TRAIN FOR SUCCESS INC.
Digestive System 2Hr

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PURPOSE

The purpose of this course is to educate and reinforce the knowledge of nurses; ARNP, RN, LPN and CNA who are working in the health care environment, as well as other students, individuals regarding the anatomy and physiology of the Digestive system and various disorders, causes, symptoms and treatments. Review of Gastroesophageal reflux disease (GERD), Hiatal hernia, paraesophageal hernia, Gastritis, Peptic ulcer disease, Hepatitis, ASCITES- Portal hypertension, Cholecystitis, CHOLELITHIASIS, Pancreatitis and other disorders. Infection control, Hand hygiene procedures, Noroviruses, Clostridium difficile ,Occupational Safety and Health Administration (OSHA) Standards/ regulations regarding bloodborne pathogens, the Centers for Disease Control and Prevention (CDC) the Association for Professionals in Infection Control and Epidemiology (APIC) and National Institute of Occupational Safety and Health (NIOSH) recommendations.

Objectives/ Goals:

After successful completion of this course the students will be able to:

1. Describe the anatomy and physiology of the digestive track
2. Discuss some of the functions of the digestive system
3. Describe problems that are associated with the digestive system and appropriate Interventions needed.
4. Discuss causes, symptoms and treatment of Gastroesophageal reflux disease (GERD), Hiatal hernia, paraesophageal hernia, Gastritis, Peptic ulcer disease
5. Discuss types, causes, symptoms and treatment of various Hepatitis
6. Discuss ASCITES- Portal hypertension; causes, symptoms, treatment
7. Describe Cholecystitis, CHOLELITHIASIS symptoms and treatment
8. Discuss causes, symptoms and treatment of Pancreatitis and other disorders.

INTRODUCTION

The Digestive System and associated disorders

The digestive system is designed to turn the food that is consumed /eaten into nutrients, which the body needs to utilize for energy, growth and for the repair of cells.

The digestive track consists of:

- The Mouth
- Throat
- Esophagus
- Stomach
- Small Intestine
- Colon; the Large intestine
- Rectum and
- Anus

The Mouth

The mouth is the beginning of the digestive tract. This is where digestion begins; as soon as you chew the food. The chewing action breaks the food into smaller particles that are easier to digest and the saliva mixes with the food to begin the process of breaking it down into a form that the body can easily absorb and utilize.

The Throat

The throat is also called the pharynx. The food leaves the mouth to the throat. From the throat the food travels to the esophagus (swallowing tube).

Esophagus

The esophagus is a muscular tube that extends from the pharynx to the stomach. The esophagus delivers the food to the stomach by series of contractions that is called peristalsis. The esophagus has a valve, located just before it connects to the stomach,

called the lower esophageal sphincter. The valve functions to keep the food from going back into the esophagus.

Stomach

The stomach is a sac-like organ with strong muscular walls.

The stomach:

- Holds the food
- Mixes and grind the food
- Secretes acid and enzymes that continue the process of breaking down the food.

Stomach /gastric acid is composed of hydrochloric acid (HCl)

When the food leaves the stomach, it is the consistency of a paste or liquid. As the contents leave it moves into the small intestine.

Small Intestine

The small intestine is made up of three Parts:

- Duodenum,
- Jejunum, and
- ileum

The small intestine is a very long tube that is coiled within the abdomen (measures up to 20 feet long or more). The small intestine also assists in the digestion and continues to break down the food by using enzymes that are released by the pancreas and bile that is released from the liver.

Bile is a substance that assists in the digestion of fat and eliminates waste products from the blood.

The small intestine also uses peristalsis to move the food through and mixes the food with the digestive secretions.

The duodenum is primarily responsible for continuing the process of breaking down the food, and the jejunum and ileum are mainly responsible for the absorption of the nutrients into the bloodstream.

There are three organs that play a vital role in assisting the stomach and the small intestine to digest the food; this includes the Pancreas, liver and the gallbladder.

The Pancreas

The pancreas has many functions including secretion of enzymes into the small intestine. These enzymes assist in the breaking down of carbohydrate, protein and fat from the meals that are consumed.

The Liver

The liver has several functions. Two of the main functions within the digestive system are:

- To produce and secrete bile
- To cleanse and purify the blood that is coming from the small intestine containing the nutrients that was just absorbed.

The Gallbladder

The gallbladder (pear shaped structure) lies under the liver and stores bile. The bile is made in the liver then it travels to the gallbladder through the cystic duct (a channel).

While you are eating, the gallbladder contracts and sends bile to the small intestine.

When the nutrients are absorbed and the liquid that is leftover has passed through the small intestine, the remainder of the food you ate is delivered to the colon (large intestine).

The Colon (Large Intestine)

The colon is a long muscular tube (5 to 6 foot) that connects the cecum (the first part of the large intestine to the rectum (the last part of the large intestine).

The colon is made up of:

- the cecum,
- the ascending (right) colon,
- the transverse (across) colon,
- the descending (left) colon, and
- the sigmoid colon which connects to the rectum.

Waste (or stool) that remains / left over from the digestive process is passed through the colon by means of peristalsis movement, initially in liquid state then the water/ liquid is removed from the stool there is solid form.

The stool remains in or is stored in the sigmoid colon until it is emptied into the rectum once or two times per day.

It usually takes approximately 36 hours for stool to get through the colon. The stool is mainly food particles and bacteria.

The bacteria perform many useful functions, such as:

- Synthesizes different vitamins,
- Processes food particles and waste products and
- Protects against some harmful bacteria.

When the descending colon is full with stool, it empties the contents into the rectum for elimination.

The Rectum

The rectum is the section (about 8-inch) that connects the colon to the anus.

It is the function of the rectum to receive stool from the colon, letting you that there is stool that is ready to be evacuated and to store the stool until evacuation take place.

When stool or gas comes into the rectum, the sensors transmit a message to the brain. If the content is ready to be released the muscles (sphincters) relax and the rectum contracts and expels the contents. If the waste or contents cannot be expelled, the sphincters contract and the rectum will accommodate and the sensation will temporarily stops or goes away.

Anus

The last part of the digestive tract is the anus.

It consists of pelvic floor muscles and internal and external anal sphincters muscles. The lining of the upper anus is able to detect the presence of rectal contents. It helps the individual to know whether the substances present are gas, liquid or solid contents.

The anal sphincters provide fine control of stool.

The internal sphincter keeps you from going to the bathroom when you are unaware of the presence of stool (e.g. during sleep).

Whenever you develop the urge to go to the bathroom, the external sphincter, keeps the stool in until you can get to the toilet.

PROBLEMS WITH THE DIGESTIVE TRACK

Gastroesophageal reflux disease (GERD)

Gastroesophageal reflux disease (GERD) is a condition in which the stomach contents leak backwards from the stomach into the esophagus (the tube from the mouth to the stomach). This can irritate the esophagus and cause heartburn and other symptoms.

Causes

When we eat, the food passes from the throat to the stomach through the esophagus. A ring of muscle fibers within the lower esophagus prevents the food that is swallowed from moving back up. These muscle fibers are called the lower esophageal sphincter (LES).

When the ring of muscle does not close all the way, the stomach contents can flow back into the esophagus. This is called gastroesophageal reflux or reflux. Reflux may cause various symptoms. The strong stomach acids can also cause damage to the lining of the esophagus.

