stool: variable / Malnutrition: common
Colonoscopy	• Friability, edema, **pseudopolyps, continuous** rectal involvement 	• Ulcers, **strictures**, **cobblestoning**, and **skip lesions** 

Inflammatory bowel disease is a group of inflammatory conditions of the GI tract. _____ affects the small intestine and large intestine, as well as the mouth, esophagus, stomach and the anus, whereas _____ primarily affects the colon and the rectum.

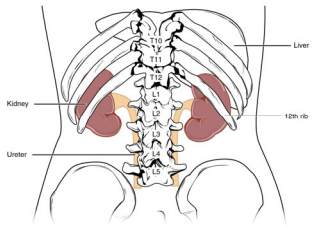
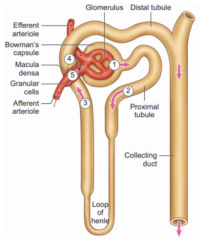
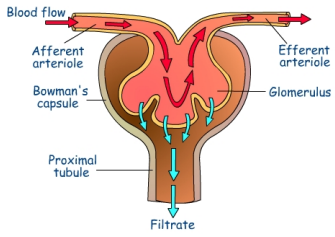
A. Crohn's disease / Ulcerative colitis
B. Ulcerative colitis / Crohn's disease
C. Irritable bowel syndrome / Ulcerative colitis
D. Crohn's disease / Irritable bowel syndrome

	Ulcerative Colitis
Extraintestinal manifestations	• Aphthous stomatitis, episcleritis/uveitis, arthritis, **primary sclerosing cholangitis**, erythema nodosum, and pyoderma gangrenosum.
Diagnosis	• CBC, abdominal X-ray, stool culture, ova and parasite test, stool assay for C difficile. • Colonoscopy can show diffuse and continuous rectal involvement, friability, edema, and **pseudopolyps**. • Definitive diagnosis can be made with **biopsy**.
Treatment	• 5-ASA agents (eg, sulfasalazine, mesalamine), topical or oral; corticosteroids and immunomodulating agents (eg, azathioprine) for refractory disease • Total proctocolectomy can be curative for long-standing or fulminant colitis or toxic megacolon; also ↓cancer risk.
Incidence of cancer	• There is a **markedly ↑risk of colorectal cancer** in long-standing cases (monitor with frequent fecal occult blood screening and yearly colonoscopy with multiple biopsies after 8 years of disease).

Ulcerative Colitis (UC) vs. Crohn's Disease (CD)		
⊙ Markedly increase risk of colorectal cancer	A. Ulcerative Colitis	B. Crohn's disease
⊙ Can affect any part of the GI tract from the mouth to the anus	A. Ulcerative Colitis	B. Crohn's disease
⊙ Only the colon and rectum are affected	A. Ulcerative Colitis	B. Crohn's disease
⊙ Can affect the entire thickness of the bowel wall	A. Ulcerative Colitis	B. Crohn's disease
⊙ Affects the inner-most lining of the large intestine	A. Ulcerative Colitis	B. Crohn's disease
⊙ Terminal ileum is commonly involved	A. Ulcerative Colitis	B. Crohn's disease
⊙ Bile duct is commonly involved (↑rate of primary sclerosing cholangitis)	A. Ulcerative Colitis	B. Crohn's disease
⊙ Cobblestoning and skip lesions on colonoscopy	A. Ulcerative Colitis	B. Crohn's disease
⊙ Pseudopolyps and continuous rectal involvement on colonoscopy	A. Ulcerative Colitis	B. Crohn's disease

UROLOGIC DISEASES

	Disease	Definition
31	**Chronic glomerulonephritis**	a type of kidney disease characterized by long-term inflammation and scarring of the glomeruli
32	**Chronic renal failure**	a condition involving a decrease in the kidneys' ability to filter waste and fluid from the blood
33	**Urinary tract infection**	an infection in any part of the urinary system, the kidneys, bladder, or urethra

The **kidneys** are a pair of bean-shaped organs on either side of the spine, below the ribs and behind the belly.	The **nephron** is the microscopic structural and functional unit of the kidney. It is composed of a renal corpuscle and a renal tubule.	Each nephron in your kidneys has a microscopic filter, called a **glomerulus** that is constantly filtering your blood.
		

The kidneys lie retroperitoneally in the abdomen, either side of the vertebral column. They typically extend from T12 to L3, although the right kidney is often situated slightly lower due to the presence of the liver. What is the functional unit of the kidney?

A. Nephron
B. Bowman's capsule
C. Loop of Henle
D. Glomerulus

BODY FLUID COMPARTMENT: Total Body Weight = **40%** nonwater mass + **60%** water mass (**40%** ICF + **20%** ECF)

Total body water (60%)		
Intracellular (40%)	**Extracellular** (20%)	
	Interstitial (15%)	**Plasma** (5%)

In lean healthy adult, the total body water is about 60% of the total body weight. There are two major fluid compartments: intracellular and extracellular. The intracellular compartment makes up only about _____ of the body mass.

A. 80%
B. 60%
C. 40%
D. 20%

There are two major fluid compartments: intracellular and extracellular. The extracellular fluid can be divided into two major subcompartments: interstitial fluid and blood plasma. Fluid movement from the intravascular to interstitial and intracellular compartments occurs in the capillaries.

Blood Urea Nitrogen (BUN)	Urea nitrogen is a normal waste product in the blood that comes from the breakdown of protein. It is normally removed from the blood by the kidneys, but when kidney function slows down, the BUN level rises.
Serum Creatinine	Creatinine is a waste product in the blood that comes from muscle activity. It is normally removed from the blood by the kidneys, but when kidney function slows down, the creatinine level rises.
Glomerular Filtration Rate (GFR)	GFR is equal to the total of the filtration rates of the functioning nephrons in the kidney. GFR is considered the optimal way to measure kidney function. It may be estimated from the blood level of creatinine.

_____ is a waste product that is produced by the muscles. It is typically removed through the kidneys. Healthy kidneys filter creatinine out of the blood, and it leaves the body through urine. The normal range for creatinine in the blood may be 0.84 to 1.21 mg/dL. Having high _____ levels can be a marker of health conditions including chronic kidney disease (CKD).

A. BUN
B. Creatinine
C. GFR
D. Potassium

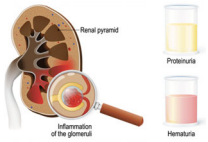
A 15-year-old male presents for a physical examination required prior to his participation in high school football. Past medical history and physical examination are unremarkable. Serum studies show a creatinine of 2.2mg/dL but are otherwise within normal limits. What is the most important next step in management?

A. Question about anabolic steroid use
B. Order voiding cystourethrogram
C. Refer to nephrologist for evaluation
D. Question about nutritional supplement use

In a healthy male athlete with a normal physical exam and normal labs other than an elevated creatinine the most appropriate next step in the work-up is to question the patient about creatine use. Creatine is proven to improve anaerobic performance. It is primarily used by football players, weight-lifters, and other strength athletes for its strength benefits. The primary side effect of creatine is that it increases the patient's risk of dehydration and can cause osmotic diarrhea. Creatine does elevate serum creatinine.

31. CHRONIC GLOMERULONEPHRITIS

Definition	• Glomerulonephritis is inflammation of the glomeruli (tiny filters in the kidneys). Glomeruli remove excess fluid, electrolytes and waste from the bloodstream and pass them into the urine. Glomerulonephritis can come on suddenly (acute) or gradually (chronic). • Glomerulonephritis occurs on its own or as part of another disease, such as lupus or diabetes. Severe or prolonged inflammation associated with glomerulonephritis can damage the kidneys. Treatment depends on the type of glomerulonephritis.
Symptoms	• Signs and symptoms of glomerulonephritis depend on the acute or chronic form and the cause. • Glomerulonephritis signs and **symptoms** include: □ Pink or cola-colored urine from red blood cells in your urine (hematuria) □ Foamy urine due to excess protein (proteinuria) □ High blood pressure (hypertension) □ Fluid retention (edema) with swelling evident in your face, hands, feet and abdomen



- Glomerulonephritis refers to an inflammation of the glomerulus, which is the unit involved in filtration in the kidney. This inflammation typically results in one or both of the nephrotic or nephritic syndromes. The key with **nephrotic** syndrome is an excess amount of protein in the urine, whereas **nephritic** syndrome is where there is an excess amount of blood in the urine.

Nephrotic syndrome	Nephritic syndrome
an excess amount of _____ in the urine	an excess amount of _____ in the urine
proteinuria (>3.5 g/day), hypoalbuminemia, edema, **hyperlipidemia**	**hematuria**, oliguria, proteinuria (<1.5 g/day), edema, **hypertension**

- Many conditions can cause glomerulonephritis. Sometimes the disease runs in families and sometimes the cause is unknown. Conditions that can lead to inflammation of the kidneys' glomeruli include:

Infections	Immune diseases	Vasculitis	Conditions likely to cause scarring of the glomeruli
• Post-streptococcal glomerulonephritis • Bacterial endocarditis • Viral infections	• Lupus • Goodpasture's syndrome • IgA nephropathy	• Polyarteritis • Granulomatosis with polyangiitis	• Hypertension • Diabetic nephropathy • Focal segmental glomerulosclerosis

- Infrequently, chronic glomerulonephritis runs in families. One inherited form, Alport syndrome, also might impair hearing or vision.
- In addition to the causes listed above, glomerulonephritis is associated with certain cancers, such as multiple myeloma, lung cancer and chronic lymphocytic leukemia

Infections

- **Post-streptococcal glomerulonephritis:** Glomerulonephritis may develop a week or two after recovery from a strep throat infection or, rarely, a skin infection (impetigo). To fight the infection, the body produces extra antibodies that can eventually settle in the glomeruli, causing inflammation. Children are more likely to develop post-streptococcal glomerulonephritis than are adults, and they're also more likely to recover quickly.

Immune diseases

- **Lupus:** A chronic inflammatory disease, lupus can affect many parts of the body, including the skin, joints, kidneys, blood cells, heart and lungs.
- **Goodpasture's syndrome:** A rare immunological lung disorder that can mimic pneumonia, Goodpasture's syndrome causes bleeding in the lungs as well as glomerulonephritis.

Vasculitis

- **Granulomatosis with polyangiitis:** This form of vasculitis, formerly known as Wegener's granulomatosis, affects small and medium blood vessels in the lungs, upper airways and kidneys.

- Glomerulonephritis can damage the kidneys so that they lose their filtering ability. As a result, dangerous levels of fluid, electrolytes and waste build up in the body. Possible **complications** of glomerulonephritis include: **acute kidney failure**, **chronic kidney disease**, and **hypertension**.

A patient consults you because she has noticed lather-rich urine and generalized edema. Laboratory studies are significant for low albumin and elevated LDL levels. 24 hour urine collection is significant for proteinuria of 5.2 g/day. What is the most likely diagnosis?

A. Nephrotic syndrome B. Nephritic syndrome

- Nephrotic syndrome is characterized by proteinuria (>3.5g/day), hypoalbuminemia, hyperlipidemia and generalized edema. Presenting complaints are usually generalized edema or lather-rich/foamy urine as a result of protein loss in the urine.
- **Hyperlipidemia** is a classic feature of the nephrotic syndrome, rather than a mere complication. It is related to the hypoproteinemia and low serum oncotic pressure of nephrotic syndrome, which then leads to reactive hepatic protein synthesis, including of lipoproteins.
- Lower serum oncotic pressure causes fluid to accumulate in the interstitial tissues. Sodium and water retention aggravates the **edema**.

A 17-year-old female presents to the emergency room after she noticed a brown discoloration of her urine. She has noticed some swelling in her face. History reveals that she was treated for strep throat by her pediatrician 2 week ago. Physical examination reveals a hypertensive patient in mild distress. What is the most likely diagnosis?

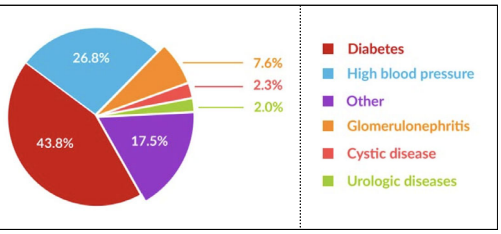
A. Nephrotic syndrome B. Nephritic syndrome

- Post-streptococcal glomerulonephritis (PSGN) is managed with supportive care which often results in a full recovery. Supportive care includes salt/water restriction, diuretics, hypertension control, and dialysis if indicated.
- PSGN presents at least a week after pharyngitis or a skin infection with beta hemolytic streptococcus pyogenes. Patients present with hematuria with red cell casts, oliguria, edema, and hypertension.

32. CHRONIC RENAL FAILURE

ACUTE RENAL FAILURE = Acute kidney injury (AKI)	CHRONIC RENAL FAILURE = Chronic kidney disease (CKD)
caused by an event that leads to kidney malfunction, such as dehydration, blood loss from major surgery or injury, or the use of medicines.	caused by a long-term disease, such as high blood pressure or diabetes, that slowly damages the kidneys and reduces their function over time.

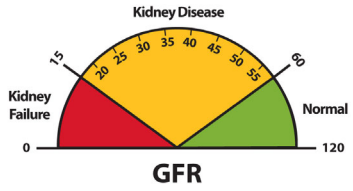
DM	Too much glucose in the blood damages the kidneys' filters. Over time, the kidneys can become so damaged that they no longer do a good job filtering wastes and extra fluid from your blood. Often, the first sign of kidney disease from diabetes is protein (albumin) in the urine.
HTN	High blood pressure can damage blood vessels in the kidneys so they don't work as well. If the blood vessels in the kidneys are damaged, your kidneys may not work as well to remove wastes and extra fluid from the body. Extra fluid in the blood vessels may then raise blood pressure even more, creating a dangerous cycle.



Chronic kidney disease, also called chronic kidney failure, describes the gradual loss of kidney function, _____ and _____ are the most common causes of chronic kidney disease (CKD).

A. Hypertension, Polycystic kidney disease
B. Hypertension, Glomerulonephritis
C. Diabetes mellitus, Hypertension
D. Diabetes mellitus, Chronic urinary tract infections

Definition	• An irreversible or only partially reversible state in which the kidneys have lost the ability to regulate some combination of the body's fluid state, electrolyte levels, and acid-base status. • Defined as >3 months of one of the following: GFR < 60 mL/min, urinary abnormalities (proteinuria/microscopic hematuria), or structural abnormalities. • Most commonly due to **diabetes mellitus (DM)**, **hypertension**, and glomerulonephritis. Another commonly tested etiology is polycystic kidney disease.
History/Exam	• Generally **asymptomatic until** GFR is <30 mL/min, but patients gradually experience the signs and symptoms of uremia (anorexia, nausea, vomiting, uremic pericarditis, "uremic frost," delirium, seizures, coma).
Diagnosis	• CKD is defined as either kidney damage or GFR <60 mL/min/1.73m^2 for >3 months. A serum creatinine that is >1.4 mg/dL for > 3 months is generally considered diagnostic. • Common metabolic derangements include the following: □ **Azotemia** "azot (nitrogen) + emia (blood condition)" → ↑BUN and creatinine). □ Fluid retention (hypertension, edema, CHF, pulmonary edema). □ Metabolic acidosis. □ **Hyperkalemia**. □ Anemia (**↓erythropoietin** → ↓RBC production in bone marrow). □ Abnormal hemostasis caused by impaired platelet aggregation. □ **Hypocalcemia**, hyperphosphatemia (↓phosphate excretion; **↓vitamin D production** leading to renal osteodystrophy).
Treatment	• Long-term treatment often involves erythropoietin (if the patient is anemic), vitamin D, phosphate binders, and calcium. Bicarbonate may be used for severe acidosis. • Renal replacement therapy includes hemodialysis, peritoneal dialysis, and renal transplantation. The only definitive treatment for irreversible end-stage renal disease is transplantation. **Indications for hemodialysis:** metabolic acidosis, hyperkalemia, intoxications, volume overload, and pericarditis.



Stage	Description	GFR (mL/min/1.73 m^2)
1	Kidney damage with normal or ↑ GFR	≥90
2	Kidney damage with mild ↓ GFR	60–89
3	Moderate ↓ GFR	30–59
4	Severe ↓ GFR	15–29
5	Kidney failure	<15 (or dialysis)

A patient with poorly controlled diabetes, hypertension, renal failure, and hyperlipidemia presents with nausea, vomiting and confusion. Serum values today include the following: urea nitrogen 70 mg/dl (normal: 7 to 20 mg/dL)**, creatinine 6.5 mg/dl** (normal: 0.84 to 1.21 mg/dl)**, calcium 7.5 mg/dl** (normal: 8.6 to 10.3 mg/dL)**, potassium 7.1 mEq/l** (normal: 3.6 to 5.2 mmol/L)**, and hemoglobin 10 gm/dl** (normal: >13.5 in male, >12 in female)**. GFR is calculated to be 32 ml/min** (normal: 90 to 120 ml/min)**.**

- ⊙ **What stage of renal failure does the patient have?** → **stage ____ CKD**
- ⊙ **What is the most likely cause of this patient's anemia?** → **↓production of _____**
- ⊙ **Which findings is an absolute indication for hemodialysis?** → **severe _____**

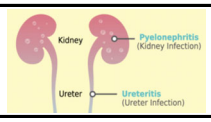
A person with stage 5 CKD has end stage renal disease (ESRD) with a GFR of _____ ml/min or less. At this advanced stage of kidney disease, the kidneys have lost nearly all their function, and eventually dialysis or a kidney transplant is needed to live.

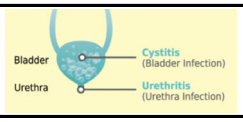
A. 60
B. 45
C. 30
D. 15

- Glomerular filtration is the process by which the kidneys filter the blood, removing excess wastes and fluids. Glomerular filtration rate (GFR) is a calculation that determines how well the blood is filtered by the kidneys, which is one way to measure remaining kidney function.
- They have a GFR of 15 mL/min or less and have End Stage Renal Disease (ESRD). The kidneys have lost almost all ability to function effectively at this stage.

33. URINARY TRACT INFECTION

Upper UTI			Lower UTI	
Kidney	Ureters		Bladder	Urethra
Pyelonephritis	Ureteritis		Cystitis*	Urethritis





Definition	• Affect females more frequently than males, and **(+) E coli** cultures are obtained in 80% of cases. See the mnemonic **SEEKS PP** for other pathogens. Risk factors include the presence of catheters or other urologic instrumentation, anatomic abnormalities (eg, BPH, vesicoureteral reflux), previous UTIs or pyelonephritis, DM, recent antibiotic use, immunosuppression, and pregnancy.
History/Exam	• Present with **dysuria**, **urgency**, **frequency**, suprapubic pain, and hematuria • Children may present with **bedwetting**, poor feeding, recurrent fevers, and foul-smelling urine. • The differential includes vaginitis, STDs, urethritis or acute urethral syndrome, and prostatitis.
Diagnosis	• Diagnosed by **clinical symptoms**. In the absence of symptoms, treatment is warranted only for children, patients with anatomical GU tract anomalies, pregnant women, those with instrumented urinary tracts, patients scheduled for GU surgery, and renal transplant patients. • **Urine dipstick/UA: ↑leukocyte esterase** (a marker of WBCs) is 75% sensitive and up to 95% specific. **↑nitrites** (a marker of bacteria), ↑urine pH (Proteus infections), and hematuria (seen with cystitis) are also commonly seen. • **Microscopic analysis: Pyuria** (> 5 WBCs/hpf) and **bacteriuria** (1 organism/hpf = 10^6 organisms/mL) are suggestive. • **Urine culture:** The gold standard is > 10^5 CFU/mL. (*CFU = colony-forming units)
Treatment	• **Uncomplicated UTI:** Treat on an outpatient basis with PO **TMP-SMX** or a **fluoroqninolone** x 3 days, or **nitrofurantoin** x 5 clays. The use of fluoroquinolones should be reserved for severe symptoms in light of resistance and MRSA selection. • **Complicated UTI** (urinary obstruction, men, renal transplant, catheters, instrumentation): Administer the same antibiotics as above, but for 7-14 days. • **Pregnant patients:** Treat asymptomatic bacteruria or symptomatic UTI with **nitrofurantoin** or amoxicillin x 3-7 clays. Avoid fluoroquinolones. Confirm clearance with a posttreatment urine culture. • **Urosepsis:** Patients with urosepsis should be hospitalized and initially treated with IV antibiotics. Consider broader coverage to include resistant GNRs or enterococcus. • Prophylactic antibiotics may be given to women with uncomplicated recurrent UTIs. Check for prostatitis in men.

SEEKS PP

S*erratia*
E *coli*
E*nterobacter*
K*lebsiella pneumoniae*
S*taphylococcus saprophyticus*
P*seudomonas*
P*roteus mirabilis*

Urinary tract infections are the most common type of bacterial infection diagnosed today. And the most common bacteria to cause these infections are _____. In fact, _____ is responsible for more than 85% of all urinary tract infections, according to the journal Emerging Infectious Diseases.

A. Escherichia coli
B. Staphylococcus saprophyticus
C. Pseudomonas aeruginosa
D. Klebsiella pneumoniae

Urinary tract infections are common in women, and many women experience more than one infection during their lifetimes. Risk factors specific to women for UTIs include EXCEPT:

A. Female anatomy
B. Sexual activity
C. Diaphragm use
D. Menopause
E. Pregnancy
F. Wiping from front to back

A 62-year-old woman with a past medical history of DM, HTN, and CHF is hospitalized after her daughter discovered her unresponsive. She is suspected to have suffered a CVA. An indwelling urinary catheter is placed on her first day of admission. Three days later, the nurse notes a temperature of 101.5°F. Physical examination reveals a HR of 101 bpm and a BP of 145/92 mmHg. Abdominal examination reveals a soft, non-distended abdomen with mild suprapubic tenderness. Physical examination is otherwise unremarkable. Urinalysis is positive for pyuria and bacteriuria. Which of the following could have prevented this patient's condition?

A. Increasing fluid intake
B. Providing prophylactic antibiotics
C. Removing the urinary catheter
D. Teaching the patient proper genitourinary hygiene

- Indwelling urinary catheters are associated with urinary tract infections (UTis) in many patients. They are the leading cause of secondary healthcare-associated bacteremia. Patients may be asymptomatic or may complain of symptoms of a UTI.
- Fever is the most common symptom in UTis associated with indwelling urinary catheters and patients may also present with flank or suprapubic discomfort, costovertebral angle tenderness, or catheter obstruction. Avoidance of unnecessary catheterization, use of sterile technique when placing the catheter, and removal of the catheter as soon as possible may prevent urinary catheter associated UTis.

HEMATOLOGIC DISEASES

	Disease	Definition
34	**Aplastic anemia**	a condition when the body stops producing enough new blood cells and causes pancytopenia
35	**Leukemia**	a type of cancer that affects the blood and bone marrow
36	**Leukopenia & Agranulocytosis**	a lowered white blood cell count, most commonly of neutrophils
37	**Thrombocytopenic purpura**	an immune disorder in which the blood doesn't clot normally

BLOOD CELLS

Leukocytes					Erythrocytes	Thrombocytes
						

A blood cell is a cell produced through hematopoiesis and found in the blood. Match the blood cells to the correct functions.

Red blood cells (erythrocytes)	■ □	**Involved in primary hemostasis / interact with fibrinogen to form platelet plug / life span of 8-10 days / derived from megakaryocytes / normally 150K – 400K per mcL**
White blood cells (leukocytes)	■ □	**Carries O_2 to tissues and CO_2 to lungs / anucleate and biconcave / large surface area-to-volume ratio for rapid gas exchange / life span of 120 days**
Platelets (thrombocytes)	■ □	**Divided into granulocytes** (consist of a granular cytoplasm) **and agranulocytes** (do not consist of a granular cytoplasm) **/ responsible for defense against infection / normally 4K - 10K cells/mm^3**

LEUKOCYTES

Granulocytes			Agranulocytes	
Neutrophils (60%)	**Eosinophils** (3%)	**Basophils** (1%)	**Lymphocytes** (30%)	**Monocytes** (6%)
				
bacterial infections	parasitic infection	allergic response	immune response	phagocytosis

⇩

Never Let Monkeys Eat Bananas

Neutrophils	Lymphocytes	Monocytes	Eosinophils	Basophils
60%	30%	6%	3%	1%

Granulocytes and agranulocytes are the two types of leukocytes. Granulocytes contain granules in their cytoplasm and agranulocytes do not. Which one of the following leukocytes does NOT belong to the granulocytes?

A. Neutrophils
B. Eosinophils
C. Basophils
D. Monocytes

What is the most abundant type of granulocyte and make up 55% to 70% of all white blood cells?

A. Neutrophils
B. Eosinophils
C. Lymphocytes
D. Monocytes

Leukocytes are the cells of the immune system that are involved in protecting the body against both infectious disease and foreign invaders. Match the type of leukocytes to their correct functions.

Neutrophils	■ □	**defends against bacterial or fungal infections / ingest and destroy invaders / most common first responders**
Lymphocytes	■ □	**divided into B cells, T cells, and NK cells / B & T cells → adaptive immunity; NK cells → innate immunity**
Monocytes	■ □	**differentiates into macrophages (phagocytic cell) in tissues / large, kidney-shaped nucleus**
Eosinophils	■ □	**defends against helminthic infections / participating in immediate allergic reactions and inflammatory response**
Basophils	■ □	**mediate allergic reaction / release histamine which causes vasodilation**

BLOOD TESTS

Complete blood count	**CBC**	**WBC, RBC, Hemoglobin (Hgb), Hematocrit (Hct), Platelets**
	CBC with Differential	**CBC + the number of each type of WBC**
Metabolic panel	**BMP (Basic)**	**Sodium (Na), Chloride (Cl), Potassium (K), Bicarbonate (CO_2), BUN, Creatinine, Glucose**
	CMP (Comprehensive)	**BMP + AST, ALT, Albumin, Bilirubin, Alkaline Phosphatase**

34. APLASTIC ANEMIA

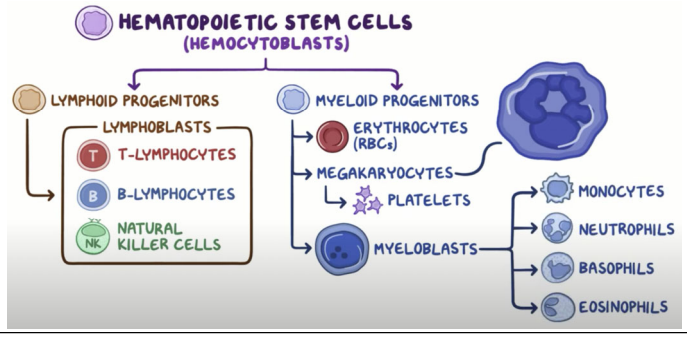
Aplastic anemia	→	Pancytopenia	→	↓RBC anemia	+	↓WBC leukocytopenia	+	↓Platelet thrombocytopenia

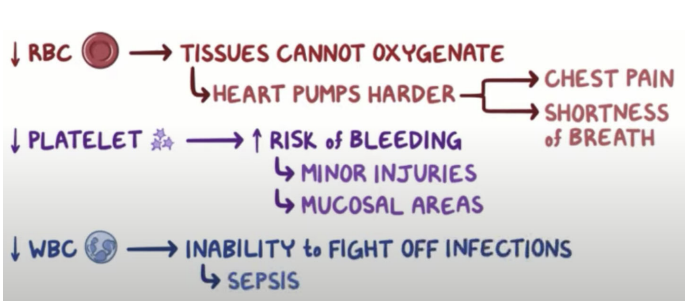
Overview	• Aplastic anemia is a disease in which the body fails to produce blood cells in sufficient numbers. Blood cells are produced in the bone marrow by stem cells that reside there. **Aplastic anemia** causes a deficiency of all blood cell types: red blood cells, white blood cells, and platelets. • The disease is also known as the cause of death of Eleanor Roosevelt and Marie Curie.
Causes	• It is more frequent in people in their teens and twenties but is also common among the elderly. It can be caused by heredity, immune disease, or exposure to chemicals, drugs, or radiation. However, in about one-half of cases, the cause is unknown.

Unidentifiable	Identifiable			
autoimmune	radiation/toxins	drugs	viruses	geneitc disorders

Symptoms	↓RBC	↓WBC	↓Platelet
	fatigue, pallor, chest pain, SOB	recurrent infections	mucosal bleeding, petechiae

Diagnosis	• CBC: ↓RBC, ↓WBC, ↓Platelet, ↓Reticulocyte (young RBC), ↑Erythropoietin (EPO) • The definitive diagnosis is by **bone marrow biopsy**; normal bone marrow has 30–70% blood stem cells, but in aplastic anemia, these cells are mostly gone and replaced by fat.
Treatment	• First-line treatment for aplastic anaemia consists of **immunosuppressive drugs**, typically either anti-lymphocyte globulin or anti-thymocyte globulin, combined with corticosteroids, chemotherapy and cyclosporin. • **Hematopoietic stem cell transplantation** is used, especially for patients under 30-year-old with a related matched marrow donor.





Bone marrow is found in the bones throughout the body. There are two types of bone marrow. Red bone marrow is involved in production of ___ cells, while yellow marrow is important for ___ storage. As one ages, yellow bone marrow replaces red bone marrow.

A. blood, fat
B. fat, blood

Hematopoietic stem cells are the stem cells that give rise to other blood cells. This process is called haematopoiesis. This process occurs in the red bone marrow, in the core of most bones.

Hematopoietic stem cells give rise to different types of blood cells, in lines called myeloid and lymphoid. Myeloid stem cells give rise to which of the following EXCEPT?

A. Neutrophils
B. Eosinophils
C. Lymphocyte
D. Monocytes

Aplastic anemia develops as a result of bone marrow damage. Aplastic anemia causes a deficiency of:

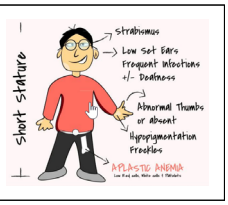
A. RBC only
B. RBC and WBC
C. RBC and Platelet
D. RBC, WBC, Platelet

Aplastic anaemia causes pancytopenia. What is the most common inherited form of aplastic anemia?

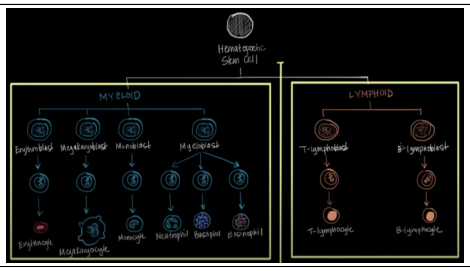
A. Down syndrome
B. Fanconi's anemia
C. Hemolytic anemia
D. Hemophilia

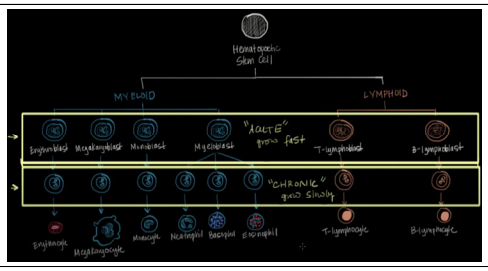
FANCONI's ANEMIA

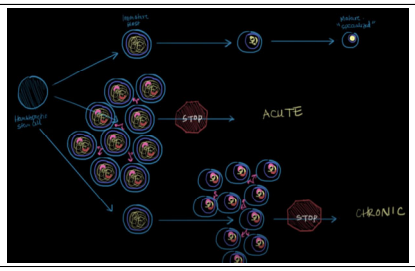
- Fanconi anemia is a rare disease passed down through families (inherited) that mainly affects the bone marrow. It results in decreased production of all types of blood cells. This is the **most common inherited form of aplastic anemia**.
- Fanconi anemia is due to an abnormal gene that damages cells, which keeps them from repairing damaged DNA. To inherit Fanconi anemia, a person must get one copy of the abnormal gene from each parent. The condition is often diagnosed in children between 3 and 14 years old.
- Manifestations: short stature, microcephaly, developmental delay, cafe-au-lait skin lesions, absent or hypoplastic thumb



35. LEUKEMIA



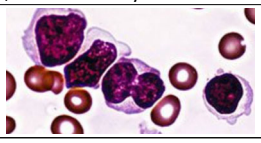
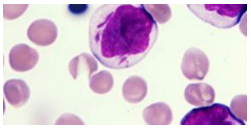
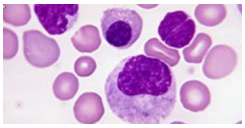
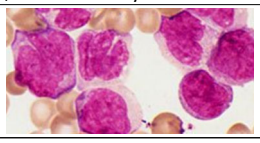




SIGNS & SYMPTOMS

Cancer	↓RBC	↓WBC	↓Platelets
weakness, weight loss, bone pain	fatigue, shortness of breath, pale	↑infections	prolonged bleeding, bruising

FOUR MAIN TYPES OF LEUKEMIA

Acute Lymphocytic Leukemia (ALL)	Acute Myeloid Leukemia (AML)	Chronic Lymphocytic Leukemia (CLL)	Chronic Myeloid Leukemia (CML)
• found in lymphoid cells • grows quickly • common in children (peak age 2-6) • 6,000 cases a year	• found in myeloid cells • grows quickly • common in children and adults • 18,000 cases a year	• found in lymphoid cells • grows slowly • common in adults 55+ • 15,000 cases a year	• found in myeloid cells • grows slowly • common in adults • 6,000 cases a year
			

Which of the following diagnostic methods is used to confirm the diagnosis and identify the specific type of leukemia?

A. Complete blood count
B. Comprehensive metabolic panel
C. Bone marrow biopsy and aspiration
D. X-ray, CT scan, and MRI

Leukemia is a type of cancer that affects the blood and bone marrow. Which one is the most common type of childhood cancer?

A. Acute lymphobalstic leukemia
B. Acute myelogenous leukemia
C. Chronic lymphobalstic leukemia
D. Chronic myelogenous leukemia

Which of the following types of leukemia does NOT belong to acute myeloid leukemia?