Some of the risk factors for reflux include:

- Alcohol intake
- Hiatal hernia (part of the stomach moves up above the diaphragm).
- Obesity
- Pregnancy
- Smoking

Heartburn and gastroesophageal reflux can be brought on or made worse by pregnancy.

Symptoms can also be caused by certain medications, such as:

- Anticholinergics (such as for seasickness)
- Beta-blockers (for HTN /high blood pressure or heart disease
- Bronchodilators (used for asthma)
- Calcium channel blockers (used for HTN /high blood pressure)
- Dopamine active drugs (used for Parkinson disease)

- Progestin (used for birth control or abnormal menstrual bleeding)
- Sedatives (used for anxiety or insomnia)
- Some antidepressants (e.g. Tricyclic)

Some common symptoms of GERD include:

- Heart burn
- Feeling like food is “stuck” behind the breastbone
- Burning pain within the chest
- Nausea after meals

Less common symptoms are:

- Regurgitation (bringing food back up)
- Soreness in throat
- Wheezing
- coughing
- Difficulty swallowing
- Hiccups
- Hoarseness
- change in voice

Patients may report worsening of symptoms when they bend over or lie down, or after they eat.

Symptoms may also become worse during the night.

Exams and Tests

Upper Endoscopy (EGD)

If the symptoms are severe or they come back after they have been treated, the physician may perform an upper endoscopy (EGD)

- The test to examine the lining of the esophagus, stomach, and the first part of the small intestine.
- The procedure is done with a flexible endoscope -small camera, that is inserted down the throat.

Other testes may include:

Test that measure how often stomach acid enters the esophagus (tube that leads from the mouth to the stomach)

Esophageal manometry - test to measure the pressure that is inside the lower part of the esophagus.

Stool occult test - a positive stool occult blood test can diagnose bleeding that is coming from an irritation within the stomach, esophagus and / or the intestine.

PATIENT TEACHING

Treatment

Educate the patient to make some lifestyle changes that may help treat the symptoms, such as:

- Avoiding medications such as ibuprofen (Motrin, Advil), Aspirin or naproxen (Naprosyn, Aleve). Take Tylenol (acetaminophen) to relieve discomfort/ pain.
- Take all of medications with adequate amount of water.
- Proton pump inhibitors (PPIs) decrease the amount of the acid produced in the stomach
- H2 blockers also lower the amount of acid released in the stomach
- Weight lose goal; if the patient is obese /overweight, in some cases, losing weight can help.

- Ask the physician what over-the-counter antacids to take after meals and at bedtime, (the relief may not last long).

Some side effects of antacids may include constipation or diarrhea.

Anti-reflux surgery

Anti-reflux surgery may be an option for individuals whose symptoms do not go away with medications or lifestyle changes. Heartburn and other symptoms should be relieved or improve after surgery.

HIATAL HERNIA

The hiatus is an opening that is located in the diaphragm (the muscular wall separating the chest cavity from abdomen). The esophagus passes through the hiatus and is attached to the stomach.

When the patient has an hiatal hernia (or hiatus hernia) the stomach bulges up into the chest through that small opening.

There are two main types of hiatal hernias:

- Sliding hiatal hernia
- Paraesophageal (next to the esophagus).

Sliding hiatal hernia

With sliding hiatal hernia, the stomach and the portion of the esophagus that joins the stomach slides up through the hiatus into the chest. This is the more common type of hernia.

The paraesophageal hernia

The paraesophageal hernia is not as common. The esophagus and stomach stay in the normal positions but a part of the stomach squeezes through the hiatus, placing it next to the esophagus. The stomach can become strangled and loose it's blood supply.

Many individuals with hiatal hernia have no symptoms, but others may have heartburn related to gastroesophageal reflux disease (GERD). People with heartburn may experience chest pain that can easily be confused with the pain of a heart attack. That's why it's so important to undergo testing and get properly diagnosed.

Causes of Hiatal Hernia

Most of the time, the cause is unknown or ;

- An individual may be born with a larger hiatal opening
- Increased pressure in the abdomen for example from obesity, pregnancy, coughing, and /or straining during bowel movements may also contribute to the condition.

Risk for Hiatal Hernia

- Hiatal hernias frequently occur in women,
- Occurs in individuals who are overweight,
- Occurs in individuals older than 50.

Hiatal Hernia Diagnoses

Barium swallow - a hiatal hernia can be diagnosed with a specialized X-ray that allows the physician to see the esophagus or with endoscopy.

Hiatal Hernias Treatment

Many individuals do not experience any symptoms however, with paraesophageal hernia when part of stomach squeezes through the hiatus, this can sometimes cause the stomach to be receiving less blood supply or become strangled, therefore surgery is sometimes recommended.

If other symptoms, such as chest pain, occur along with the hernia they should be evaluated.

Symptoms of GERD, for example heartburn, should be treated.

Hiatal Hernia Surgery

As mentioned above, when the hiatal hernia is at risk of becoming strangulated, blood supply cutting off and surgery may be needed to reduce the hernia.

Hiatal hernia surgery can often minimally invasive procedure such as a laparoscopic procedure. During this type of surgery, a few small incisions are made in the abdomen. The laparoscope that allows the surgeon to see inside the abdomen and the surgical instruments are inserted through the incisions. The surgeon is guided by a laparoscope, that transmits a picture of the organs to a monitor.

Some advantages of laparoscopic surgery include:

- smaller incisions,
- less risk of infection,
- less pain and scarring, and
- a more rapid recovery.

Many patients are able to walk around the day after hernia surgery. Generally, there are no dietary restrictions and the patient can resume his or her regular activities within a week.

Instruct the patient that complete recovery will take 2 to 3 weeks, and to avoid hard labor and lifting objects that are heavy (avoid for at least 3 months after the surgery). Sometimes even with surgery, there is no guarantee, that the hernia will not return.

Gastritis

Gastritis is an inflammation, irritation, or erosion of the lining of the stomach. It can be acute - occurs suddenly or chronic which occurs gradually.

Causes of Gastritis

Gastritis can be caused by irritation due to:

- Excessive alcohol use,
- chronic vomiting,
- stress, or
- the use of certain medications such as aspirin or other anti-inflammatory drugs.

It may also be caused by any of the following:

- ***Helicobacter pylori (H. pylori)*:** A bacteria that lives within the mucous lining of the stomach and without treatment, the infection can lead to ulcers, and in some individuals, stomach cancer.
- **Pernicious anemia:** A form of anemia that occurs when the stomach lacks a naturally occurring substance needed to properly absorb and digest vitamin B12.
- **Bile reflux:** A backflow of bile into the stomach from the bile tract (that connects to the liver and gallbladder)
- **Infections** caused by bacteria and viruses

If gastritis is left untreated, it can lead to a severe loss of blood and may increase the risk of developing stomach cancer.

Symptoms of Gastritis

Symptoms of gastritis vary among individuals, and in many people there are no symptoms.

However, the most common symptoms include:

- Nausea or recurrent upset stomach
- Abdominal bloating
- Abdominal pain
- Vomiting
- Indigestion
- Burning or gnawing feeling in the stomach between meals or at night
- Hiccups
- Loss of appetite
- Vomiting blood or coffee ground-like material
- Black, tarry stools

Gastritis Diagnoses

To diagnose gastritis, the healthcare providers/ physician will perform a thorough physical examination, review the personal medical history, family history, and may order tests such as:

- **Lab work; blood test** to check the red blood cell count to determine whether the individual has anemia (does not have enough red blood cells). Lab work (blood tests) to also screen for pernicious anemia and *H. pylori* infection.