A. Acute myeloblastic leukemia
B. Acute lymphoblastic leukemia
C. Acute megakaryoblastic leukemia
D. Acute monoblastic leukemia

The word leukemia comes from the Greek words *leukos* (white) and *haima* (blood). The complete blood count (CBC) usually reveals:

A. ↓RBC
B. ↓WBC
C. ↓Platelt
D. ↓RBC, ↓WBC, ↓Platelet

A 3-year-old patient is brought in by his mother after she noticed petechiae and easy bruising over the past 3 months. She states that the patient has been complaining of bone pain. Laboratory studies exhibit platelet count of 105,000 u/L (normal: 150K - 400K), hemoglobin 9 g/dL (normal: male >13.5, female >12.0), hematocrit 27% (normal: male 41-50%, female 36-48%), and leukocyte count 2,000/mm^3 (normal: 4,000 – 10,000). On physical examination, you note petechiae on the trunk, splenomegaly, pallor and 102°F temperature. Bone marrow biopsy reveals increased blasts of lymphoid lineage. What is the most likely diagnosis?

A. Acute lymphoblastic leukemia
B. Acute myelogenous leukemia
C. Chronic lymphoblastic leukemia
D. Idiopathic thrombocytopenic purpura

Acute lymphoblastic leukemia (ALL) is the most common form of cancer in children. Peak incidence of ALL is between 3-5 years old. Risk factors are immunodeficiency conditions such as neurofibromatosis and Down's syndrome. Common presenting signs/symptoms are increased infections, bleeding, bone pain, non-tender lymphadenopathy, petechiae, and fatigue/pallor due to anemia. Bone invasion causes pancytopenia (↓RBC, ↓WBC, ↓Platelets), and bone marrow biopsy will reveal increased immature cells (blasts) of lymphoid lineage.

- **Case:** A 60-year-old female presents to the clinic complaining of progressively worsening fatigue for the past month. History reveals that she has been otherwise healthy and has never used alcohol or intravenous drugs. Physical examination reveals bilateral cervical and axillary lymphadenopathy. Peripheral smear demonstrates smudge cells (looks like mature B-cell but fragile). → **CLL**
- **Case:** A patient with 30s, bone marrow biopsy exhibit blast of myeloid lineage, auer rods on blood smear. → **AML**
- **Case:** A patient with 50s, demonstrating presence of the Philadelphia chromosome or the BCR-ABL fusion gene. → **CML**

36. LEUKOPENIA & AGRANULOCYTOSIS

Leukopenia	**LEUKO** (white) + **PENIA** (deficiency) • **Leukopenia** is a decrease in the number of leukocytes. They are the body's primary defense against infection. Thus the condition of leukopenia places individuals at **↑risk of infection**. • **Neutropenia**, a subtype of leukopenia, refers to a decrease in the number of circulating neutrophil granulocytes, **the most abundant** WBC. The terms **leukopenia** and **neutropenia** may occasionally be used interchangeably, as the neutrophil count is the most important indicator of infection risk.
Agranulocytosis	**A** (no) + **GRANULOCYT** (granulocyte) + **OSIS** (diseased state) • Agranulocytosis, aka agranulosis or **granulopenia**, is an acute condition involving a **severe and dangerous leukopenia**, most commonly of neutrophils, and thus causing a neutropenia in the blood. It is a severe lack of one major class of infection-fighting WBC. People with this condition are at **very high risk of serious infections** due to their suppressed immune system. • In agranulocytosis, the concentration of granulocytes (a major class of WBC that includes neutrophils, basophils, and eosinophils) drops below 200 cells/mm³ of blood.

_____ is an elevation in the absolute WBC count (>11,000 cells/μL). _____ is a reduction in the WBC count (<3500 cells/μL).

A. Leukocytosis / Leukopenia
B. Leukopenia / Leukocytosis
C. Thrombocytosis / Thrombocythemia
D. Thrombocythemia / Thrombocytosis

Neutropenia	Lymphopenia	Eosinopenia
Sepsis, postinfection, drugs (including chemotherapy), aplastic anemia, SLE, radiation	HIV, DiGeorge syndrome, SCID, SLE, corticosteroids, radiation, sepsis, postoperative	Cushing syndrome, corticosteroids

Which of the following terms describes an acute condition involving a severe and dangerous leukopenia, most commonly of neutrophils?

A. Leukocytosis
B. Agranulocytosis
B. Neutrophilia
D. Granulocytosis

Leukopenia is an umbrella term that refers to a reduction in any of the white blood cell types. _____ is the most common type and can be used interchangeably with leukopenia.

A. Lymphopenia
B. Neutropenia
C. Eosinopenia
D. Monocytopenia

Neutropenia	• An absolute neutrophil count (ANC) < 1500/mm³, where ANC = (WBC count) × (% bands + % segmented neutrophils) • Patients are at ↑risk of infection, with the risk varying inversely with neutrophil count.
Acute Neutropenia	• Associated with Staph aureus, Pseudomonas, E coli, Proteus, and Klebsiella sepsis
Chronic Neutropenia	• Associated with autoimmune disorders. Presents with recurrent sinusitis, stomatitis, gingivitis, and perirectal infections rather than sepsis. Some chronic neutropenias are accompnaied by splenomegaly (eg, Felty's syndrome, Gaucher's disease, sarcoidosis)

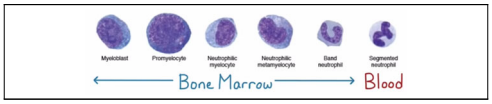
Leukocytosis is a condition in which the WBC is above the normal range in the blood. What is the most common form of leukocytosis?

A. Basophilia
B. Monocytosis
C. Neutrophilia
D. Lymphocytosis

A "_____ shift" is a phrase used to note that there are a high number of young, immature WBCs present. Most commonly, this means that there is an infection or inflammation present and the bone marrow is producing more WBCs before they are fully mature.

A. Left
B. Right

Left shift ←--- inflammation



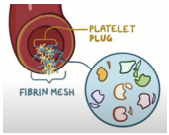
---→ bone marrow suppression **Right shift**

Corticosteroids have a profound effect on the concentration of peripheral blood leukocytes. Which of the following leukocyte counts increases in response to corticosteroid administration?

A. Lymphocyte
B. Monocyte
C. Basophil
D. Neutrophil

Glucocorticoids (e.g., dexamethasone, methylprednisolone, prednisone) are known to ↑WBC count upon their initiation. The ↑WBC count is primarily contributed from neutrophils (polymorphonuclear leukocytes; PMN). ↓Lymphocyte, ↓monocyte, and ↓basophil counts in response to corticosteroid administration, while ↑neutrophil counts. The peak effects are seen within 4-6 hours after a dose of corticosteroid.

37. THROMBOCYTOPENIC PURPURA

Hemostasis (2 steps)		Primary hemostasis	Secondary hemostasis ("coagulation")
		Platelet plugs (Mediated by GPIIb/IIIa)	Clotting factors convert Fibrinogen → **Fibrin clot**

Thrombocytopenia (clinically)	**Normal Thrombocyte**	**Thrombocytosis** (clinically)
Platelet < 50,000	150,000 – 400,000 per microliter	Platelet > 750,000

Causes of Thrombocytopenia		
↓Production	**↑Destruction**	**Splenic sequestration**
• Aplastic anemia • Hematologic malignancies • Infections (HIV, measles) • Vitamin B12 and Folic acid deficiency • Drugs (valproate, methotrexate, chemo, etc)	• Immune thrombocytopenic purpura (ITP) • Thrombotic thrombocytopenic purpura (TTP) • Hemolytic uremic syndrome (HUS) • Disseminated intravascular coagulation (DIC) • Heparin-induced thrombocytopenia (HIT)	• Hypersplenism • Splenomegaly (ie, portal hypertension)

IMMUNE THROMBOCYTOPENIC PURPURA (ITP)

ITP

- **Immune thrombocytopenic purpura**, aka **Idiopathic thrombocytopenic purpura**
- ITP have autoantibodies against the platelet glycoprotein (GP) IIb/IIIa complex.
- Spleen → IgG antibodies → against platelet receptor (GPIIb/IIIa)

Acute vs. Chronic

Acute (children 2-6yo)	Chronic ITP (Adult 20-40yo, female>male)
• A couple of weeks after viral infection • Resolves spontaneously within 2 months	• Primary: no underlying trigger • Secondary: triggered by Hep C, HIV, Lupus

Symptoms

- Mostly asymptomatic
- **Some cases:** purpura (red/purple spots, 0.3-1cm diameter)
- **Severe cases:** frequent mucosal bleeding (epistaxis, gingival bleeding, GI bleeding, menorrhagia)

Diagnosis

- Diagnosis of exclusion: no test to confirms it
- **CBC:** normal RBC, normal WBC, normal PT/PTT, ↓platelet → isolated thrombocytopenia
- abdominal ultrasound: rule out splenomegaly
- hepatitis C, HIV testing: rule out secondary ITP

Treatment

Primary ITP			Secondary ITP
> 30,000 / asymptomatic	< 30,000 / active bleed	< 10,000	Treat underlying condition
• observed • often recover on own	• corticosteroids • IVIG	• transfusing platelets	

A 6-year-old male with his mother presents to the emergency room with a 2-hour history of bleeding gums. He denies trauma and states that he was having flu-like symptoms last week. On physical examination, petechiae is noted on the trunk. Laboratory studies reveal the following: normal PT/PTT, hemoglobin 14 gm/dL (normal: male >13.5, female >12.0), platelets 12,000/mm^3 (normal: 150K - 400K). There is no platelet clumping on peripheral smear. What is the most likely diagnosis?

A. Hemolytic uremic syndrome (HUS)
B. Idiopathic thrombocytopenic purpura (ITP)
C. Thrombotic thrombocytopenic purpura (TTP)
D. Disseminated intravascular coagulation (DIC)

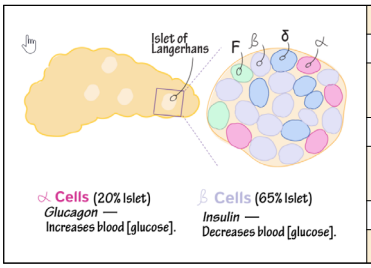
- ITP has an **isolated thrombocytopenia**. The diagnosis of ITP requires two components: Isolated thrombocytopenia and no external factors such as drugs causing the thrombocytopenia. ITP is presumed to be caused by the combination of ↑platelet destruction along with ↓platelet production. **Petechiae**, **purpura**, **easy bruising**, and **gingival bleeding** are common initial complaints. In **children**, it is usually associated with a preceding infection and lasts under a year, whereas in **adults** it is a chronic condition. Peripheral smear will be normal. Treatment consists of corticosteroids and IV immune globulin.
- **HUS:** thrombocytopenia + acute renal failure + microangiopathic hemolytic anemia / affects children with E.coli O157:H7 infection
- **TTP:** HUS + fever, neurological symptoms / affects adults unlike HUS, due to inhibition of the enzyme ADAMTS13 (a protease that cleaves vWF)
- **DIC:** prolonged PT and PTT / unlike HUS and TTP, DIC is associated with activation of the coagulation cascade

THROMBOTIC THROMBOCYTOPENIC PURPURA (TTP)

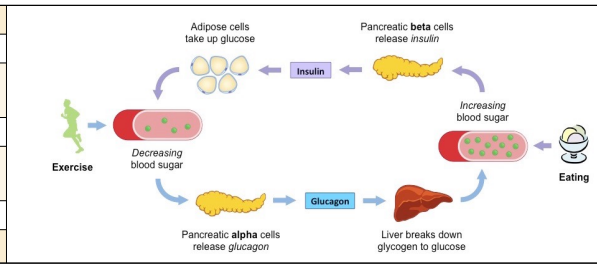
- **Case:** A 45-year-old male presents to the emergency room with a 3-day history of confusion and jaundice. On physical examination, temperature is 102.4°F. The sclera reveal jaundice, the gums are actively bleeding, and petechiae is noted on the trunk. Blood studies reveal the following: normal PT and PTT, hemoglobin 9 gm/dL (↓), platelets 12,000/mm^3 (↓), BUN 50 mg/dL (↑), creatinine 3.5 mg/dL (↑). Peripheral blood smear shows schistocytes. A positive ADAMTS13 antibody is detected.
- **Signs and Symptoms:** TTP causes fever, microangiopathic anemia, thrombocytopenia, neurological signs (delirium, seizure, stroke) and acute renal failure. Microangiopathic anemia is associated with increased LDH, hyperbilirubinemia (primarily indirect), and schistocytes.
- **Diagnosis:** Antibodies against ADAMTS13 (the enzyme which responsible for preventing excessive platelet aggregation) are characteristic of TTP.
- **Treatment:** The first line therapy for TTP is plasma exchange.

ENDOCRINE DISEASES

	Disease	Definition
34	**Diabetes mellitus**	a metabolic disease that causes high blood glucose
35	**Hyperthyroidism**	a condition involving an overproduction of thyroid hormones



Low blood glucose	High blood glucose
↓	↓
Glucagon released by α-cells of pancreas	Insulin released by β-cells of pancreas
↓	↓
Liver breaks down glycogen to glucose	Adipose cells take up glucose from blood
↓	↓
Achieve normal blood glucose levels	



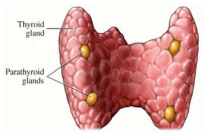
The pancreas is a glandular organ in the upper abdomen, but really it serves as two glands in one: a digestive exocrine gland and a hormone-producing endocrine gland. Which of the following belongs to the endocrine portion of the pancreas?

A. Duct cells
B. Acinar cells
C. Pancreatic duct
D. Islets of Langerhans

- The islets of Langerhans (a.k.a. Pancreatic islets) are small islands of endocrine tissue scatterd throughout the pancreas. The hormones made by the endocrine cells in the islets of Langerhans are released into the blood stream.

Two antagonistic hormones are responsible for regulating blood glucose concentrations. _____ is released from beta (β) cells of the pancreas and cause a ↓blood glucose. _____ is released from alpha (α) cells of the pancreas and cause an ↑blood glucose.

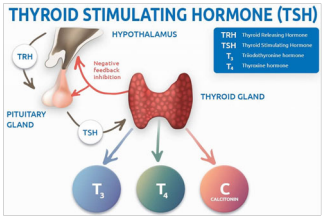
A. Insulin, Glucagon
B. Glucagon, Insulin

Thyroid		Parathyroid
There is only one thyroid gland		There are four parathyroid glands
A butterfly-shaped gland		A rice grain-sized gland
Produce T3 (triiodothyronine) and T4 (thyroxine)		Produce PTH (parathyroid hormone)
Regulate the rate of metabolism in the body		Regulate the calcium level in the blood

_____ produces hormones that regulate the metabolism of the body whereas _____ produces hormones that control the calcium ion levels in the blood.

A. Parathyroid, Thyroid
B. Thyroid, Parathyroid

The thyroid makes 2 main hormones – triiodothyronine (T3) and thyroxine (T4). Adequate amounts of iodine are needed for the thyroid to be able to make these hormones. Another hormone that's produced in the thyroid gland is called _____.



A. Thyroid releasing hormone (TRH)
B. Thyroid stimulating hormone (TSH)
C. Calcitonin
D. Parathyroid hormone (PTH)

Hypothalamus	⇨	Anterior pituitary	⇨	Thyroid gland
TRH (thyroid releasing hormone)		TSH (thyroid stimulating hormone)		T3, T4

Parathyroid hormone works in concert with Calcitonin to maintain blood calcium levels. Parathyroid hormone acts to _____ blood calcium levels, while calcitonin acts to _____ blood calcium levels.

A. decrease, increase
B. increase, decrease

Calcitonin (produced by thyroid)	Parathyroid hormone (produced by parathyroid)
↓ blood calcium level	↑ blood calcium level

Physiological processes are commonly moderated via two distinct feedback mechanisms - positive and negative feedback. Which one of the following belongs to "positive feedback"?

A. Thermoregulation
B. Blood sugar regulation
C. Thyroid hormone regulation
D. Childbirth

- **Childbirth:** Stretch receptors activated in uterus → Oxytocin causes uterine muscles to contract → Contractions get stronger until baby is delivered
- **Positive feedback mechanisms:** childbirth, lactation, ovulation, blood clotting

38. DIABETES MELLITUS

Type I DM (Insulin Dependent DM) - 10%	Type II DM (Non Insulin Dependent DM) - 90%
Usually occurs during childhood (early onset)	Usually occurs during adulthood (late onset)
Body does not produce sufficient insulin	Body does not respond to insulin production
Caused by the destruction of β-cells (autoimmune)	Caused by the down-regulation of insulin receptors
Requires insulin injections to regulate blood glucose	Controlled by managing diet and lifestyle

Type 1 and type 2 diabetes both occur when the body cannot properly store and use glucose, which is essential for energy. _____ diabetes is due to autoimmune pancreatic beta-cell destruction; _____ diabetes is due to insulin resistance in peripheral tissues.

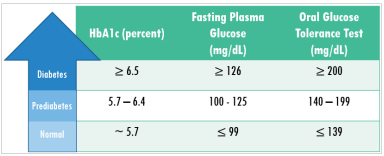
A. Type 1, Type 2 B. Type 2, Type 1

Polyurea	Polydipsia	Polyphagia
kidney' effort to remove the glucose	Losing fluids → brain tells body to drink more	due to lack of glucose in the cells

A 40-year-old overweight patient with no past medical history presents for a health maintenance exam. His fasting plasma glucose is 122 mg/dl, and repeat testing the following week reveals fasting plasma glucose of 113 mg/dl. The most appropriate next step is:

A. Recommend weight loss and exercise B. Reassurance

C. Start the patient on metformin D. Give an insulin injection



	HbA1c (percent)	Fasting Plasma Glucose (mg/dL)	Oral Glucose Tolerance Test (mg/dL)
Diabetes	≥ 6.5	≥ 126	≥ 200
Prediabetes	5.7 – 6.4	100 - 125	140 – 199
Normal	~ 5.7	≤ 99	≤ 139

- Impaired fasting glucose, or pre-diabetes, is defined as two tests revealing a fasting glucose level of 100-125 mg/dl. These patients are at higher risk of cardiovascular disease and diabetes. Weight loss and exercise are the initial recommendation for these patients.

Hemoglobin A1c, also called A1c or glycated hemoglobin, is hemoglobin with glucose attached. The A1c test evaluates the average amount of glucose in the blood over the last 3 months by measuring the percentage of glycated hemoglobin in the blood. A hemoglobin A1C level of _____ or more indicates diabetes.

A. 5.7% B. 6.5% C. 7% D. 10%

A 22-year-old female is brought to the emergency room because she was found by her roommate lying face down in her bedroom. At that time, she was difficult to arouse and appeared very lethargic and confused. Her roommate states that the patient has been losing weight and has been excessively tired. Physical examination reveals HR 123 bpm, BP 115/54 mmHg, and RR 23 bpm. She has fruity-odor breath, dry mucous membranes, and is arousable to painful stimuli. Laboratory results are significant for sodium of 134 mEq/L, potassium of 5.8 mEq/L, chloride of 97 mEq/L, bicarbonate of 19.2 mEq/L, and glucose of 601 mg/dL. A urinalysis is significant for glucose and ketones. A urine drug screen is negative. The most likely diagnosis is:

Precipitating Stressor:

Infection [30-50%]
- UTI
- PNA

Major vascular event:
- MI
- CVA
- PE

Insufficient insulin

Drugs
- Corticosteroids
- HCTZ
- Anti-psychotics

A. Prediabetes B. Type II diabetes mellitus

C. Hyperosmolar hyperglycemic syndrome (HHS) D. Diabetic ketoacidosis (DKA)

- Diabetic ketoacidosis (DKA) is diagnosed by a glucose >250 mg/dL, a pH <7.3, ↑serum ketones, and a bicarbonate <18 mEq/L. Patients often present with nausea, vomiting, abdominal pain, and excessive fatigue, and they appear extremely dehydrated. DKA is a life-threatening condition generally seen in type I diabetics, and initial management with **normal saline fluid replacement** should be the mainstay of treatment.

Diabetic Ketoacidosis (DKA)	Hyperglycemic Hyperosmolar State (HHS)
Absolute insulin deficiency resulting in: severe hyperglycemia (250-600 mg/dL), ketone body production, systemic acidosis	Severe relative insulin deficiency, resulting in: profound hyperglycemia (600-1200 mg/dL) and hyperosmolality, no significant ketone/acidosis
fruity-scented breath, Kussmaul breathing	↓consciousness, seizure
Develops over hours to days	Develops over days to weeks
Typically present in **type 1 DM**	Typically present in **type 2 DM**

Which of the following medication has been used since the 1950s as a first-line pharmacotherapy to treat patients with type 2 DM?

A. Insulin injection B. Sulphonylureas

C. Metformin D. Acarbose

- **Metformin** is the first line drug for the treatment of DM type II. If patients' hemoglobin A1C is between 7-8.5%, a sulfonylurea is added to the regimen. If over 8.5%, insulin is added instead.
- **Complications of DM (microvascular/nervous):** damage to eyes (retinopathy) → blindness / damage to kidneys (nephropathy) → renal failure / damage to nerves (neuropathy) → impotence and diabetic foot disorders.

Which of the following types of diabetes is manifested with fluid imbalance due to insufficient ADH production by the pituitary gland?

A. Diabetes mellitus B. Diabetes insipidus

B. Type 1 Diabetes D. Type 2 Diabetes

Diabetes mellitus (sugar diabetes) → Polyuria + Polydipsia + Polyphagia	**Diabetes insipidus** (water diabetes) → Polyuria + Polydipsia
↓insulin ⇨ excessive levels of the glucose in the blood	↓ADH ⇨ large amount of severely dilute urine

39. HYPERTHYROIDISM

Hyperthyroidism	Hypothyroidism
↑metabolism	↓metabolism
heat, tachycardia, weight loss, hyperreflexia	cold, bradycardia, weight gain, hyporeflexia
low TSH, high T3,T4 / antibody to TSH (Graves)	high TSH, low T3,T4 / antibody to TPO (Hashimoto)
Autoimmune form: Graves' disease	Autoimmune form: Hashimoto's thyroditis
Severe form: Thyrotoxic storm	Severe form: Myxedema coma

A 32-year-old female presents to the office complaining of difficulty sleeping, shortness of breath, and weight loss for 4 weeks. While obtaining a history, you note rapid speech. Physical exam reveals tachycardia, tremor, systolic hypertension, and pretibial myxedema. The most likely findings on laboratory results are:

A. ↑TSH, ↑T4, ↑T3
B. ↑TSH, ↓T4, ↓T3
C. ↓TSH, ↑T4, ↑T3
D. ↓TSH, ↓T4, ↓T3

	Hyperthyroidism	Hypothyroidism
TSH	↓	↑
T4, T3	↑	↓

- This patient most likely has Graves disease. The initial test of choice is TSH level. T4 level may be ordered as well. TSH levels will be decreased, T4 and T3 will be increased. TSH level is the initial diagnostic test of choice for hyperthyroidism.

Hyperthyroidism in _____ is caused by thyroid-stimulating autoantibodies to the TSH receptor, whereas hypothyroidism in _____ is associated with thyroid peroxidase autoantibodies.

A. Graves' disease, Hashimoto's thyroiditis
B. Hashimoto's thyroiditis, Graves' disease

Exophthalmos describes a condition where the eyeball protrudes from the eye socket, making it appear to bulge. It can affect one or both eyes. What is the most common cause of bilateral exophthalmos?

A. Myasthenia gravis
B. Ocular trauma
C. Hashimoto's thyroiditis
D. Graves' disease

- Graves disease occurs more often in women than in men, which may be related to hormonal factors. Graves disease is the most common cause of hyperthyroidism in North America.
- The primary cause of **Exophthalmos** is Graves' disease. **Pretibial myxedema** (thyroid dermopathy) is an infrequent manifestation of autoimmune thyroid disease characterized by localized thickening of the skin commonly seen in the pretibial area. Pretibial myxedema is nearly always associated with Graves' disease.


A 29-year-old female at 9-weeks estimated gestational age presents to the office complaining of shortness of breath, weight loss, and palpitations for 3 weeks. Physical exam is remarkable for tachycardia, tremor, systolic hypertension, and warm skin. What is the most common cause of hyperthyroidism during pregnancy?

A. Hashimoto's thyroiditis
B. Graves' disease
C. Thyroiditis
D. Too much thyroid medicine

- The most common cause of hyperthyroidism during pregnancy is Grave's disease.
- It is treated with propylthiouracil during the first trimester and methimazole on subsequent trimesters.

A 61-year-old female presents complaining of feeling sad. History reveals that she has had frequent crying spells for the past seven months. She reports early morning wakening, a decreased libido, decreased energy, weight gain, decreased concentration, cold intolerance, and a loss of interest in her hobbies. She denies suicidal ideation. Physical examination reveals a flat affect with slowed speech, dry skin, hyporeflexia, and non-pitting pedal edema. The most likely diagnosis is:

A. Dementia
B. Major depression
C. Hyperthyroidism
D. Hypothyroidism

- Hypothyroidism is commonly tested as a medical cause of depression. Clues that hypothyroidism is the underlying medical problem are weight gain, slowed speech, dry skin, hyporeflexia, non-pitting pedal edema, bradycardia, constipation, cold intolerance, and hypothermia.

A 40-year-old patient is diagnosed with hypothyroidism today after presenting with several symptoms. The patient is subsequently started on levothyroxine. The most appropriate re-evaluation includes:

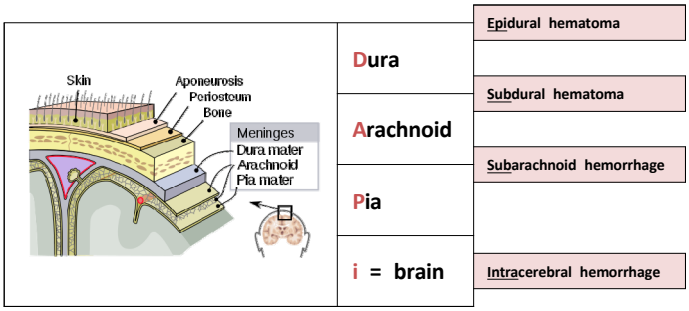
A. thyroid stimulating hormone level in 1 weeks
B. thyroid stimulating hormone level in 2 weeks
C. thyroid stimulating hormone level in 6 weeks
D. observation for symptomatic relief in 2 weeks

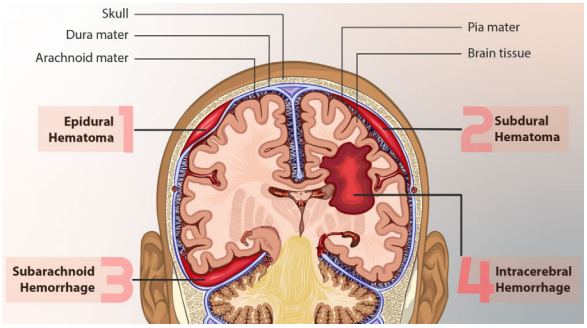
- Levothyroxine, synthetic thyroxine (T4), is the treatment of choice for hypothyroidism. Dosage varies from 50-200 mcg/day. Serum T4 levels will increase and TSH will decrease shortly thereafter. It typically takes 6 weeks to see changes in laboratory values.

NEUROLOGICAL DISEASES

	Disease	Definition
40	**Acute cerebrovascular diseases**	a variety of medical conditions that affect the blood vessels of the brain and the cerebral circulation
41	**Epilepsy**	a disorder in which nerve cell activity in the brain is disturbed, causing seizures
42	**Facial paralysis**	an inability to move the muscles of the face on one or both sides
43	**Guillan-Barre syndrome**	a rapid-onset muscle weakness caused by the immune system damaging the peripheral nervous system
44	**Meniere's disease**	a disorder of the inner ear that can lead to vertigo and hearing loss
45	**Neurosis**	a class of functional mental disorders involving chronic distress, but neither delusions or hallucinations
46	**Sciatica**	a pain that radiates along the path of the sciatic nerve
47	**Trigeminal neuralgia**	a chronic pain condition affecting the trigeminal nerve in the face

INTRACRANIAL HEMORRHAGE





The purpose of the meninges is to cover and protect the brain. Bleeding can occur anywhere between these three membranes. What is the correct terminology for the bleeding between the inner layer of the dura mater and the arachnoid mater?

A. Epidural hematoma
B. Subdural hematoma
C. Epiarachnoid hematoma
D. Subarachnoid hemorrhage

Cerebrospinal fluid (CSF) is a clear, colorless body fluid found in the brain and spinal cord. CSF acts as a cushion or buffer, providing basic mechanical and immunological protection to the brain inside the skull. Cerebrospinal fluid is located in the _____.

A. Epidural space
B. Subdural space
C. Subarachnoid space
D. Subpia dapce

- CSF occupies the subarachnoid space and the ventricular system around and inside the brain and spinal cord. It is produced by specialised ependymal cells in the choroid plexuses of the ventricles of the brain, and absorbed in the arachnoid granulations.
- There is about 125 mL of CSF at any one time, and about 500 mL is generated every day.

Intracranial hemorrhage refers to acute bleeding inside the skull or brain. What is the most common type of intracranial hemorrhage that occurs with a stroke and it is not usually the result of injury?

A. Epidural hematoma
B. Subdural hematoma
C. Subarachnoid hemorrhage
D. Intracerebral hemorrhage

- Intracerebral hemorrhage is caused by bleeding within the brain tissue itself — a life-threatening type of stroke. A stroke occurs when the brain is deprived of oxygen and blood supply. Intracerebral hemorrhage is most commonly caused by hypertension, arteriovenous malformations, or head trauma. Treatment focuses on stopping the bleeding, removing the blood clot, and relieving the pressure on the brain.

Ischemic Stroke (87%)			**Hemorrhagic Stroke (13%)**	
Occurs when a blood vessel to the brain is obstructed.			Occurs when a weakened blood vessel ruptures.	
Thrombotic (48%)	**Embolic (26%)**	**Lacunar (13%)**	**Intracerebral (10%)**	**Subarachnoid (3%)**
perfusion failure distal to site of severe stenosis or occlusion of major vessels	due mainly to cardiac source	small infarcts (2-20mm) in the deep cerebral white matter, basal ganglia, or pons	hypertension	ruptured aneurysms and vascular malformations

A hemorrhagic stroke is bleeding that suddenly interferes with the brain's function. Which TWO intracranial hemorrhages are considered as hemorrhagic stroke?

A. Epidural hematoma
B. Subdural hematoma
C. Subarachnoid hemorrhage
D. Intracerebral hemorrhage

40. ACUTE CEREBROVASCULAR DISEASE

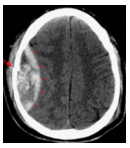
	Epidural hematoma	Subdural hematoma	Subarachnoid hemorrhage
Mechanism	head injury, skull fracture	MVA, fall	rupture of aneurysms, AV malformation
Source	aterial	venous (bridging veins)	predominantly arterial
Shape on CT	lentiform	crescent	tracks along the sulci and fissures
Onset	acute	may be insidious (elderly, alcoholism)	acute
Presentation	lucid interval	worsening headache	worst headache of life

A suspected intracranial hemorrhage would require a computed tomography (CT) of the head:

A. With contrast
B. Without contrast
C. With and without contrast
D. Would not require a CT of the head

- The head CT would usually be done without contrast since both contrast and blood would appear as white (hyperdense) on the scan, making diagnosis more difficult.

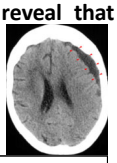
A 17-year-old male was hit on the temple with a baseball and he became unconscious. After about ten minutes, he regained consciousness, but he soon became lethargic, and over the next two hours, he was stuporous. His pupils were unequal. What is the most likely diagnosis?



A. Epidural hematoma
B. Subdural hematoma
C. Subarachnoid hemorrhage
D. Intracerebral hemorrhage

- Epidural hematoma is when bleeding occurs between the tough outer membrane covering the brain (dura mater) and the skull. Often there is loss of consciousness following a head injury, a brief regaining of consciousness, and then loss of consciousness again.
- Almost half of patients with epidural hematoma have a lucid interval, ie, they awaken after initial unconsciousness and then deteriorate neurologically.

A 64-year-old man is brought to the emergency room via ambulance after being found lying on the grass in front of a local fast-food restaurant. He is conscious but is unable to provide further history due to altered mental status and confusion. Prior records reveal that he has presented to the emergency room several times in the past due to alcohol intoxication. Neurologic examination reveals disorientation to place and time, impaired level of consciousness, and left-sided mydriasis. Head CT scan likely shows:



A. Triangle-shaped
B. Biconvex-shaped
C. Lens-shaped
D. Crescent-shaped

- Subdural hematomas are most commonly seen in the elderly and in patients with a history of alcohol use disorder. They are caused by rupture of the bridging veins, usually after blunt head trauma is sustained in a fall.
- Patients present with headache, alteration of mental status, and contralateral weakness depending on the extent of the hemorrhage. Surgical evacuation is necessary only when symptomatic. The CT scan of a subdural hematoma will show a crescent shaped, concave hyperdensity. The patient may have mydriasis (dilation of the pupil) - always on the same side of the hemorrhage.

A 55 year-old female presents to the emergency room with a complaint of headache that started abruptly about 1 hour ago. She has an episode of vomiting in the clinic. In addition, the patient states she has never experienced a headache with such severity before. She denies smoking, illicit drug use, and alcohol. She does not recall any traumatic events.

What is the most likely diagnosis?

A. Subdural Hematoma
B. Epidural hematoma
C. Subarachnoid hemorrhage
D. Temporal arteritis

- A subarachnoid hemorrhage is usually caused by the rupture of an aneurysm. The blood irritates the meninges, causing a severe headache.
- A work-up of subarachnoid hemorrhage is emergent in any patient presenting with a sudden onset of "the worst headache of my life". This is sometimes described as a "thunderclap" headache.