- **Upper endoscopy;** an endoscope, a thin tube containing a tiny camera, is inserted through the mouth and down into the stomach to view the lining of the stomach. The physician will check for inflammation and may obtain a biopsy (remove a small sample of tissue and sent it to the laboratory for analysis).

- **Fecal occult blood test (stool test)** checks for presence of blood in the stool, which may be a possible sign of gastritis.

Treatment for Gastritis

Treatments for gastritis usually include:

- Taking medications such as antacids and other drugs (proton pump inhibitors or H-2 blockers) to reduce the stomach acid
- Patient will need to avoid hot and spicy foods
- For gastritis caused by *H. pylori* infection, the the healthcare provider will prescribe a regimen of antibiotics and acid blocking medication for the heartburn
- If pernicious anemia is causing the gastritis, B12 vitamin shots will be administered.
- Patients will need to eliminate irritating foods from the diet for example, lactose (dairy) or gluten (from wheat).

Many individuals with gastritis improve quickly when treatment begins.

Peptic ulcer disease

Peptic ulcer disease refers to painful sores or ulcers in the lining of the stomach or first part of the small intestine (the duodenum).

Causes of Ulcers

No single cause has been found for ulcers.

Many ulcers are caused by an infection of bacteria Helicobacter pylori (H. pylori).

Factors that can increase the risk for ulcers include:

- Use of painkillers called nonsteroidal anti-inflammatory drugs (NSAIDs), such as aspirin, naproxen (Aleve, Anaprox, Naprosyn, and others), ibuprofen (Motrin, Advil, some types of Midol), and many others available by prescription; even when aspirin is safety-coated and aspirin in powered form can frequently cause ulcers.
- Excess acid production from gastrinomas, tumors of the acid producing cells of the stomach that increases acid output such as in Zollinger-Ellison syndrome.

- Excessive alcohol intake
- Smoking and /or chewing tobacco
- Serious illness increases the risk for ulcers
- Radiation treatment to the area increases the risk for ulcers

Symptoms of an Ulcer

The individual with an ulcer may or may not experience symptoms.

When symptoms occur, they may include:

- A burning or gnawing pain in the middle or upper stomach between meals and /or at night
- Bloating
- Heartburn
- Nausea or vomiting

In severe cases, symptoms can include:

- Dark or black stool (due to bleeding)
- Vomiting blood that can look like "coffee-grounds"
- Weight loss
- Severe pain in the mid to upper abdomen

Patient teaching:

Educate patients that although ulcers often may heal on their own, they should not ignore the warning signs. If an ulcer is not properly treated, they can lead to serious health problems, such as:

- Bleeding
- Perforation (a hole through the wall of the stomach)
- Gastric outlet obstruction from scarring and/ or swelling which blocks the passageway leading from the stomach to the small intestine.

Taking nonsteroidal anti-inflammatory drugs (NSAIDs) can lead to an ulcer without any warning.

The risk is a great concern for:

- the elderly and for
- individuals with a prior history of having peptic ulcer disease.

Individuals may be more likely to develop ulcers if they:

- Have an infection of bacteria Helicobacter pylori (H. pylori)
- Take NSAIDs such as aspirin, ibuprofen, or naproxen
- Have a family history of ulcers
- Have another illness such as kidney, liver, or lung disease
- Drink alcohol frequently /regularly
- Are age 50 or older

Diagnosis

To confirm the diagnosis one of several tests should be taken.

The healthcare provider / physician may ask the patients to take an acid-blocking medication, to treat the heartburn for a short period of time to assess if the symptoms improve.

The healthcare provider / physician may recommend a procedure called an upper endoscopy. It involves inserting a small, lighted tube (endoscope) through the throat and into the stomach to look for any abnormalities. This procedure is usually given if the patients are having very severe or recurring symptoms of ulcers.

Ulcer Treatment

When ulcers are treated appropriately, they can lead to serious health issues.

There are several ways in which ulcers can be treated, including:

- making lifestyle changes,

- taking medication, and/or
- Undergoing surgery.

Lifestyle Changes to Treat an Ulcer

To treat an ulcer, first eliminate substances that can be causing the ulcers.

- Stop smoking
- stop drink alcohol
- If the ulcer is believed to be caused by the use of NSAIDs, stop taking them.

Ulcer treatments / Medications

Ulcer medications can include:

- **Proton pump inhibitors (PPI)**. Proton pump medications reduce acid levels and allow the ulcer to heal.

  They include:
  - dexlansoprazole (Dexilant),
  - esomeprazole (Nexium),
  - lansoprazole (Prevacid),
  - omeprazole (Prilosec),
  - pantoprazole (Protonix),
  - rabeprazole (Aciphex), and
  - omeprazole/sodium bicarbonate (Zegerid).

- **Antibiotics** . If the patient has H. pylori infection, antibiotics are also prescribed. There are multiple combinations of antibiotics that are taken for one to two weeks along with a Proton pump inhibitor (PPI). Bismuth may also be a part of some treatment regimens. Bismuth is used to treat occasional heartburn, upset stomach, and nausea. It helps to slow the growth of the bacteria that might be causing diarrhea.

- **Upper endoscopy**. Sometimes bleeding ulcers can be treated through an endoscope.

- **Surgery**. An operation may be needed if the ulcer has created a hole in the wall of the stomach and/ or if there is serious bleeding that cannot be controlled with an endoscope.

Preventing Ulcers

Educate the patient to reduce the risk of developing ulcers:

- Do not smoke.
- Avoid drinking alcohol.
- Do not overuse aspirin and/or NSAIDs.

Cholecystitis

Cholecystitis is inflammation of the gallbladder, the pear-shaped muscular sac the lies below the liver.

The main functions of the gallbladder are:

- to store and concentrate bile and
- to expel bile through the bile duct into the intestine to assist with the digestion of fats.

Bile is a greenish-brown liquid produced by the liver that helps to break down fats present in the small intestine during digestion. Cholecystitis may come on suddenly (acute) or may persist over a period of time (chronic).

Acute cholecystitis is usually caused by obstruction of the outlet of the gallbladder, which is often due to the development of a stone formed in the biliary tract (gallstone or biliary calculus).

Repeated mild episodes of acute cholecystitis may result in chronic cholecystitis, which may be characterized by thickening and shrinking of the gallbladder walls and a resulting inability to store bile.

Cholecystitis may cause a variety of symptoms including:

- severe pain in the right side of the abdomen (right upper quadrant) and/or back,
- nausea, vomiting,
- indigestion,
- fever, and
- persistent yellowing of the skin, mucous membranes, and whites of the eyes (jaundice).

In some cases, there may be additional symptoms.

CHOLELITHIASIS/ Gallstones

Gallstones are crystal-like deposits that develop in the gallbladder.

Gallstones:

- These deposits may be small or large as a golf ball;
- They may be hard or soft, smooth or jagged.
- There may be several gallstones or just one.

Many individuals who have gallstones do not know it.

Gallstones that are simply floating around inside the gallbladder generally cause no symptoms and no harm.

The gallstones usually go unnoticed unless they are observed on an ultrasound exam conducted for other reasons. However, the longer the gallstones exists in the gallbladder, it is more likely to cause problems. Individuals who have gallstones without

symptoms have a 20% chance of developing/ experiencing an episode of pain during their lifetime.

Whenever symptoms occur, it is usually because:

- the gallstone has moved and become lodged within a duct that carries bile (the cystic duct -a small conduit that connects the gallbladder to another tube called the common bile duct).

The typical symptom that the patient experiences is:

- Abdominal pain,
- Possible accompanied by nausea, indigestion, or fever.

The pain, caused by the gallbladder's contraction against the stone, generally occurs **within 1 hour of eating a large meal or in the middle of the night**.

Gallstones can also block:

- the common bile duct that carries the bile into the small intestine, and
- the hepatic ducts that take the bile out of the liver.

Obstructions that are present in the bile pathway can possibly result in inflammation of the duct become and possibly infection.

Blockage within the common bile duct that merges with the pancreatic duct at the small intestine may also lead to some inflammation of the pancreas (gallstone pancreatitis).

Causes of Gallstones

The main function of the gallbladder is:

- To store bile (yellowish or brown fluid) that helps the body to break down fatty food.

Whenever the individual eat a meal, the gallbladder will release the stored bile into the cystic duct. Then the fluid passes through the common bile duct and into the small intestine where it mix with the food.

Usually, the concentration of bile acids is high enough that it is able to break down the cholesterol and keep it in a liquid form.

However, a diet that is high in fat can cause the liver to produce more cholesterol than the bile acids are able to effectively manage. Therefore causing some of the excess cholesterol to begin to solidify into crystals (gallstones).

- About 80% of all gallstones are cholesterol stones
- The remaining 20% consist of calcium mixed with the bile pigment bilirubin - called pigment stones.

Gallstones can also form in individuals who eat appropriate nutrients and well balanced diets.

Researchers have found that a diet extremely low in fat can also contribute to the formation of gallstone.

Some other factors that can also reduce the activity in the gallbladder and possibly lead to gallstone formation include;

- cirrhosis,
- the use of birth control pills
- the use of hormone replacement therapy, and
- pregnancy.

Increase risk for gallstones also includes factors such as:

- Family history,
- diabetes,
- sudden weight loss, and
- cholesterol drugs, and
- older age

Pancreatitis

There are two types of pancreatitis:

- chronic and
- acute.

Both types refer to the inflammation of the pancreas, the gland that produces digestive enzymes; which the body utilizes to metabolize carbohydrates and fats, and the hormone insulin.

The symptoms of acute pancreatitis are typically severe and need to be treated. If they are not treated, the patient may develop complications such as:

- pancreatic cysts,
- abscesses, and
- leaks of pancreatic fluid into the abdomen, which can lead to other long-term problems or even death.
- Shock is a possibly fatal complication of acute pancreatitis.

Chronic pancreatitis develops over a number of years, usually after a history of recurrent attacks of acute pancreatitis. Chronic pancreatitis may cause you to lose the ability to secrete the enzymes the body needs to digest foods.

The resulting condition, known as pancreatic insufficiency, is a principal characteristic of chronic pancreatitis and is signaled by:

- weight loss; gradual or sudden, and
- foul-smelling stools or diarrhea.
- Chronic pancreatitis can also lead to diabetes mellitus and
- pancreatic calcification, in which small, hard calcium deposits develop in the pancreas.

Causes of Pancreatitis

In the majority of cases within the U.S.A, acute pancreatitis is associated with:

- Excessive alcohol use and
- Gallstones.

The other cases result from:

- infections,
- some medications,
- trauma or surgery to the abdomen,
- blood vessel disease,
- elevated calcium levels,
- genetic mutations,
- extremely high triglyceride levels.

These factors appear to encourage pancreatic digestive enzymes to act on the pancreas itself, causing swelling, hemorrhage, and damage to blood vessels in the pancreas.

About 30% of individuals who develop chronic pancreatitis are heavy drinkers; heavy consumption of alcohol is the most frequent cause of pancreatic insufficiency in adults.

The leading cause of pancreatic insufficiency in children is cystic fibrosis.

Pancreatitis - Exams and Tests

- Physical exam,
- lab and
- Imaging tests

Two blood tests that measure enzymes are used to diagnose an attack of pancreatitis. These tests are:

- Serum amylase. An increase of amylase in the blood usually indicates pancreatitis.
- Serum lipase. Sudden (acute) pancreatitis almost always raises the level of lipase in the blood.

Other blood tests may be done, such as:

- A complete blood count (CBC). The number of white blood cells rises during an attack of pancreatitis, sometimes dramatically.
- Liver function tests. Increases in liver enzymes, particularly of alanine aminotransferase and alkaline phosphatase, can be a sign of sudden pancreatitis caused by gallstones.
- Bilirubin. The level of bilirubin in the blood may increase if the common bile duct is blocked.

Imaging tests that may be done include:

- CT scan with contrast dye. A CT scan can help rule out other causes of abdominal pain, determine whether tissue is dying (pancreatic necrosis), and find complications such as fluid around the pancreas, blocked veins, and obstructed bowels.
- Abdominal ultrasound. This test can locate gallstones. It also can show an enlarged common bile duct.
- Endoscopic retrograde cholangiopancreatogram (ERCP). This procedure allows the doctor to see the structure of the common bile duct, other bile ducts, and the pancreatic duct. ERCP is the only diagnostic test that also can be used to treat narrow areas (strictures) of the bile ducts and remove gallstones from the common bile duct.

- Magnetic resonance cholangiopancreatogram (MRCP). This form of MRI can detect gallstones in the common bile duct. This test is not available everywhere.

- Endoscopic ultrasound. In this form of ultrasound, a probe attached to a lighted scope is placed down the throat and into the stomach. Sound waves show images of organs in the abdomen. Endoscopic ultrasound may reveal gallstones in the common bile duct.

- MRI. Sometimes an MRI is used to look for signs of pancreatitis. It provides information similar to that of a CT scan.

  If the healthcare provider is not sure whether the pancreatic tissue is infected, he or she may use a needle to take some fluid from the inflamed area. The fluid is then tested for organisms that can cause infection.

  With severe or chronic pancreatitis, a stool sample/ analysis may be done to look for fat in stools, which is a sign that the individual may not be getting enough nutrition. This happens when the pancreas no longer produces the enzymes they need to digest the fat.

TREATMENT

Treatment of pancreatitis depends on whether there is a sudden (acute) attack of pancreatitis or the patients have had the condition for a long time (chronic).

Initial treatment

For acute pancreatitis.

- Treatment will be given in the hospital to allow the pancreas to heal.
- Intravenous (IV) fluids to replace lost fluids and maintain the blood pressure.
- Medications to control pain, until the inflammation goes away.

To help rest the pancreas, the patient will not be given anything to eat.

If gallstones are causing pancreatitis, a procedure called ERDP may be done.

- Endoscopic retrograde cholangiopancreatogram (ERCP) to remove the stones from the common bile duct.

After recovering from pancreatitis, the patient may have surgery to remove the gallbladder. This surgery often prevents future attacks of pancreatitis.

For chronic pancreatitis

Individuals who have chronic pancreatitis also may have episodes of acute pancreatitis, which are treated the same as an initial episode of acute pancreatitis.

Ongoing treatment

Excessive use of alcohol is the most common cause of chronic pancreatitis.

It is extremely important that the patient stops drinking alcohol.

Drinking even small amounts can cause severe pain and complications.

If the patients have chronic pancreatitis, they may s ongoing pain.

Treatment for pain includes:

- Avoiding alcohol,
- eating a low-fat diet,
- using pain medication, and
- in some cases taking enzyme pills to help rest the pancreas.