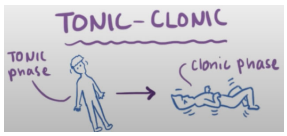
The most appropriate diagnostic test to order is:

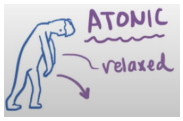
A. CT scan with contrast
B. CT scan without contrast
C. MRI
D. Skull x-ray

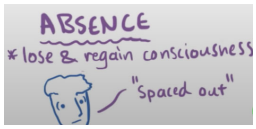
- The work-up of a suspected acute subarachnoid hemorrhage should always include immediate CT scan without contrast. This is a very sensitive diagnostic test (98%) if done within the first 12 hours of symptomatic onset.
- The initial test is a CT scan without contrast. It has come back as negative but the patient's symptoms are unchanged, raising suspicion that the CT may have missed the diagnosis. The next best diagnostic test is a lumbar puncture. It will show a yellowish color due to the breakdown of red blood cells - referred to as xanthochromia.

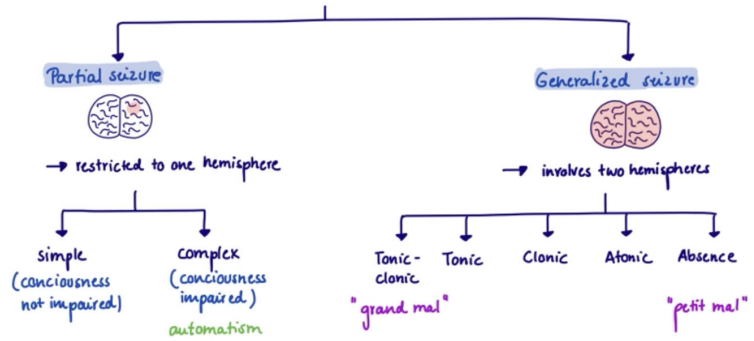
41. EPILEPSY

Seizure	• abnormal electrical discharge in the brain
Epilepsy	• characterized by 2 or more unprovoked seizures









A child is brought to the office by his mother complaining that his teacher reports the child is daydreaming too often. The teacher stated that the child is inattentive and that she has noticed the child blinking constantly and smacking his lips at times. The most likely diagnosis is:

A. Simple partial seizure disorder
B. Complex partial seizure disorder
C. Tonic-clonic seizure disorder
D. Absence seizure disorder

- **Absence seizures** have a characteristic three-per-second spike and wave pattern on EEG. Even if you did not know about this characteristic EEG finding associated with absence seizures, you can rule out the other options. Absence seizures usually start in childhood and the child seems to be daydreaming. It may be associated with rapid eye blinking, lip smacking, or movements of the head. Consciousness is impaired while the patient is having an episode, often described as "depersonalization". Valproic acid may be used for absence, myoclonic, and generalized tonic-clonic seizures. The other drug that may be used is ethosuximide, which is used only for absence seizures.
- **Simple partial seizure disorder** is incorrect because impaired consciousness is not associated with this type of seizure.
- **Complex partial seizure disorder** causes impaired level of consciousness, involuntary movements and postictal confusion. Because the majority of these occur in the temporal lobe, olfactory, auditory and visual hallucinations are commonly reported.
- **Tonic-clonic seizure disorder** will also manifest with impaired consciousness along with a tonic phase (patient becomes rigid and appears cyanotic) followed by a clonic phase (repetitive movements) followed by a postictal phase (confusion). These patients usually lose continence and have signs of biting their tongue.

A young patient is brought to clinic by her husband after falling to the floor. What information should you elicit from the patient's husband to help determine if the patient experienced an episode of syncope versus a tonic-clonic seizure?

A. Whether the patient maintained consciousness
B. Whether the patient experienced diaphoresis
C. Whether the patient lost bladder control
D. Whether the patient experienced any type of movements when she fell

- Patients who experience a tonic-clonic seizure (a.k.a. grand mal seizure) will usually lose bladder control, while patients with a syncopal episode usually maintain bladder control.

A 7-year-old female with cerebral palsy presents to the emergency room following a seizure. Her mother states that the patient began having seizures 35 minutes ago. Her mother administered a diazepam suppository but she continues to seize. Initial assessment reveals a secure airway with bilateral breath sounds. Six minutes after infusing lorazepam, she continues to seize. The most likely diagnosis is:

A. Status epilepticus
B. Tonic-clonic seizure disorder
C. Absence seizure disorder
D. Complex partial seizure disorder

- Status epilepticus (seizures lasting greater than 30 minutes) can result in death if untreated. It is important to address the ABCs (airway, breathing, circulation) first and foremost. Suctioning of copious secretions may be necessary. Oxygen therapy should be administered. Glucose administration should be considered to treat possible hypoglycemia.
- Treatment for status epilepticus should begin with benzodiazepines and progress in order if subsequent steps fail to stop the seizure. Remember this sequence: benzodiazepines → fosphenytoin → barbiturates → intubation (with propofol sedation).

A 19-year-old female presents with new-onset seizures. History reveals that she had not slept two nights prior and had an episode of convulsions followed by confusion on the following day. She denies any headache and fever. Diagnostic studies reveal normal brain parenchyma without mass or lesion. The most appropriate next step in this patient's management is:

A. Psychiatry consultation
B. Observation with follow up
C. Lumbar puncture
D. Valproic acid

- First time seizures do not usually require anticonvulsant therapy. The initial workup should include brain imaging (CT or MRI) and an EEG, but therapy should be instituted for a second seizure.
- You should note that if a patient with a first time seizure is high risk (presents in status epilepticus or presents after more than one seizure) antiepileptic medications should be started. If a patient on antiepileptics is without a seizure for two years, a medication wean can be attempted.

42. FACIAL PARALYSIS

Overview	• Facial paralysis is a loss of facial movement due to nerve damage. Your facial muscles may appear to droop or become weak. It can happen on one or both sides of the face. Common causes of facial paralysis include: infection or inflammation of the facial nerve, head trauma, head/neck tumor, or stroke. • Facial paralysis can come on suddenly (in the case of Bell's palsy, for example) or happen gradually over a period of months (in the case of a head or neck tumor). Depending on the cause, the paralysis might last for a short or extended period of time.
Bell's palsy	• According to the National Institute of Neurological Disorders and Stroke, Bell's palsy is the most common cause of facial paralysis. Every year, around 40,000 Americans experience sudden facial paralysis due to Bell's palsy. This condition causes inflammation of the facial nerve, which commonly causes the muscles on one side of the face to droop. • No one knows exactly why Bell's palsy occurs. It may be related to a viral infection of the facial nerve. The good news is that most people with Bell's palsy recover completely in about six months.
Stroke	• A more serious cause of facial paralysis is stroke. Facial paralysis occurs during a stroke when nerves that control the muscles in the face are damaged in the brain. • Depending on the type of stroke, damage to the brain cells is caused by either lack of oxygen or excess pressure on the brain cells caused by bleeding. Brain cells can be killed within minutes in each case.
Other causes	• Other causes of facial paralysis or weakness include: skull fracture or injury to the face, head or neck tumor, middle ear infection or other ear damage, Lyme disease (a bacterial disease transmitted to humans by a tick bite), Ramsay-Hunt Syndrome (a viral reactivation that affects the facial nerve), autoimmune diseases (MS which affects the CNS and GBS which affects the PNS). • Birth can cause temporary facial paralysis in some babies. However, 90 percent of babies with this type of injury recover completely without treatment. You can also have facial paralysis at birth due to certain congenital syndromes, such as Mobius syndrome and Melkersson-Rosenthal syndrome.

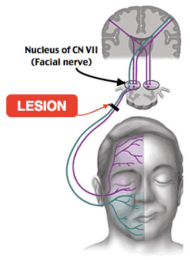
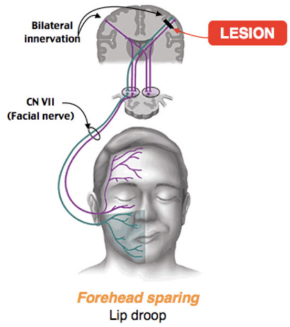
Which of the following disorders is called idiopathic facial paralysis and is the most common cause of unilateral facial paralysis?

A. Head trauma
B. Bell's palsy
C. Stroke
D. Brain tumor

- It has the **following features:** acute onset of unilateral upper AND lower facial paralysis / flattening of the forehead and inability to raise eyebrows on affected side / hyperacusis / changes in taste / impaired eyelid closure.
- The above symptoms are thought to occur as a result of the injury, swelling, and/or ischemia of the facial nerve (CN VII) as a result of compression as it passes through the facial canal. While the exact cause is unknown, it appears that viral infection (herpes virus) is associated.

Bell's palsy is an unexplained episode of facial muscle weakness or paralysis. It begins suddenly and worsens over 48 hours. This condition results from damage to the _____.

A. Cranial nerve IV
B. Cranial nerve V
C. Cranial nerve VI
D. Cranial nerve VII

Bell's palsy → Peripheral lesion (Lower motor neuron lesion)	Stroke → Central lesion (Upper motor neuron lesion)	Bell's palsy vs. Stroke
		• **Bell's Palsy** is a peripheral nerve effect whereas a **ischemic stroke** is a central process. As shown in the diagram, the forehead receives motor innervation from both hemispheres of the cerebral cortex. • A **stroke** that compromised motor innervation of the face would therefore only result in paralysis of the lower half of the face - the forehead still receiving innervation from the unaffected hemisphere. • A peripheral lesion, such as **Bell's Palsy**, interrupts the innervation after the motor commands from both hemispheres have joined, so that the forehead is paralyzed.

The two most common causes of acute facial paralysis are Bell's palsy and ischemic stroke. Which one is peripheral facial palsy?

A. Bell's palsy
B. Stroke
C. Both
D. Both are central facial palsy

- The cranial nerves are considered components of the peripheral nervous system (PNS). Cranial nerves I and II are part of the CNS, and the rest are considered part of the PNS.

Both a stroke and Bell's Palsy can cause patients to have partial facial paralysis, which is why one is occasionally mistaken for the other. A stroke results in:

A. Ipsilateral lower facial paralysis
B. Ipsilateral upper and lower facial paralysis
C. Contralateral lower facial paralysis
D. Contralateral upper and lower facial paralysis

43. GUILLAIN-BARRE SYNDROME

- Guillain–Barré syndrome (GBS) is a rapid-onset muscle weakness caused by the immune system damaging the peripheral nervous system.
- The initial symptoms are typically changes in sensation or pain often in the back along with muscle weakness, beginning in the feet and hands, often spreading to the arms and upper body, with both sides being involved.

ALS	Asymmetric muscle weakness and atrophy
Botulism	Generalized limb weakness
Guillain-Barré syndrome	Ascending limb weakness
Inflamm. muscle disorders	Proximal symmetric limb weakness
Lambert-Eaton syndrome	Proximal symmetric limb weakness
Multiple sclerosis	Bilateral internuclear ophthalmoplegia

Guillain-Barre syndrome is a rare disorder in which the body's immune system attacks the nerves. Guillain-Barre syndrome is characterized by:

A. Ascending paralysis
B. Descending paralysis

A patient receives an influenza vaccination and returns 2 weeks later complaining of parasthesias and weakness in the lower extremities that have been progressively moving cephalad. Physical examination reveals tachycardia and absent Achilles and patellar deep tendon reflexes. What is the most likely diagnosis?

A. Myasthenia gravis
B. Guillain-Barre syndrome
C. Stroke
D. Multiple sclerosis

- Guillain-Barre syndrome is characterized by ascending paralysis and parasthesias along with depressed deep tendon reflexes, facial weakness, and dysautonomia. Diagnosis is confirmed with lumbar puncture revealing elevated CSF protein and normal WBC count (albuminocytologic dissociation), electromyography, and nerve conduction tests. While rare today, Guillain-Barre syndrome has been associated with influenza vaccination and is a test favorite. Treatment of choice for GBS is plasmapheresis or IVIG
- GBS vs. MS

Guillain-Barre syndrome	Multiple sclerosis
autoimmune diseases →	damage myelin sheath
affects the peripheral nerve system	affects the central nerve system

A 27-year-old female presents with paresthesias and slight muscle weakness that started in the lower extremities. It is progressively ascending to her upper extremities and face. The patient is afebrile and areflexic. Which of the following is the most common preceding infection?

A. Campylobacter jejuni
B. Haemophilus influenzae
C. Varicella-zoster virus
D. Cytomegalovirus

- Progressive, ascending neuropathy is the hallmark of Guillain-Barre syndrome. Backpain, difficulty chewing and speaking are often present. Patients with intact deep tendon reflexes should be re-evaluated for something other than GBS. The progression of weakness usually lasts less than 4 weeks followed by stabilization and improvement of the weakness. GBS is commonly preceded by infection of the respiratory or GI tract. All of the answer choices (Haemophilus influenzae, Varicella-zoster virus, Cytomegalovirus, and Mycoplasma pneumoniae) may lead to GBS, but the most common preceding infection leading to GBS is Campylobacter jejuni. Spinal tap will reveal increased CSF protein.
- Campylobacter jejuni is the most common infection leading to Guillain-Barre syndrome.

Which of the following can trigger Guillain–Barré syndrome (GBS)?

A. Respiratory viral infection
B. Gastrointestinal bacterial/viral infection
C. Vaccinations
D. All of the above

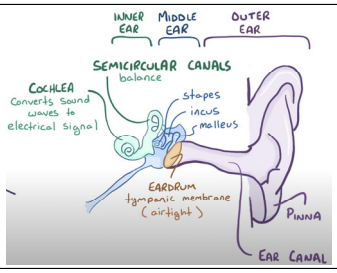
- GBS is believed to be caused by Campylobacter jejuni or a viral attack on the myelin and Schwann cells. Initial symptoms will include weakness and tingling sensation in the legs and can progress to almost total paralysis.

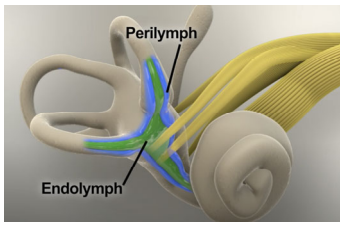
Guillain–Barré syndrome (GBS) may be treated with all of the following EXCEPT:

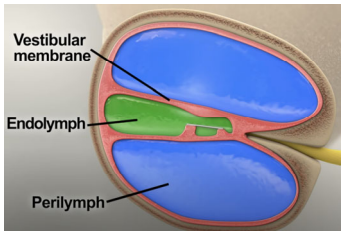
A. Rehabilitation
B. Plasmapheresis
C. Steroids
D. IV immunoglobulins (IVIgs)

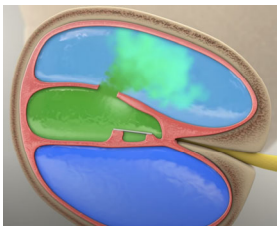
- Steroids have not proven to be an effective treatment for GBS. IVIg is usually started fi rst owing to the ease of administration and safety profile. Plasmapheresis hastens recovery when used in the first 4 weeks of symptom onset. Rehabilitation usually follows the acute phase treatment modalities.

44. MENIERE'S DISEASE









Overview	• The cause of Meniere's disease is unknown. Symptoms of Meniere's disease appear to be the result of an abnormal amount of fluid (endolymph) in the inner ear.
History	• Presents with recurrent episodes of severe **vertigo**, **hearing loss**, **tinnitus**, or **ear fullness**, often lasting hours to clays. **Nausea** and **vomiting** are typical. Patients progressively lose low-frequency hearing over years and may become deaf on the affected side.
Diagnosis	• The diagnosis is made clinically and is based on a thorough history and physical. **Two episodes** lasting >20 minutes remission of symptoms between episodes, hearing loss documented at least once with audiometry, and tinnitus or aural fullness are needed to make the diagnosis once other causes (eg, TIA, otosyphilis) have been ruled out.
Treatment	• Classically, a low-sodium diet and diuretic therapy were first-line treatments. As theories of pathogenesis have shifted, many clinicians have begun to treat patients with "migraine diets," lifestyle changes, prophylactic antimigraine medications, and occasionally benzodiazepines or antiemetics. • For severe unilateral cases, ablative therapies (eg, intratympanic gentamicin to ablate the labyrinth, vestibular nerve section) have been used with some success.

A female patient presents to clinic complaining of sensation of movement when she is in fact standing still. History reveals that when this happens, she also hears ringing in her ear and hearing loss. This has occured over ten times over the past three years. The most likely diagnosis is:

A. Acute labyrinthitis
B. Otitis media
C. Benign positional paroxysmal vertigo
D. Acoustic neuroma
E. Meniere's disease

- This patient presents with the **classic triad** associated with **Meniere's disease**: **vertigo + tinnitus + hearing loss**. Patients may also complain of a sensation of fullness in their ear. Nausea/vomiting, profuse diaphoresis, and nystagmus may be present in addition to the classic triad. While the hearing loss will eventually become permanent, there are treatments to reduce symptoms of Meniere's disease. The diagnosis is made clinically. Patients must have experienced two episodes to meet diagnostic criteria. Antihistamines, anticholinergics, a low sodium diet, and diuretics may lower endolymphatic pressure by reducing the amount of endolymphatic fluid to reduce the disease process. Treat dizziness and nausea/vomiting with sedatives, benzodiazepines, and anti-emetics.
- **Acute labyrinthitis** is often preceded by an upper respiratory tract infection and occurs in epidemics.
- **Otitis media** will not have the symptoms this patient presents with.
- **Benign positional paroxysmal vertigo** presents with short periods of vertigo in specific positions.
- **Acoustic neuroma** is a tumor of cranial nerve 8 also called a vestibular schwannoma. It also presents with vertigo, tinnitus, hearing loss and fullness in the ear. Due to the tumor's growth, patients will often have involvement of cranial nerve 5 and 7. It is associated with Neurofibromatosis Type I (unilateral) and II (bilateral).