The patient may need surgery or another procedure to widen a narrow pancreatic duct or to remove tissue or stones that are blocking the pancreatic duct. Surgery can also drain a pseudocyst or an obstructed duct. A pancreatic pseudocyst is a sac of fluid and tissue around the pancreas.

Complications of chronic pancreatitis may include:

- recurring flare-ups of symptoms,
- fluid buildup, and
- blockage of a blood vessel,
- the bile duct, or the small intestine.
- Chronic pancreatitis also increases your risk of pancreatic cancer.

Treatment if the condition gets worse

In advanced chronic pancreatitis, the body may not absorb fat.

This causes loose, oily, especially foul-smelling stools (called steatorrhea). Patient may lose weight as a result, because the pancreas no longer produces the enzymes is needed to digest fat and protein.

Pancreatic enzyme pills can replace lost enzymes.

The patient may need insulin if the pancreas has stopped producing enough of it.

If infection develops, patient may need antibiotics and surgery may be done to remove infected and dead tissue. But surgery is avoided whenever possible, because the pancreas is damaged easily.

- **Pain medication.** Mild pain is first treated with a medicine such as acetaminophen or ibuprofen. If you have stronger pain, you may be given an opiate pain reliever.
- **Pancreatic enzyme supplements.** In advanced chronic pancreatitis, the pancreas may stop producing the enzymes needed to digest fats, proteins, and carbohydrates. Enzyme supplements at meals can help the body digest fats, allowing you to retain nutrients and gain weight.
- **Insulin.** Advanced chronic pancreatitis can lead to diabetes if the part of the pancreas that produces insulin becomes damaged.

CAUTION!!!

Side effects of pancreatic enzymes that are given to treat chronic pancreatitis include:

- Abdominal (belly) discomfort and soreness of the mouth and the anus.
- Patients who are allergic to pork or who do not eat pork for other reasons should not take these enzymes, because they are made of pork protein.
- In young children, high doses of pancreatic enzymes could cause a bowel obstruction.

Surgery

Surgery of the pancreas is avoided, if possible, because the gland is easily damaged. But surgery may be needed to remove infected or damaged tissue (pancreatic necrosis). The gallbladder may be removed to prevent future attacks from gallstones.

Surgery choices

One of two surgeries can be done to remove the gallbladder if gallstones are causing pancreatitis:

- Laparoscopic gallbladder surgery
- Open gallbladder surgery

Surgeons may choose among several techniques to remove damaged pancreatic tissue.

Endoscopic retrograde cholangiopancreatogram (ERCP) is a procedure used to remove one or more gallstones from the common bile duct. ERCP can also be used to widen or drain blocked ducts and insert stents.

Cirrhosis of the Liver

The liver weighs about 3 pounds and is the largest solid organ in the body. It performs many important functions, such as:

- Manufacturing blood proteins that aid in clotting, oxygen transport, and immune system function
- Storing excess nutrients and returning some of the nutrients to the bloodstream
- Manufacturing bile, a substance needed to help digest food
- Helping the body store sugar (glucose) in the form of glycogen
- Ridding the body of harmful substances in the bloodstream, including drugs and alcohol
- Breaking down saturated fat and producing cholesterol

Cirrhosis is a slowly progressing disease in which healthy liver tissue is replaced with scar tissue, eventually preventing the liver from functioning properly. The scar tissue blocks the flow of blood through the liver and slows the processing of nutrients, hormones, drugs, and naturally produced toxins. It also slows the production of proteins and other substances made by the liver.

According to the National Institutes of Health, cirrhosis is the 12th leading cause of death by disease.

Causes Cirrhosis of the Liver

- Hepatitis C, fatty liver, and alcohol abuse are the most common causes of cirrhosis of the liver in the U.S.A. but anything that damages the liver can also cause cirrhosis, including:

- Fatty liver that is associated with diabetes and obesity.

- Chronic viral infections of the liver (hepatitis types B, C, and D; Hepatitis D is extremely rare).

- Blockage of the bile duct, which carries bile formed in the liver to the intestines, where it helps in the digestion of fats; in babies, this can be caused by biliary atresia in which bile ducts are absent or damaged, causing bile to back up in the liver.

  In adults, bile ducts may become inflamed, blocked, or scarred, due to another liver disease called primary biliary cirrhosis.

- Repeated episodes of heart failure with fluid backing up into the liver

- Certain inherited diseases such as:Cystic fibrosis

- Glycogen storage diseases, in which the body is unable to process glycogen, a form of sugar that is converted to glucose and serves as a source of energy for the body

- Alpha 1 antitrypsin deficiency, an absence of a specific enzyme in the liver

- Diseases caused by abnormal liver function, such as hemochromatosis a condition in which excessive iron is absorbed and deposited into the liver and other organs, and Wilson's disease, caused by the abnormal storage of copper in the liver

Less likely cause of cirrhosis include:

- Reactions to prescription drugs,
- prolonged exposure to environmental toxins, or
- parasitic infections.

Most individuals who drink large amounts of alcohol harm the liver, but not all of these individuals will develop cirrhosis of the liver. Evidence shows that women who are heavy drinkers are at higher risk than men and other individuals who have hepatitis B or hepatitis C are more likely to experience liver damage from alcohol.

**Hepatitis D is also known as delta hepatitis, is a liver infection that is caused by the Hepatitis D virus (HDV). Hepatitis D is uncommon in the United States. Hepatitis D only occurs among people who are infected with the Hepatitis B virus because HDV is an incomplete virus that requires the helper function of HBV to replicate.

HDV can be an acute, short-term, infection or a long-term, chronic infection. Hepatitis D is transmitted through percutaneous or mucosal contact with infectious blood and can be acquired either as a coinfection with HBV or as superinfection in people with HBV infection. There is no vaccine for Hepatitis D, but it can be prevented in persons who are not already HBV-infected by Hepatitis B vaccination (CDC 2015).

Symptoms of Cirrhosis of the Liver

The symptoms of cirrhosis of the liver vary with the stage of the illness. In the beginning stages, there may not be any symptoms. As the disease worsens, symptoms may include:

- Loss of appetite
- Lack of energy (fatigue), which may be debilitating
- Weight loss or sudden weight gain
- Bruises
- Yellowing of skin or the whites of eyes (jaundice)
- Itchy skin
- Fluid retention (edema) and swelling in the ankles, legs, and abdomen

- A brownish or orange tint to the urine
- Light colored stools
- Confusion, disorientation, personality changes
- Blood in the stool
- Fever

Cirrhosis of the Liver Diagnosis

Cirrhosis of the liver is diagnosed through several methods:

Physical exam

During a physical exam, the healthcare provider can observe changes in how the liver feels or how large it is (for example the liver with cirrhosis is bumpy and irregular instead of being smooth).

Blood tests

If the physician /healthcare provider suspects cirrhosis, blood tests will be done to find out if liver disease is present.

Other tests

In other cases, other exams that take pictures of the liver may be completed, for example a computerized tomography (CT scan), ultrasound, or another specialized procedure such as radioisotope liver/spleen scan.

Biopsy

A biopsy may confirm the diagnosis by taking a sample of tissue (biopsy) from the liver.

Surgery

In some cases, cirrhosis is diagnosed during surgery when the surgeon is able to see the entire liver. The liver also can be inspected through a laparoscope, a viewing device that is inserted through a tiny incision in the abdomen.

Complications caused by Cirrhosis of the Liver

Some complications associated with cirrhosis of the liver include:

Variceal bleeding.

Variceal bleeding is caused by portal hypertension, which is an increase in the pressure within the portal vein (the large vessel that carries/ transports blood from the digestive organs to the liver).

This increase in pressure is caused by a blockage of blood flow through the liver as a result of the cirrhosis.

Increased pressure in the portal vein causes other veins in the body to enlarge (varices), such as those in the esophagus and stomach, to bypass the blockage.

These varices become fragile and can bleed easily, which can lead to severe hemorrhaging and fluid in the abdomen.

Confused thinking and other mental changes (hepatic encephalopathy).

Hepatic encephalopathy most often occurs when cirrhosis has been present for a long time. Toxins produced in our intestines are normally detoxified by the liver, but when cirrhosis occurs, the liver cannot detoxify as well. Therefore the toxins get into the bloodstream and can lead to changes in behavior, confusion, and sometimes coma.

Other serious complications of cirrhosis of the liver include:

- Kidney failure
- Reduced oxygen in the blood
- Diabetes
- Changes in blood counts
- Increased risk of infections
- Excessive bleeding and bruising
- Breast enlargement in men
- Premature menopause

- Loss of muscle mass

Most of these complications can initially be treated with medications or dietary changes. Whenever treatment for these complications becomes ineffective, a liver transplant is usually considered.

Almost all of the complications can be cured by the liver transplantation; however, in many circumstances, careful management can reduce the harmful effects of cirrhosis and delay or even prevent the need for a liver transplant.

Treatment for Cirrhosis of the Liver

There is no cure for cirrhosis of the liver, but there are treatments available that can:

- Delay or stop its progress,
- minimize the damage to liver cells, and
- Reduce complications.

The treatment used depends on the cause of cirrhosis of the liver.

For cirrhosis that is caused by alcohol abuse, the individual must stop drinking alcohol to stop the progression of cirrhosis.

If an individual has hepatitis, the healthcare provider may prescribe antiviral or steroids medications to reduce the liver cell injury.

For individuals with cirrhosis that is caused by autoimmune diseases, Wilson's disease, or hemochromatosis, the treatment will vary.

Medications may be given to control the symptoms of cirrhosis.

Edema (fluid retention) and ascites (fluid in the abdomen) are treated, in part, by reducing salt in the diet. Diuretics are used to remove excess fluid and to prevent edema from recurring.

Diet and medication therapies can help improve the altered mental function that cirrhosis can cause.

Laxatives such as lactulose may be given to help absorb toxins and speed their removal from the intestines.

Liver transplantation may be needed for some individuals with severe cirrhosis.

Preventing Cirrhosis of the Liver

There are several ways to reduce the risk of developing cirrhosis of the liver.

Educate the patients;

Do not abuse alcohol. If drinking alcohol, limit how the amount and how often.
Remember, it is not only the heavy drinker will develop cirrhosis.

- Drinking more than 2 drinks a day, will increase the risk.
- A drink is a 5-oz glass of wine, a 12-oz can of beer, or a 1 1/2-oz portion of hard liquor.

Avoid high-risk sexual behavior such as unprotected sexual contact with multiple partners.

Be careful around synthetic chemicals, such as cleaning products and pesticides.
If the individuals come into contact with chemicals very often, encourage to wear protective clothing and a facemask.

Encourage the patients to get vaccinated against hepatitis B.

Teach the patients to:
Eat a well-balanced,
low-fat diet
Diet high in fruits and vegetables and
To take vitamins.

Teach patients the importance of maintaining a healthy weight, because the excess body fat can lead to fatty liver, which may contribute to liver disease.

ESOPHAGEAL VARICES

Bleeding esophageal varices are enlarged veins in the walls of the lower part of the esophagus that bleed. The esophagus is the tube that connects the throat to the stomach.

Causes

Scarring (cirrhosis) of the liver is the most common cause of esophageal varices. The scarring cuts down on blood that is flowing through the liver. Therefore as a result, more blood flows through the veins of the esophagus. The extra blood flow causes the blood vessels /veins in the esophagus to balloon outward. Heavy bleeding can occur if the veins break open.

Any type of chronic liver disease can cause esophageal varices. Varices can also occur in the upper part of the stomach.

Symptoms

Individuals with chronic liver disease and esophageal varices may have no symptoms.

If there is only a small amount of bleeding, the only symptom may be dark or black streaks in the stools.

If larger amounts of bleeding occur, symptoms may include:

- Black, tarry stools
- Bloody stools
- Light-headedness
- Paleness
- Symptoms of chronic liver disease
- Vomiting
- Vomiting blood

Exams and Tests

The physician will complete a physical exam which may show:

- Bloody or black stool (in a rectal exam)
- Low blood pressure
- Rapid heart rate
- Signs of chronic liver disease or cirrhosis

Tests to find the source of the bleeding and determine if there is active bleeding include:

- Esophagogastroduodenoscopy (EGD), which involves-the use of a camera on a flexible tube to examine the upper gastrointestinal system
- Insertion of a tube through the nose into the stomach (nasogastric tube) to look for signs of bleeding

Some physicians recommend EGD for patients who are newly diagnosed with mild to moderate cirrhosis. This test will screen for esophageal varices and treats them before there is bleeding.

Treatment

The goal of treatment is to stop acute bleeding as soon as possible.
Bleeding must be controlled quickly to prevent shock and death.
If massive bleeding occurs, a person may need to be put on a ventilator to protect the airways and prevent blood from going down into the lungs.

To treat acute bleeding:

- The health care provider may inject the varices directly with a clotting medicine, or place a rubber band around the bleeding veins. This procedure is done using a small lighted tube called an endoscope.
- A medication that tightens blood vessels (vasoconstriction) may be used. Examples include octreotide or vasopressin.
- Rarely, a tube may be inserted through the nose into the stomach and inflated with air. This produces pressure against the bleeding veins (balloon tamponade).

Once the bleeding is stopped, varices can be treated with medicines and medical procedures to prevent future bleeding including:

- Drugs called beta blockers, such as propranolol and nadolol that reduce the risk of bleeding.
- A rubber band can be placed around the bleeding veins during an EGD procedure.
- Transjugular intrahepatic portosystemic shunt (TIPS). This is a procedure to create new connections between two blood vessels in the liver. This can decrease pressure in the veins and prevent bleeding episodes from happening again.
  Emergency surgery may be used (rarely) to treat patients if other therapy fails. Portocaval shunts or surgery to remove the esophagus are two treatment options, but these procedures are risky.

  Patients with bleeding varices from liver disease may need more treatment for their liver disease, including a liver transplant.

  Prognosis
  Bleeding often comes back with or without treatment. Bleeding esophageal varices are a serious complication of liver disease and have a poor outcome. Placement of a shunt can result in a decrease of blood supply to the brain, leading to mental status changes or encephalopathy.

Possible Complications

- Encephalopathy (called hepatic encephalopathy)
- Esophageal stricture after surgery or endoscopic therapy
- Hypovolemic shock
- Infection (pneumonia, bloodstream infection, peritonitis)
- Return of bleeding after treatment

Prevention

Treating the causes of liver disease may prevent bleeding.

Preventive treatment of varices with drugs such as beta blockers or with endoscopic banding may help prevent bleeding. Liver transplantation is considered for some patients.

ASCITES- Portal hypertension

Ascites is the build-up of fluid in the space between the lining of the abdomen and abdominal organs.