A 54-year-old man comes to the physician because of ringing in his ears, a feeling of spinning, and a progressive loss of hearing in his left ear. He says that this all began a while ago with a slight feeling of unsteadiness and this annoying ringing. He never came to the doctor because he thought he was "going crazy", but now his wife is getting worried that the television needs to be much louder and he constantly says "what?" when she speaks to him on his left side. He has no chronic medical conditions, does not take any medications, and does not drink alcohol. Examination shows nystagmus, but no other abnormalities. Which of the following is the most likely diagnosis?

A. Benign positional vertigo
B. Toxic labyrinthitis
C. Meniere disease
D. Vestibular neuronitis

Benign	Paroxysmal	Positional	Vertigo
otolith (not a tumor)	sudden, temporary episodes lasting < 1 minute	triggered by turning in bed or reaching overhead	vertigo or dizziness is the main symptom

A 71-year-old man with mild hypertension and high cholesterol comes to the office complaining of 2 weeks of intermittent vertigo with each episode lasting about 2-4 hours. He also reports hearing a low frequency buzzing, which is constnant but waxes and wanes in intensity. He tells you that over this time he has been having trouble hearing while in noisy areas such as in resturants or temple gatherings. Physical examination is normal. Vertigo is not exaverbated by changes in head position. The most appropriate management of this patient is to:

A. Begin hydrochlorothiazide therapy
B. Begin meclizine therapy
C. Begin scopolamine therapy
D. Recommend physical therapy

45. NEUROSIS

Neurosis	Psychosis
Mild functional neuro-psychical disorders that manifest themseleves in specific clinical phenomena in the absence of psychical phenomena	A severe mental illness characterized by loss of contact with reality and relationship with other people causing social maladaption
judgement intact, insight present, delusions absent	judgement impaired, insight absent, delusions present
anxiety disorder, panic disorder, major depressive disorder, PTSD	schizophrenia, bipolar disorder, delusional disorder

A 25-year-old soldier returns from war and complains of flashbacks of his colleague who was killed three months ago. The symptoms started 5 weeks ago. He is having trouble sleeping because he awakens to nightmares of gunfire and his lost colleague almost every night. He feels guilty that he is alive and is having trouble with relationships back at home as a result. He is easily startled by loud sounds. The most likely diagnosis is:

A. Major depressive disorder
B. Post-traumatic stress disorder
C. General anxiety disorder
D. Bipolar disorder

- This patient has the classic presentation of post-traumatic stress disorder. It occurs after experiencing a traumatic event (car accidents resulting in death, rape, and war are common scenarios). The patient will have the following symptoms for at least 1 month: re-experiencing symptoms (flashbacks, nightmares), avoidance symptoms, avoiding triggers, feeling numb, guilty, depressed, losing interest in activities, forgetting the event; and hyperarousal symptoms (easily startled, tense, and sleeping difficulty). Treatment of choice is an SSRI and exposure therapy.

A 22-year-old patient is brought to the office complaining of difficulty catching her breath, sweating, chest pain, and a pounding heart. The symptoms started one hour ago and lasted 15 minutes. She states that she felt like she was dying at the time. She admits to having similar episodes unexpectedly during the past couple of months and avoiding certain places where she may not have any help in case an additional episode occurs. The most likely diagnosis is:

A. Major depressive disorder
B. Post-traumatic stress disorder
C. Panic disorder
D. General anxiety disorder

- SSRis are first line treatment for panic disorder. This includes citalopram, escitalopram, fluoxetine, paroxetine, and sertraline.
- Treatment of choice for panic disorder is an SSRI.

A 37-year-old female is seen in the office for her sleep difficulty. Her husband passed away 14 months ago from pancreatic cancer and she has felt that she should have died with him. She tells you that 5 weeks ago, she started feeling down with decreased energy, concentration, appetite, and interest in skiing which was her favorite activity. She also states that falling asleep has become extremely difficult and she may sleep only 2-3 hours per night. The most likely diagnosis is:

A. Normal bereavement
B. Post-traumatic stress disorder
C. Schizophrenia
D. Major depressive disorder

"SIG-E-CAPS"

- This patient has major depressive disorder (MDD). It is defined as depressed mood or anhedonia plus 4 or more of the **SIG E CAPS** symptoms for at least 2 weeks.

S	I	G	E	C	A	P	S
sleep ↓↑	interest ↓	guilt ↑	energy ↓	concentration ↓	appetitie ↓↑	psychomotor ↓↑	suicide ↑

A 30-year-old male graduate student presents to his primary care physician complaining of a 7-month history of difficulty falling asleep and staying asleep at night. Over this time period, he has been persistently worried that there will be no jobs available after he completes his graduate degree and he will end up homeless. Despite a good marriage, he feels that his spouse may leave him and take his daughter to another country; as a result of this concern, he has had difficulty achieving intimacy with her, despite the fact that his sexual function and desire are intact. He complains of fatigue throughout the day and difficulty concentrating resulting in deterioration of his grades. He smokes a pack of cigarettes daily, and has been hoping to decrease his use, but has had difficulty with this because he feels that smoking helps to relieve his anxiety. He recalls that he has always been prone to worry, but this has deteriorated recently. Past medical history is unremarkable. Mental status examination is significant for anxious affect. The most likely diagnosis is:

A. Generalized anxiety disorder
B. Panic disorder
C. Post-traumatic stress disorder
D. Major depressive disorder

- Generalized anxiety disorder (GAD) is the most prevalent psychiatric illness in the general population. It tends to manifest in young adulthood with peak onset around age 30. It is defined as at least six months of daily anxiety and at least 3 of the following: restlessness, fatigue, concentration problems, irritability, muscle tension, and insomnia. The worry causes distress or impairment in relationships, at work, or at school. Anxiety tends to be particularly associated with anticipation of disaster and is more intense than the situation warrants.
- The most appropriate first-line treatment is cognitive-behavioral therapy and/or serotonergic antidepressants, both of which show approximately equal efficacy in reducing symptoms. Selective serotonin reuptake inhibitors (SSRis), which include citalopram, escitalopram, sertraline, fluoxetine, paroxetine, and fluvoxamine, are typically used first because of the relatively benign tolerability profile. Serotonin-norepinephrine reuptake inhibitors (SNRis), which include venlafaxine, desvenlafaxine, duloxetine, milnacipran, and levomilnacipran, can also be used as a first-line treatment but are not usually preferred over SSRis because they can cause or exacerbate hypertension.

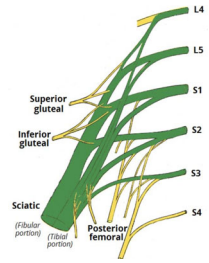
46. SCIATICA

Sciatic nerve

- longest and widest nerve in the body. Formed by spinal nerves L4, L5, and S1-3.
- Anterior division: tibial nerve / Posterior division: common fibular (peroneal) nerve

Tibial nerve	Common fibular nerve
posterior thigh and leg	lateral (superficial) and anterior (deep) leg

- The sciatic nerve is a thick and long nerve in the body. It passes alongside or goes through the piriformis muscle, goes down the back of the leg, and eventually branches off into smaller nerves that end in the feet. Nerve compression can be caused by spasm of the piriformis muscle.



Sciatica

- Irritation to the sciatic nerve or the spinal nerves that form it.
- Pain is associated with injury or compression of the sciatic nerve.

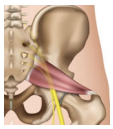
Signs & Symptoms

- Aching & Sharp leg pain
  - □ below knee: pain follows dermatome distribution
  - □ could begin suddenly: disc herniation, piriformis syndrome, trauma
  - □ develop slowly: tumor, spinal stenosis
  - □ typically unilateral
  - □ bilateral can occur: central disc herniation, lumbar stenosis, spondylolisthesis
- Sensory & Motor dysfunctions
  - □ numbness, motor weakness, reduction/loss of reflexes

Physical Exam

Straight leg raise (Lasègue's sign)

Spinal causes	Non-spinal causes
related to spinal column	occur outside the spinal region
• **Intervertebral disc herniation:** due to poor posture, traumas, or strong rotational movement • **Spinal stenosis:** narrowing of the spinal canal, due to degenerative bone disorders, trauma, rheumatoid arthritis • **Spondylolisthesis:** vertebra becomes displaced due to trauma, surgery or degenerative spinal disease • **Growths (eg tumors, cysts, or abscesses):** can cause compression on spinal nerves	• **Piriformis syndrome:** most common, muscle inflammation or muscle spasms → compress sciatic nerve • **Wallet sciatica:** aka credit-carditis, puts pressure on gluteal muscles • **Pregnancy** • **Trauma to leg** • **Pelvic tumors**



A 59-year-old male presents to the clinic complaining of persistent pain and paresthesias in his right buttock and extending down his leg for the past two weeks. He denies any recent trauma or injury and says that he has been unable to exercise since the pain started. Physical examination reveals decreased sensation to light touch over the right buttock, posterior thigh, and lateral leg as well as decreased strength of inversion and eversion of the left foot. The most likely appropriate initial management for this patient is:

A. Strict bed rest
B. Epidural glucocorticoid injection
C. Urgent surgical nerve decompression
D. Ibuprofen and activity modification

- Sciatica is a term used to describe low back pain that radiates to the lower extremities. Compression of the sciatic nerve, whose nerve roots are L4-S3 and travels down the lower extremities on both sides, branching into the **common peroneal** and **tibial** nerves at the level of the knee, results in the following findings on the affected side pain and paresthesias in the associated dermatomal distribution (buttocks, posterior thigh, lateral leg, ankle and foot), poor ankle jerk reflex, and decreased strength through the ankle's range of motion, as well as decreased ability to extend the great toe. If the nerve fibers are compressed by intervertebral disc herniation, the findings may be unilateral or bilateral whereas more distal compression of nerve fibers after they have branched into left and right will result in ipsilateral findings.
- Sciatica is treated with **NSAIDs**, **physical therapy**, and **modification of activity level** until symptoms improve. For those who do not respond to initial treatment, systemic or epidural glucocorticoids may be initiated. Opioids are only considered if the patient has severe pain even after non-narcotic analgesics.

If the patient experiences sciatic pain, and more specifically pain radiating down the leg (radiculopathy), when the straight leg is at an angle of between ____ and ____ degrees, then the test is positive and a herniated disk is a possible cause of the pain.

A. 0°, 30°
B. 30°, 70°
C. 70°, 90°
D. 90°, 180°

- The **straight leg test** (aka Lasègue's sign) is 95% sensitive for detecting L4-L5 or L5-S1 disc herniation but not specific. A positive test is when the supine patient feels reproduction of the pain as the leg is elevated with hip flexion.
- Diagnosis: medical history, physical exam, imaging (X-rays, CT scans, MRI), EMG

Which of the following muscles become frequently inflamed and leads to the most common cause of non-spinal sciatica?

A. Iliopsoas
B. Gluteus maximus
C. Piriformis
D. Obturator internus

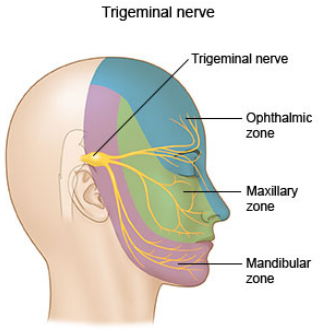
A patient presents with weak dorsiflexion, medial foot sensory loss, and diminished knee reflex. Which nerves is compromised?

A. L4
B. L5
C. S1
D. S2

Nerve root	Screening exam	Motor loss*	Sensory loss*	Reflex loss*
L4	squat & rise (L3/L4)	dorsiflexion of foot	medial foot	↓knee jerk
L5	heel walking (L4/L5)	dorsiflexon of great toe	dorsal foot	none reliable
S1	toe walking (S1/S2)	plantarflexion of foot	lateral foot	↓ankle jerk

47. TRIGEMINAL NEURALGIA

Overview	• Trigeminal neuralgia (aka tic douloureux) is a chronic pain condition that affects the trigeminal nerve, which carries sensation from your face to your brain. If you have trigeminal neuralgia, even mild stimulation of your face — such as from brushing your teeth or putting on makeup — may trigger a jolt of excruciating pain.
Signs and symptoms	• Trigeminal neuralgia causes episodes of sudden, intense facial pain that usually last for two minutes or less. In most cases, the pain is described as excruciating, and its quality is "sharp," "stabbing," "piercing," "burning," "like lightning" or "like an electric shock." • This pain can occur almost anywhere between the jaw and forehead, including inside the mouth. In most cases, only one side of the face is affected.
Diagnosis	• Trigeminal neuralgia is diagnosed via the result of neurological and physical tests, as well as the individual's medical history.
Treatment	• The first treatment for trigeminal neuralgia usually is carbamazepine (Tegretol and others). Carbamazepine is an anticonvulsant medication that decreases the ability of the trigeminal nerve to fire off the nerve impulses that cause facial pain.



Trigeminal neuralgia	Bell's palsy
damage to the CN____ (trigeminal nerve)	damage to the CN____ (facial nerve)

A 34-year-old woman with multiple sclerosis presents to your office with facial pain. The pain is described as stabbing, electric pain, is unilateral over the jaw, and is intermittent. What is the most likely diagnosis?

A. Occipital neuralgia
B. Bell's palsy
C. Cluster headache
D. Trigeminal neuralgia

- The trigeminal nerve supplies sensation over the jaw. Trigeminal neuralgia causes neuropathic pain, is more common in women, multiple sclerosis patients, and is described as a sharp, electric pain. It is usually unilateral and intermittent.
- Trigeminal neuralgia occurs most often in people over age 50, although it can occur at any age, including infancy. The possibility of trigeminal neuralgia being caused by multiple sclerosis increases when it occurs in young adults.

A 55-year-old man complains that he sometimes has sudden pain on one side of his face. It lasts up to 2 minutes. The pain is excruciating and feels like an 'electrirc shock.' He states it happens when he shaves and sometimes when he is chewing food. Upon physical exam, you notice the area of the face he points to is the area of distribution of the fifth cranial nerve. He is otherwise healthy and does no take any medications. You ask him if he has ever had shingles and says no. The most likely diagnosis is:

A. Temporomandibular joint dysfunction
B. Temporal arteritis
C. Tic Douloureux
D. Postherpetic neuralgia

- When the trigeminal nerve becomes irritated, an attack of intense pain results. Also called tic douloureux (painful tic in French) because of the uncontrollable facial twitching caused by the pain, trigeminal neuralgia is serious because it interferes with many aspects of a person's life.

A 60-year-old man complains of extremely severe, sharp, shooting pain in his face. He describes the episodes as being "like a bolt of electricity" that are brought about by touching a specific area, last about 60 seconds, and occur many times during the day. Neurologic examination is completely normal, but it is noted that part of his face is unshaven because he fears to touch that area. Which of the following is the most appropriate initial treatment?

A. Anticonvulsants
B. Aspirin
C. Nonsteroidal anti-inflammatory drugs
D. Vasodilators

- The trigeminal neuralgia case will most likely state the pain occurs while the patient brushes their teeth, applies makeup, or shaves. Treatment of choice is with an anticonvulsant.

A 65-year-old female presents to the clinic complaining of pain when she applies makeup. She describes the pain as burning and stabbing and rated 10/10 in severity when pressure is placed on the face. The pain is otherwise between 0 and 1. The most appropriate management is:

A. Baclofen (Lioresal®)
B. Carbamazepine (Tegretol®)
C. Acetaminophen (Tylenol®)
D. Tuina

- Pain due to trigeminal neuralgia is often described as shock-like, lightning-like, burning or stabbing. It is most common in women and those over 50. As the name implies, it is neuropathy of the trigeminal nerve therefore pain is felt in the CN V distribution (V1, V2, and V3) and most excruciating when the area is touched even with the softest pressure. While this is a clinical diagnosis, an MRI should be performed to rule out multiple sclerosis and tumors.

ACUTE CLINICAL CONDITIONS

	Disease	Definition
48	**Acute poisoning**	an adverse effects from a single exposure of substance in a short period of time
49	**Bleeding**	a hemorrhage or blood escaping from the circulatory system from damaged blood vessels
50	**Acute coma**	a state of unconsciousness when a person cannot be wakened with touch or noise
51	**Organophosphate insecticide poisoning**	an illness as a result of exposure to chemicals in organophosphate insecticide
52	**Shock**	a life-threatening condition that occurs when the body is not getting enough blood flow
53	**Stroke**	a sudden interruption in the blood supply of the brain
54	**Trauma**	a physical injury of sudden onset and severity which require immediate medical attention

DISORDERS OF CONSCIOUSNESS

- **Consciousness:** a function of the ascending reticular activating system (RAS) and the cerebral cortex. Lesions that interrupt the metabolic or structural integrity of the RAS or enough of the cortical neurons receiving RAS input can cause disorders of consciousness.
- **Disorder of consciousness:** a.k.a. impaired consciousness, is a state where consciousness has been affected by damage to the brain. Consciousness requires both wakefulness and awareness. Wakefulness is the ability to open your eyes and have basic reflexes such as coughing and swallowing.

	COMA	VEGETATIVE STATE (VS)	MINIMALLY CONSCIOUS STATE (MCS)
Awake?	No	Yes	Yes
Aware?	No	No	Yes

Match the disorders of consciousness to the correct characteristics.

Coma	■ □	• Lack of wakefulness as evidenced by the lack of sleep wake cycles on EEG. • There is no spontaneous purposeful movement. Patient's eyes remain closed.
Vegetative State	■ □	• Characterized by the resumption of the sleep-wake cycle on EEG. • No perceivable evidence of purposeful behavior. Patient opens eyes.
Minimally Conscious State	■ □	• Patient shows minimal but definite evidence of self or environmental awareness. • Patient shows evidence of inconsistent but reproducible purposeful behaviors.

STROKE (CerebroVascular Accident)

Ischemic Stroke (87%)			Hemorrhagic Stroke (13%)	
Occurs when a blood vessel to the brain is obstructed			Occurs when a weakened blood vessel ruptures	
Thrombotic (48%)	**Embolic (26%)**	**Lacunar (13%)**	**Intracerebral (10%)**	**Subarachnoid (3%)**
perfusion failure distal to site	mainly due to cardiac source	small infarcts (2-20mm)	hypertension	ruptured aneurysms

Which of the following causes ischemic stroke by moving through the blood vessels until it reaches a vessel that is too small to pass?

A. Thrombi
B. Intracerebral hemorrhage
C. Emboli
D. Subarachnoid hemorrhage

- Ischemic stroke is the result of an thrombosis or embolism.

Thrombus (Sit)	**Embolus** (Move)
a blood clot that forms in a blood vessel	breaks loose and travels through the bloodstream

- Hemorrhagic stroke is the rupturing of a cerebral vessels, causing bleeding into the brain tissue.

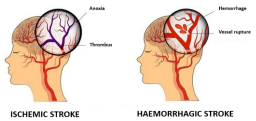
Which of the following types of stroke is caused by the blockage of small penetrating arteries that supplies deeper structures in the brain such as the thalamus, the basal ganglia, or pons?

A. Thrombotic stroke
B. Embolic stroke
C. Lacuna stroke
D. Intracerabral hemorrhage

- **A Lacunar stroke** results from the occlusion of small penetrating arteries that provide blood to the brain's deep structures.
- The **classic syndromes** are as follows: **Pure motor stroke** (most common lacunar syndrome: 33–50%), **Ataxic hemiparesis** (second most frequent lacunar syndrome), **Dysarthria/clumsy hand** (sometimes considered a variant of ataxic hemiparesis, but usually still is classified as a separate lacunar syndrome), **Pure sensory stroke**, and **Mixed sensorimotor stroke**.

What is the most important modifiable risk factor for ischemic and hemorrhagic stroke?

A. Age
B. Gender
C. Race
D. Hypertension



- Hypertension is the most important modifiable risk factor in both ischemic and hemorrhagic stroke. In fact, studies have shown that patients with blood pressure less than 120/80 have about half the lifetime risk of stroke as compared with those with high blood pressure.
- The other risk factors listed are non-modifiable.

48. ACUTE POISONING

Acute poisoning	Chronic poisoning
excessive dose of a poison taken over a short period of time	smaller doses taken over a period of time resulting in gradual worsening

A 4-year-old female is brought to the emergency room after she and her father were discovered unconscious on the living room floor. The mother states that the entire household has been experiencing headaches since winter started. Past medical history is unremarkable. Physical examination reveals an unconscious child with spontaneous respirations.

What is the most likely diagnosis?

A. Opioid overdose
B. Cyanide poisoning
C. Carbon dioxide poisoning
D. Carbon monoxide poisoning

- Carbon monoxide (CO) poisoning is characterized by a number of nonspecific symptoms, including, headache, dizziness, nausea, loss of consciousness, shortness of breath, cherry-red skin, and loss of muscle control. CO is a toxic gas that is both colorless and odorless.
- The gas is produced by devices that burn gas, petroleum products, wood, and other fuels. A common test scenario involves a gasoline generator placed too close to the home or a malfunctioning heating unit during wintertime.

Carbon monoxide (CO)	Carbon dioxide (CO_2)
result of oxygen starved combustion in improperly ventilated fuel-burned equipment	Natural byproduct of human and animal respiration, fermentation, chemical reactions, and combustion fossil fuels/woods

Supplemental high-flow oxygen is administered and pulse oximetry reveals an oxygen saturation of 94%. She remains confused and unresponsive to questioning. The most appropriate management for this patient is:

A. Naloxone
B. Atropine
C. Hyperbaric oxygen therapy
D. Cupping on bilateral UB13

- Pulse oximetry is falsely elevated in the setting of CO poisoning because carboxyhemoglobin has nearly the same light absorption as oxyhemoglobin. An arterial blood gas analysis with CO-oximetry provides a more accurate assessment of hypoxia in these patients.
- Treatment of CO poisoning is centered on removing the patient from the source of CO exposure, providing supplemental high-flow oxygen by means of a nonrebreather face mask, and providing hyperbaric oxygen therapy for select patients. Indications for hyperbaric oxygen therapy include altered mental status or confusion, coma, an abnormal neurologic exam, a carboxyhemoglobin level >25%, seizures, or syncope.

A 16-year-old male is brought into the emergency room by his parents because he was confused all morning. The patient goes into a coma 15 minutes later. His parents tell you that he was drinking a home-made alcoholic beverage called "moonshine" last night at his classmate's house. The patient's airway, breathing, and circulation are controlled. A blood gas reveals a metabolic acidosis. What is the most likely diagnosis?

A. Lead poisoning
B. Methanol poisoning
C. Arsenic poisoning
D. Ethanol poisoning

- Methanol poisoning is found in windshield wiper fluid, anti-freeze, and home-made alcoholic beverages. There will most likely be a history of attempted suicide or home-made alcohol. Patients present with hyperpnea, confusion, seizures, or coma. An anion-gap metablic acidosis will also be present. Fomepizole is an alcohol dehydrogenase antagonist used to treat methanol or ethylene glycol poisoning.
- Methanol poisoning can be treated with fomepizole, or if unavailable, ethanol. Both drugs act to reduce the action of alcohol dehydrogenase on methanol by means of competitive inhibition.

Acute liver failure is when the liver suddenly begins to lose its ability to function. What is the most common cause of acute liver failure in North America?

A. Acetaminophen overdose
B. Herbal supplements
C. Hepatitis
D. Autoimmune disease

- **Case:** A 17-year-old female presents to the emergency room with nausea and vomiting after swallowing "handfuls" of acetaminophen pills. The patient states that she swallowed the pills about 45 minutes prior to presentation because she did not get accepted into her university of choice. Past medical history reveals a major depressive disorder treated with fluoxetine. Physical examination reveals minimal epigastric tenderness.
- Acetaminophen poisoning is the most common cause of acute liver failure in North America. If a patient presents within one hour of overdose, administer oral activated charcoal to decrease absorption from the stomach and small intestine. The toxic metabolite of acetaminophen is NAPQI (N-acetyl-p-benzoquinone imine). N-Acetylcysteine is the drug of choice for the treatment of an acetaminophen overdose.

A 12-month-old boy presents to his pediatrician for a routine physical examination. His mother reports he just began walking, says "Mama, Dada, ball, juice, up," feeds himself, and drinks from a cup. A routine screening lead level is obtained and shows a serum lead level of 18 ug/dL (normal: <10ug/dL) and a repeat one week later is 19 ug/dL. The most appropriate action to prevent morbidity is:

A. Chelation therapy
B. Speech therapy for language delay
C. Repeat the serum lead level in three months
D. Identification of lead dust hazards

- The most common source of lead exposure in children is lead-based paint in the home. Other sources are lead-contaminated toys, cosmetics, soil, and water. Blood lead levels are used to screen children for lead poisoning. When faced with an abnormal screening lead level, the next step is to identify any lead hazards in the home by the local health department. Once the source is identified, decontamination steps are taken.

49. BLEEDING

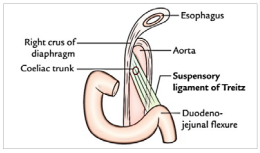
Acute bleeding	Chronic bleeding
may go into shock	may develop anemia

Hemoglobin (Hb)		Hematocrit (Hct)	
The protein in the RBC that carries oxygen to the body		The percentage of red cells in the blood	
male	**female**	**male**	**female**
13.5 to 17.5 g/dL	12.0 to 15.5 g/dL	41% to 50%	36% to 48%

_____ is a disease state where there is a decrease in the hemoglobin or hematocrit. _____ is a disease state where there is an increase in the hemoglobin or hematocrit.

A. Anemia, Leukocytosis
B. Anemia, Polycythemia
C. Anemia, Thrombocytopenia
D. Anemia, Thrombocytosis

The anatomic landmark that separates upper and lower bleeds is the ligament of Treitz. Which of the following does NOT belong to lower GI bleeding?



A. Bleeding in the duodenum due to Peptic ulcer
B. Bleeding in the jejunum due to Arteriovenous malformation
C. Bleeding in the ileium due to Crohn's disease
D. Bleeding in the colon due to Colon cancer

A 55-year-old male with past medical history of alcohol abuse comes to the office complaining of vomiting blood. History reveals that the hematemesis started three days ago and feelings of weakness started today. Vital signs reveal a blood pressure of 90/65 mmHg, a heart rate of 120/min, a respiratory rate of 15/min, and pulse oximetry 97% on room air. The most appropriate next step is:

A. Colonoscopy
B. Esophagogastroduodenoscopy
C. Nasogastric tube placement
D. IV fluids

- This patient has reported bleeding for 3 days, feels weak, and is hypotensive. Always start by addressing **A**irway → **B**reathing → **C**irculation. Fluid resuscitation is the best answer choice for initial treatment. Ringer's lactate or normal saline may be used.
- Acute bleeding may lead to a person going into shock. Acute bleeding is an emergency condition. Signs and symptoms of shock include: ↓blood pressure, ↑heart rate, little urination, and unconsciousness.

A 67-year-old patient with past medical history of alcoholic cirrhosis presents with massive hematemesis. The next best step in management is:

A. Fecal occult blood test
B. Nasogastric tube placement
C. IV normal saline
D. Upper endoscopy

- Upper GI bleeding most often presents as hematemesis or melena. It is defined as bleeding above the ligament of Treitz. The most common cause of UGIB is peptic ulcer disease. Other causes include esophageal varices, A-V malformations, Mallory-Weiss tears, or cancer.
- Always remember that ABCs take precedence over studies for etiology in ALL GI bleed. The first step in the management of an acutely bleeding patient who is hypovolemic is fluid resuscitation. A type-and-cross should also be performed in case a blood transfusion is necessary.

A patient with no past medical history presents with coffee-ground emesis. Physical examination reveals a blood pressure of 85/60 mm Hg and tachycardia. Nasogastric tube demonstrates coffee-ground aspirate. The patient is resuscitated and CBC is returned with a decreased hemoglobin and hematocrit. The next best step in management is:

A. Upper endoscopy
B. Colonoscopy
C. Anoscopy
D. Flexible sigmoidoscopy

- Coffee-ground emesis is a classic sign of upper GI bleeding. After some time, blood exposed to gastric acid results in oxidized iron and a ground coffee appearance. Upper GI bleed is defined as bleeding above the ligament of Treitz. Upper endoscopy has the benefit of locating the lesion as well as providing treatment.

A 55-year-old postmenopausal woman presents with new-onset vaginal bleeding. An endometrial biopsy reveals endometrial carcinoma. Which of the following is a risk factor for this condition?

A. Oral contraceptive pills
B. Early age of coitus
C. Multiparity
D. Diabetes mellitus

- Postmenopausal bleeding is usually caused by atrophy but endometrial carcinoma must be ruled out by biopsy. A transvaginal ultrasound may also be performed to assess the thickness of the endometrium. Thickened endometrial stripe is thickness > 5mm on ultrasound and is considered abnormal in postmenopausal women.
- Risk factors for endometrial cancer are unopposed estrogen, early menarche, late menopause, obesity, tamoxifen, polycystic ovarian syndrome, age, diabetes mellitus (even without obesity), and family history of breast, ovarian, or endometrial cancer.

50. ACUTE COMA

COMA	VS	MCS	Locked-in syndrome
No Awakeness / No Awareness	Yes Awakeness / No Awareness	Yes Awakeness / Yes Awareness	Yes Awakeness / Yes Awareness

Which of the following disorders of consciousness is characterized by a lack of wakefulness on an electroencephalogram and a lack of awareness of self or environment?

A. Coma
B. Vegetative state
C. Minimally conscious state
D. Locked-in syndrome

- **Coma** is a deep state of prolonged unconsciousness in which a person cannot be awakened; fails to respond normally to painful stimuli, light, or sound; lacks a normal wake-sleep cycle; and does not initiate voluntary actions. Coma patients exhibit a complete absence of wakefulness and are unable to consciously feel, speak or move. Comas can be derived by natural causes, or can be medically induced.
- **Locked-in syndrome**, a.k.a. pseudocoma, is a condition in which a patient is aware but cannot move or communicate verbally due to complete paralysis of nearly all voluntary muscles in the body except for vertical eye movements and blinking. Causes: poisoning, brainstem stroke, disease of the circulatory system, medication overdose, central pontine myelinolysis secondary to excessively rapid correction of hyponatremia, TBI, etc.

Which of the following patients is alive, but in a state of eyes-closed, depressed consciousness from which they cannot be aroused?

A. Minimally conscious state
B. Vegetative state
C. Coma
D. Brain death

- **Coma:** distinguished from brain death by the presence of brain stem responses, spontaneous breathing or non-purposeful motor responses.
- **Brain death:** Irreversible cessation of all functions of the entire brain, including the brain stem.

COMA	• Lack of wakefulness as evidenced by the **lack** of sleep-wake cycles on EEG • Patient's eyes remain closed.
VEGETATIVE STATE (VS)	• Characterized by the **resumption** of the sleep–wake cycle on EEG • Patient opens eyes (either spontaneously or with noxious stimuli).

Which best describes someone who is in a vegetative state?

A. Eyes are open, eyes are tracking, he/she has sleep-wake cycles
B. Eyes are open, eyes are not tracking, he/she has sleep-wake cycles
C. Eyes are closed, eyes are not tracking, he/she has no sleep-wake cycles
D. Eyes are closed, eyes are not tracking, he/she has sleep-wake cycle

Condition	Sleep-wake cycles	Awareness	Motor behaviour characteristics
Coma	No	No	No purposeful behaviour
Vegetative state	Yes	No	No purposeful behaviour
Minimally conscious state	Yes	Partial, fluctuating	Inconsistent but reproducible purposeful behaviour

- A **comatose** patient has eyes closed and no sleep-wake cycles.
- A patient in a **minimally conscious state (MCS)** has eyes open, tracking, and inconsistent but reproducible behavior. Emergence from **MCS** occurs when there is consistent command following.

VEGETATIVE STATE (VS)	• Patient opens eyes, however, no perceivable evidence of purposeful behavior. • No awareness of self or environment.
MINIMALLY CONSCIOUS STATE (MCS)	• Patient shows evidence of inconsistent but reproducible (or sustained) purposeful behaviors. • Patient shows minimal but definite evidence of self or environmental awareness.

Which of the following signify progressing from a vegetative state to a minimally conscious state?

A. Spontaneous eye opening
B. Sleep wake cycle
C. Spontaneous breathing
D. Visual tracking

- Spontaneous eye opening and presence of sleep wake cycle signifies the **vegetative state (VS)**.
- The diagnosis of **Minimally Conscious State (MCS)** is based on clearly discernible and reproducible evidence of purposeful movements.

Minimally conscious state is defined by the presence of:

A. Sleep-wake cycle
B. Cranial nerve reflexes
C. Environmental awareness
D. Reflexive behaviors

- **Minimally conscious state (MCS):** the patient will be able to show some evidence of self or environmental awareness and will show evidence of purposeful behaviors.
- **Vegetative state (VS):** characterized by the presence of sleep-wake cycles. Cranial nerve reflexes may be preserved in the vegetative state. One must be careful that reflexive behaviors such as yawning or auditory startle not be considered true awareness.

51. ORGANOPHOSPHATE INSECTICIDE POISONING

Organophosphate	• Any organic compound whose molecule contains one or more phosphate ester groups, especially a pesticide of this kind. • Examples of organophosphates include the following: Insecticides (malathion, parathion, diazinon, fenthion, dichlorvos, chlorpyrifos, ethion), Nerve gases (soman, sarin, tabun, VX), Ophthalmic agents (echothiophate, isoflurophate), Antihelmintics (trichlorfon), Herbicides (tribufos, merphos). • The most widely used insecticides today. They are used in agriculture, the home, and gardens. • Organophosphate insecticides = AChE Inhibitor

Acetylcholine (ACh)	Acetylcholinesterase (AChE)	Acetylcholine receptor (AChR)
a chemical neurotransmitter found widely in the body	an enzyme that rapidly breaks down the neurotransmitter	an receptor that responds to the binding of acetylcholine; muscarinic & nicotinic

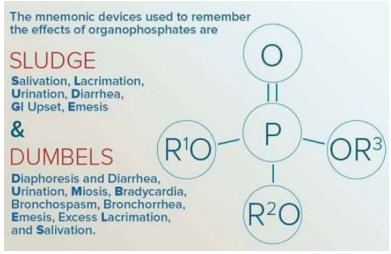
Organophosphates → ↓ **Acetylcholinesterase (AChE)** → ↑ **Acetylcholine (ACh)**

Organophosphate insecticides are one type of pesticide that works by damaging an enzyme in the body called _____. This enzyme is critical for controlling nerve signals. The damage to this enzyme kills pests and may cause unwanted side effects in exposed humans.