Causes

Ascites results from high pressure in the blood vessels of the liver (portal hypertension) and low levels of a protein called albumin.

Diseases that can cause severe liver damage can lead to ascites. Some of them include long-term hepatitis C or B infection and alcohol abuse over many years.

Individuals with certain cancers in the abdomen may develop ascites. These include:

- Cancer of the colon,
- Cancer of the ovaries,
- Cancer of the uterus,
- Cancer of the pancreas, and
- Cancer of the liver.

Other conditions that can cause this problem include:

- Clots in the veins of the liver (portal vein thrombosis)
- Congestive heart failure
- Pancreatitis
- Thickening and scarring of the sac-like covering of the heart

Kidney dialysis may also be linked to ascites.

Symptoms

Symptoms may develop slowly or suddenly depending on the cause of ascites. Some individuals may have no symptoms if there is only a small amount of fluid in the belly.

As more fluid collects, they may have abdominal pain and bloating. Large amounts of fluid can cause shortness of breath.

Many other symptoms of liver failure may also be present.

Exams and Tests

Physical examination is done to determine the amount of swelling in the belly.

Other tests to assess the liver and kidneys may include:

- 24-hour urine collection
- Electrolyte levels
- Kidney function tests
- Liver function tests
- Tests to measure the risk of bleeding and protein levels in the blood
- Urinalysis
- Abdominal ultrasound

The physician may also use a thin needle to withdraw ascites fluid from the belly. The fluid is tested to look for the cause of ascites.

Treatment

The condition that causes ascites will be treated, if possible.

Treatments for fluid build-up may include lifestyle changes:

- Avoiding alcohol

- Lowering salt in the diet (no more than 1,500 mg/day of sodium)
- Limiting fluid intake

Some medication may include:

- Diuretics - to get rid of extra fluid
- Antibiotics for infections

Some procedures may include:

- Paracentesis - Inserting a tube into the belly to remove large volumes of fluid
- Placing a special tube or shunt inside the belly to repair blood flow to the liver

Patients with end-stage liver disease may need a liver transplant.

Possible Complications

Complications may include:

- Spontaneous bacterial peritonitis (a life-threatening infection of the ascites fluid)
- Hepatorenal syndrome (kidney failure)
- Weight loss and protein malnutrition
- Mental confusion, change in the level of alertness, or coma (hepatic encephalopathy)
- Other complications of liver cirrhosis

Patients with ascites, needs to call the health care provider right away if they have:

- Fever above 100.5°F (38.05°C), or a fever that does not go away
- Belly pain
- Blood in your stool or black, tarry stools
- Blood in your vomit
- Bruising or bleeding that occurs more easily
- Build-up of fluid in your belly
- Swollen legs or ankles
- Breathing problems
- Confusion or problems staying awake
- Yellow coloring of skin and whites of the eyes (jaundice)

HEPATIC ENCEPHALOPATHY

Hepatic encephalopathy is the decline in brain function that occurs when the liver is unable to remove toxins from the blood.

Causes

The exact cause of hepatic encephalopathy is unknown. Hepatic encephalopathy is brought on by disorders that affect the liver.

These include:

- Conditions that reduce liver function (such as cirrhosis or hepatitis)
- Conditions in which blood circulation does not enter the liver

An important job of the liver is to make toxic substances in the body harmless. These can include substances made by the body as well things that are administered in (for example medications). However, when the liver is damaged, these poisons can build up in the bloodstream.

Ammonia, which is produced by the body when proteins are digested, is one of the substances normally made harmless by the liver. Other toxins may also build up. These things can cause damage to the nervous system.

When liver damage occurs, hepatic encephalopathy may occur suddenly, even in people who have not had liver problems in the past. More often, the problem develops in people with chronic liver disease.

Hepatic encephalopathy may be triggered by:

- Dehydration
- Eating too much protein
- Electrolyte abnormalities (especially a decrease in potassium) from vomiting, or from treatments such as paracentesis or taking diuretics.
- Bleeding from the intestines, stomach, or esophagus
- Infections
- Kidney problems
- Low oxygen levels in the body
- Shunt placement or complications
- Surgery
- Medications that suppress the central nervous system (such as barbiturates or benzodiazepine tranquilizers)

Disorders that can appear similar to hepatic encephalopathy include:

- Alcohol intoxication
- Complicated alcohol withdrawal
- Meningitis
- Metabolic abnormalities such as low blood glucose

- Sedative overdose
- Subdural hematoma (bleeding under the skull)
- Wernicke-Korsakoff syndrome

In some cases, hepatic encephalopathy is a short-term problem that can be corrected. It may also occur as part of a chronic problem from liver disease that gets worse over time.

Symptoms

Symptoms may begin slowly and slowly get worse. They may also begin suddenly and be severe from the start.

Early symptoms may be mild and include:

- Breath with a musty or sweet odor
- Change in sleep patterns
- Changes in thinking
- Mild Confusion
- Forgetfulness
- Mental fogginess
- Personality or mood changes
- Poor concentration
- Poor judgment
- Worsening of handwriting or loss of other small hand movements

More severe symptoms may include:

- Abnormal movements or shaking of hands or arms
- Agitation, excitement, or seizures

- Disorientation
- Drowsiness or confusion
- Strange behavior or severe personality changes
- Slurred speech
- Slowed or sluggish movement

  - People with hepatic encephalopathy can become unconscious, unresponsive, and possibly enter a coma.

Patients are often not able to care for themselves because of these symptoms.

Exams and Tests

Signs of nervous system changes may include:

- Shaking of the hands when trying to hold arms in front of the body and lift the hands
- Problems with thinking and doing mental tasks
- Signs of liver disease, such as yellow skin and eyes (jaundice) and fluid collection in the abdomen- ascites.
- Musty odor to the breath and urine

Tests may include:

- Complete blood count or hematocrit to check for anemia
- CT scan of the head or MRI
- EEG
- Liver function tests
- Prothrombin time
- Serum ammonia levels
- Sodium level in the blood
- Potassium level in the blood

- BUN and creatinine to see how the kidneys are working

Treatment

Hepatic encephalopathy can be a medical emergency that requires a hospital stay.

The first step is to identify and treat any factors that may have caused hepatic encephalopathy.

Gastrointestinal bleeding must be stopped. The intestines must be emptied of blood. Infections, kidney failure, and electrolyte abnormalities (especially potassium) need to be treated.

Life support may be necessary to help with breathing or blood circulation, particularly if the person is in a coma. The brain may swell, which can be life-threatening.

If the problem is very bad, you may need to cut down the protein in your diet. However, too little protein can cause malnutrition, so you should talk to a dietitian about how to change your diet. People who are very ill may need intravenous or tube feedings.

Lactulose may be given to prevent intestinal bacteria from creating ammonia and to remove blood from the intestines.

Neomycin to reduce ammonia production by intestinal bacteria.

Rifaximin, antibiotic is also effective in hepatic encephalopathy.

patients may need to avoid sedatives, tranquilizers, and any other medications that are broken down by the liver.

Medications containing ammonium (including certain antacids) should also be avoided.

Possible Complications

- Brain herniation
- Brain swelling
- Increased risk of heart, kidney, and breathing problems

- Increased risk of body-wide infection
- Permanent nervous system damage
- Coma that continues to get worse
- Side effects of medications

Patient teaching:

Call the physician/ health care provider if you or others around you notice any problems with your mental state or nervous system function. This is very important for people who already have a liver disorder. Hepatic encephalopathy can get worse quickly and become an emergency condition.