A. monoamine oxydase enzyme
B. tyrosine hydroxylase
C. acetylcholinesterase
D. tryptophan hydroxylase

- **Acetylcholinesterase** (a.k.a. cholinesterase): an enzyme that rapidly breaks down the acetylcholine (ACh) into Choline & Acetic acid → a reaction necessary to allow a cholinergic neuron to return to its resting state after activation → so that it does not overstimulate postsynaptic nerves, muscles, and exocrine glands.
- Exposure to organophosphate insecticide (**Cholinesterase inhibiting compounds**) → the body is unable to break down the acetylcholine → acetylcholine can then build up in the synapse → overstimulate the AChR (muscarinic and nicotinic) and causing a "jam" in the nervous system

Overstimulation of Muscarinic receptors	Overstimulation of Nicotinic receptors
• D = Diarrhea • U = Urination • M = Miosis (constrcted pupils) • B = Bradycardia, Bronchoconstriction • E = Emesis (vomiting) • L = Lacrimation (excess tears), Lethargy • S = Salivation	• High blood pressure • Sweating • Mydriasis (dilated pupils) • Tachycardia • Muscle weakness • Muscle fasciculations • Paralysis of respiratory muscles (severe cases)
Tx: Atropine	**Tx:** Pralidoxime (2-PAM)



A 6-year-old boy is brought in by his parents. Over the past 3 to 4 hours, he has been complaining of headache, blurry vision, and nausea. In addition, he has had abdominal cramps and diarrhea. The family lives on a farm, and the child has spent the last day helping with crop spraying. The father also reports that the boy has been salivating and sweating quite a bit. Vital signs: Temp 37°C, BP 90/54 mmHg, HR 130/min, RR 36/min. Physical examination reveals a lethargic boy with the following findings: miotic pupils, moist and flushed skin, fasciculations of the muscles in the legs with associated weakness. The most likely diagnosis is:

A. Mercury poisoning
B. Carbon monoxide poisoning
C. Lead poisoning
D. Organophosphate poisoning

Which of the following medications is used to reduce the effect of the organophosphate insecticide poisoning by blocking muscarinic acetylcholine receptors by excessive acetylcholine accumulation?

A. Vitamin K
B. Atropine
C. Pralidoxime (2-PAM)
D. Naloxone

- Atropine is a prescription medicine used to treat the symptoms of bradycardia, reduce salivation and bronchial secretions before surgery or as an antidote for organophosphate insecticide poisoning, overdose of cholinergic drugs, or mushroom poisoning.

A 10-year-old boy is brought to the emergency room by his parents after he sprayed himself while playing with an unmarked spray can. After several minutes, he began tearing and drooling according to his mother. By the time his father arrived, the boy has collapsed on the floor and was unresponsive. Vitals: HR 48 bpm, BP 80/40 mmHg, RR 10/min, O_2 saturation 70% on room air. On examination, the boy appears comatose and is profusely diaphoretic. He also presents with shallow breathing, constricted pupil, multiple fasciculations in various muscles. The child is immediately intubated and ventilated on 100% O_2. The most appropriate next step is to:

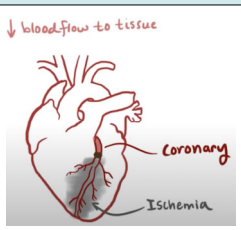
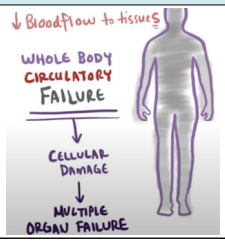
A. Administer IV atropine
B. Administer IV corticosteroids
C. Administer IV edrophonium
D. Administer IV epinephrine

Parents present to the emergency room carrying their 4-year-old child, who is lethargic and has excessive oral secretions, miosis, tearing, and "soiled" trousers from urination and defecation. The patient's symptoms developed while playing in a field recently sprayed with insecticides. Patient manifest with hypertension, muscle weakness, and muscle fasciculations. The physician suspects organophosphate poisoning. To treat the nicotinic effects, the physician should use which of the following?

A. Atropine
B. Pralidoxime (2-PAM)

52. SHOCK

- Shock is a life-threatening condition that occurs when the body is not getting enough blood flow. Lack of blood flow means the cells and organs do not get enough oxygen and nutrients to function properly. Many organs can be damaged as a result.
- Shock requires immediate treatment and can get worse very rapidly.

Ischemia		Shock	
	**Ischemia** is a condition in which the blood flow (and thus oxygen) is restricted or reduced in a part of the body. **Cardiac ischemia** is the name for ↓blood flow and oxygen to the heart muscle. **Brain ischemia** is a condition in which there is ↓blood flow to the brain to meet metabolic demand.		**Shock** is like ischemia, but on a global scale. In other words, it's a circulatory failure of the whole body; blood flow to tissues is dangerously low, which leads to cellular injury, possibly damages multiple organs, and can even lead to multiple organ failure if not treated immediately.

TYPES OF SHOCK

Low fluid	Heart doesn't work	Change in fluid status (Distributive Shock)		
⇩	⇩	⇩	⇩	⇩
Hypovolemic	**Cardiogenic**	**Septic**	**Neurogenic**	**Anaphylactic**
↓blood volume	↓heart pump	abnormal infection response	↓sympathetic tone	anaphylaxis
dehydration, hemorrhage	MI, arrhythmia	microbial infection	spinal cord injury	allergic reaction

A 30-year-old male with 5 day history of hematochezia has a blood pressure of 85/55 mmHg with tachycardia, dry, cold, and pale skin.

A. Hypovolemic shock
B. Cardiogenic shock
C. Septic shock
D. Neurogenic shock

- Hypovolemic shock is usually caused by trauma, diarrhea, vomiting, GI bleeding, small bowel obstruction, or burns. In hypovolemic shock, decreased preload results in decreased cardiac output. Systemic vascular resistance increases to compensate. Cardiac output will be low, pulmonary capillary wedge pressure will be low, and SVR will be high.

Non-hemorrhagic	Hemorrhagic
dehydration, vomiting, diarrhea, burn	GI bleeding, traumatic bleeding

A 60-year-old male with a recent myocardial infarction, blood pressure 90/50 mmHg, tachycardia, pallor and cold skin.

A. Hypovolemic shock
B. Cardiogenic shock
C. Septic shock
D. Neurogenic shock

- Cardiogenic shock is a medical emergency resulting from inadequate blood flow due to the dysfunction of the ventricles of the heart.
- Low blood pressure due to decrease in cardiac output.
- A rapid, weak, thready pulse due to decreased circulation combined with tachycardia.
- Cool and clammy due to vasoconstriction and subsequent hypoperfusion of the skin.

A 45-year-old female with pneumonia and a blood pressure of 80/50 temperature of 101.5°F, leukocytosis, warm and flushed skin.

A. Hypovolemic shock
B. Cardiogenic shock
C. Septic shock
D. Neurogenic shock

- Sepsis is the result of an infection, and causes drastic changes in the body. It occurs when chemicals that fight infection by triggering inflammatory reactions are released into the bloodstream.
- Septic shock is when you experience a significant drop in blood pressure that can lead to respiratory or heart failure, stroke, failure of other organs, and death. It can be very dangerous and potentially life-threatening.

A patient involved in a motorcycle accident and spinal cord injury is found to have a blood pressure of 85/50 mmHg with warm and flushed skin.

A. Hypovolemic shock
B. Cardiogenic shock
C. Septic shock
D. Neurogenic shock

- Neurogenic shock is defined as the injury to the spinal cord with associated autonomic dysregulation. Neurogenic shock is caused by a disruption of autonomic nervous system control over vasoconstriction (usually due to trauma). Patients will have peripheral vasodilation causing warm, flushed skin. This dysregulation is due to a loss of sympathetic tone and an unopposed parasympathetic response. Neurogenic shock is most commonly a consequence of traumatic spinal cord injuries.

53. STROKE

Ischemic Stroke (87%)			Hemorrhagic Stroke (13%)	
Thrombotic (48%)	Embolic (26%)	Lacunar (13%)	Intracerebral (10%)	Subarachnoid (3%)

A patient with a history of hypertension and diabetes mellitus complains of sudden, painless loss of vision in his left eye as well as right-sided hemiparesis. The patient described it as a black curtain coming down vertically into the field of vision in one eye. The symptoms fully resolved in 20 minutes. Carotid artery ultrasound is performed and shows 80% stenosis of the left internal carotid artery. The visual loss is most likely due to:

A. Occlusion of the central retinal vein
B. Retinal detachment
C. Amaurosis fugax
D. Macular degeneration

- In a patient with transient ischemic attack (TIA), the symptoms will resolve in less than 24 hours. On the other hand, in a stroke, the symptoms persist for over 24 hours and may never fully resolve. The most common cause of a TIA is an embolus that arises from a dislodged atherosclerotic plaque in one of the carotid arteries or from a thrombus in the heart due to atrial fibrillation.
- TIA's will commonly present with amaurosis fugax (sudden, painless loss of vision), hemiparesis, parasthesia and aphasia. Amaurosis fugax is caused by central retinal artery occlusion. Some people have described the occurrence of amaurosis fugax as feeling as if someone has pulled a shade over their eye.

In a patient with symptoms of a stroke, which of the following is the first-line diagnostic radiological test?

A. MRI of the brain
B. Carotid Dopplers
C. MRA of the head
D. CT brain without contrast

- Noncontrast CT of the brain is the first-line diagnostic radiological test done in a patient with symptoms of stroke.
- This is done to rule out an intracranial bleed. On a CT scan, blood appears hyperdense (radiopaque) and will show up white.

Tissue plasminogen activator (tPA) is an intravenous medicine given for ischemic stroke that can dissolve the stroke-causing clot. Studies show that people who receive tPA within ____ hours have better and more complete recoveries.

A. 1 B. 3 C. 12 D. 24

- TPA is a thrombolytic or a "Clot Buster" drug. An injection of tPA is usually given through a vein in the arm with the first 3 hours. Sometimes, tPA can be given up to 4.5 hours after stroke symptoms started. This drug restores blood flow by dissolving the blood clot causing your stroke.
- Contraindications: significant head trauma, prior stroke in the previous 3 months, history of intracranial hemorrhage, intracranial neoplasm, platelet count <100,000/mm^3, current use of anticoagulant with INR >1.7, pregnancy, recent MI within preceding 3 months, minor stroke symptoms, etc

Aphasia	Disarthria	Dysphagia
language impairment	speech impairment (motor disorder)	difficulty swallowing

Aphasia is an impairment in language. Aphasia classification is based on which three parts of the language assessment: Fluency (Is speech fluent?), Comprehension (Can you comprehend of spoken messages?), Repetition (Can the person repeat words or phrases)?

Fluent?	×	×	×	×	○	○	○	○
Comprehends?	×	×	○	○	×	×	○	○
Repets?	×	○	×	○	×	○	×	○
	↓	↓	↓	↓	↓	↓	↓	↓
Aphasia	Global	Mixed transcortical	Broca*	Transcortical motor	Wernicke*	Transcortical sensory	Conduction	Anomic

A 54-year-old woman experiences a left middle cerebral artery infarction. She presents with fluent speech, impaired comprehension, and impaired repetition. The most likely diagnosis is:

A. Broca's aphasia
B. Conduction aphasia
C. Global aphasia
D. Wernicke's aphasia

B	**B**roken words
W	**W**acky words

- Wernicke's aphasia is also referred to as **Fluent aphasia** or **Receptive aphasia**. In Wernicke's aphasia, the ability to grasp the meaning of spoken words and sentences is impaired, while the ease of producing connected speech is not very affected.

The type of language disorder that results from a lesion in the frontal lobe and is characterized by relatively good comprehension but decreased verbal output, difficulty in performing verbal repetitions, and right hemiparesis is called:

A. Broca's aphasia
B. Wernicke's aphasia
C. Conduction aphasia
D. Global aphasia

- **Expressive aphasia**, also known as Broca's aphasia, is a type of aphasia characterized by partial loss of the ability to produce language (spoken, manual, or written), although comprehension generally remains intact. A person with expressive aphasia will exhibit effortful speech.

54. TRAUMA

The steps underlying the acute management of a trauma patient can be remembered with the mnemonic ABCDE.	
Airway	• Check for airway obstruction; Immobilize cervical spine if needed
Breathing	• Ensure adequate movement of air into the lungs; identify pneumothorax, hemothroax, cardiac tamponade, etc.
Circulation	• Determine if there is adequate perfusion; Check for life-threatening bleeding (identify Shocks)
Disability	• Assess and protect brain and spinal functions; CNS dysfunction is assessed and quantified with the GCS (E+V+M)
Exposure	• Identify all injuries and environmental threats; avoid hypothermia

The Airway, Breathing, Circulation, Disability, Exposure (ABCDE) approach is a systematic approach to the immediate assessment of trauma. Hypovolemic shock can be identified in the which of the following assessment?

A. Airway
B. Breathing
C. Circulation
D. Disability

- The Glasgow Coma Scale (GCS) is the most common scoring system used to describe the level of consciousness in a person following a traumatic brain injury (TBI). Basically, it is used to help gauge the severity of an acute brain injury. The test is simple, reliable, and correlates well with outcome following severe brain injury.

	Severe TBI	Moderate TBI	Mild TBI
GCS	3 - 8	9 - 12	13 - 15

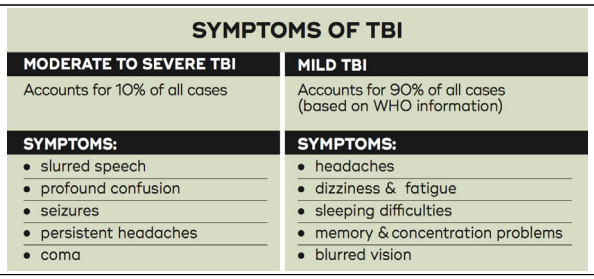
- The GCS is the summation of scores for eye, verbal, and motor responses (Mnemonic: 4 eyes + Jackson 5 + V6 engine). The minimum score is a 3 which indicates deep coma or a brain-dead state. The maximum is 15 which indicates a fully awake patient

Eye opening	Best verbal response	Best motor response
4 = spontaneous	**5 = normal conversation**	**6 = follows commands**
3 = to voice	**4 = disoriented conversation**	**5 = localizes to pain**
2 = to pain	**3 = words, but no coherent**	**4 = withdraws to pain**
1 = none	**2 = no words, only sounds**	**3 = decorticate posture**
	1 = none	**2 = decerebrate posture**
		1 = none

CASE 1: opens eyes to pain ( ) + confused conversation ( ) + withdraws from pain ( ) = 10 → _____ TBI
CASE 2: opens eyes when spoken to ( ) + disoriented but able to converse ( ) + follows command ( ) = 13 → _____ TBI

The Glasgow Coma Scale is a neurological scale which aims to give a reliable and objective way of recording the state of a person's consciousness for initial as well as subsequent assessment. According to the Glasgow Coma Scale (GCS), a severe brain injury would be:

A. 0 to 2
B. 3 to 8
C. 9 to 12
D. 13 to 15



Criteria	Mild	Moderate	Severe
Structural imaging	Normal	Normal or abnormal	Normal or abnormal
Loss of consciousness	0-30 min	>30 min and <24 h	>24 h
Alteration of consciousness or mental state*	Momentary to 24 h	>24 h	>24 h
Post-traumatic amnesia	0-1 d	>1 and <7 d	>7 d
Glasgow Coma Scale score	13-15	9-12	<9

Which of the following is the characteristic of Concussion vs. Contusion?

A. Temporary loss of neurologic function with no apparent structural damage
B. Bruising of brain tissue through direct trauma to head
C. Post traumatic amnesia persist longer than 24 hours
D. Appears as a hemorrhagic lesion on CT scan

Concussion:
- No visible bleed, microscopic diffuse/widespread neuronal stress/damage.

Contusion:
- Localized, Visible Injury with bleeding (Bruise)

- Usually, Concussion (mild TBI) has no findings of structural injury on routine neuroimaging (CT/MRI).
- Contusions are more serious than concussions because they involve damage to brain structure and pose more severe risks.

Which of the following criteria is incorrect regarding the concussion (mild TBI)?

A. Loss of consciousness < 30 minutes
B. Post-traumatic amnesia < 24 hours
C. Initial Glasgow Coma Scale of 13-15
D. The brain is bruised with possible surface hemorrhage

LOC (loss of consciousness)	PTA (post-traumatic amnesia)	GCS (glasgow coma scale)
< 30 minutes	< 24 hours	13-15