Prevention

Treating liver problems may prevent hepatic encephalopathy.

Avoiding heavy drinking and intravenous drug use can prevent many liver disorders.

HEPATITIS

Viral hepatitis, including:

- Hepatitis A, hepatitis B, and hepatitis C, are distinct diseases that affect the liver and have different hepatitis symptoms and treatments.

Other causes of hepatitis include:

- Bacteria,
- toxic or chemical injury
- recreational drugs and prescription medications.

Hepatitis type is determined by laboratory tests.

Hepatitis means inflammation of the liver. Some drugs /medications, toxins, some diseases, heavy alcohol intake, and viral and bacterial infections can all cause hepatitis. Hepatitis is also the name of a family of viral infections that affect the liver; the most common types are Hepatitis A, Hepatitis B, and Hepatitis C.

The difference between Hepatitis A, Hepatitis B, and Hepatitis C

Hepatitis A, Hepatitis B, and Hepatitis C are diseases caused by three different viruses. Although each can cause similar symptoms, they have different modes of transmission and can affect the liver differently. Hepatitis A appears only as an acute or newly occurring infection and does not become chronic. People with Hepatitis A usually improve without treatment. Hepatitis B and Hepatitis C can also begin as acute infections, but in some people, the virus remains in the body, resulting in chronic disease and long-term liver problems.

There are vaccines to prevent Hepatitis A and B; however, there is not one for Hepatitis C. If an individual has had one type of viral hepatitis in the past, it is still possible to get the other types.

Hepatitis A

Hepatitis A is a liver infection caused by the Hepatitis A virus (HAV).

- Hepatitis A is highly contagious.
- It is usually transmitted by the fecal-oral route, either through person-to-person contact or consumption of contaminated food or water.

Hepatitis A is a self-limited disease that does not result in chronic infection. More than 80% of adults with Hepatitis A have symptoms but the majority of children does not have symptoms or have an unrecognized infection. Antibodies produced in response to

Hepatitis A last for life and protect against reinfection. The best way to prevent Hepatitis A is by getting vaccinated.

Hepatitis A rates in the United States have declined by 95% since Hepatitis A vaccine first became available in 1995. The following information is from the CDC 2015; for more data/ information see CDC.gov.

HAV transmitted:

- Person-to-person transmission through the fecal-oral route (ingestion of something that has been contaminated with the feces of an infected person) is the primary means of HAV transmission in the United States. Most infections result from close personal contact with an infected household member or sex partner.
- Common-source outbreaks and sporadic cases also can occur from exposure to fecally contaminated food or water**.** Uncooked HAV-contaminated foods have been recognized as a source of outbreaks. Cooked foods also can transmit HAV if the temperature during food preparation is inadequate to kill the virus or if food is contaminated after cooking, as occurs in outbreaks associated with infected food handlers. Waterborne outbreaks are infrequent in developed countries with well-maintained sanitation and water supplies.

Increased risk for acquiring HAV infection

- Travelers to countries with high or intermediate endemicity of HAV infection
- Men who have sex with men
- Users of injection and non-injection illegal drugs
- Persons with clotting factor disorders
- Persons working with nonhuman primates

Signs and symptoms of HAV infection

Some persons, particularly young children, are asymptomatic. When symptoms are present, they usually occur abruptly and can include the following:

- Fever
- Fatigue
- Loss of appetite
- Nausea
- Vomiting
- Abdominal pain
- Dark urine
- Clay-colored bowel movements
- Joint pain
- Jaundice

In children aged <6 years, 70% of infections are asymptomatic; if illness does occur, it is typically not accompanied by jaundice. Among older children and adults, infection is typically symptomatic, with jaundice occurring in >70% of patients.

Symptoms Duration

Symptoms usually last less than 2 months, although 10%–15% of symptomatic persons have prolonged or relapsing disease for up to 6 months.

Incubation period for Hepatitis A

The average incubation period for Hepatitis A is 28 days (range: 15–50 days).

HAV survive outside the body for months

HAV can live outside the body for months, depending on the environmental conditions. The virus is killed by heating to >185 degrees F (>85 degrees C) for one minute. However, the virus can still be spread from cooked food if it is contaminated after cooking. Adequate chlorination of water, as recommended in the United States, kills HAV that enters the water supply.

Prevention of HAV infection

Vaccination with the full, two-dose series of Hepatitis A vaccine is the best way to prevent HAV infection. Hepatitis A vaccine has been licensed in the United States for use in persons 12 months of age and older. The vaccine is recommended for persons

who are more likely to get HAV infection or are more likely to get seriously ill if they get Hepatitis A, and for any person wishing to obtain immunity.

Immune globulin is available for short-term protection (approximately 3 months) against Hepatitis A, both pre- and post-exposure. Immune globulin must be administered within 2 weeks after exposure for maximum protection.

Good hygiene; including hand washing after using the bathroom, changing diapers, and before preparing or eating food, is also integral to Hepatitis A prevention, given that the virus is transmitted through the fecal–oral route.

Hepatitis A Vaccination

Hepatitis A vaccination is recommended for all children at age 1 year, for persons who are at increased risk for infection, for persons who are at increased risk for complications from Hepatitis A, and for any person wishing to obtain immunity. The following groups are recommended to receive Hepatitis A vaccination:

All children at age 1 year (i.e., 12–23 months). Children who have not been vaccinated by age 2 can be vaccinated at subsequent visits.

Children and adolescents ages 2–18 who live in states or communities where routine Hepatitis A vaccination has been implemented because of high disease incidence**.** Before 2006, when Hepatitis A vaccination was first recommended for all children at age 1 year, vaccination had been targeted to children living in states or communities that had historically high rates of Hepatitis A.

States, counties, and communities with existing Hepatitis A vaccination programs for children aged 2–18 years are encouraged to maintain these programs. In those communities, new efforts focused on routine vaccination of children at age 1 year should enhance, not replace, ongoing programs directed at a broader population of children.

Persons traveling to or working in countries that have high or intermediate rates of Hepatitis A.

Persons from developed countries who travel to developing countries are at high risk for Hepatitis A. The risk for Hepatitis A exists even for travelers to urban areas, those who

stay in luxury hotels, and those who report that they have good hygiene and that they are careful about what they drink and eat.

Men who have sex with men. Sexually active men (both adolescents and adults) who have sex with men should be vaccinated. Hepatitis A outbreaks among men who have sex with men have been reported frequently. Recent outbreaks have occurred in urban areas in the United States, Canada, and Australia.

Users of illegal injection and noninjection drugs. During the past two decades, outbreaks of Hepatitis A have been reported with increasing frequency among users of both injection and noninjection drugs (e.g., methamphetamine) in North America, Europe, and Australia.

Persons who have occupational risk for infection. Persons who work with HAV-infected primates or with HAV in a research laboratory setting should be vaccinated. No other groups have been shown to be at increased risk for HAV infection because of occupational exposure.

Persons who have chronic liver disease. Persons with chronic liver disease who have never had Hepatitis A should be vaccinated, as they have a higher rate of fulminant Hepatitis A (rapid onset of liver failure, often leading to death). Persons who are either awaiting or have received liver transplants also should be vaccinated.

Persons who have clotting-factor disorders. Persons who have never had Hepatitis A and who are administered clotting-factor concentrates, especially solvent detergent-treated preparations, should be vaccinated.

Household members and other close personal contacts of adopted children newly arriving from countries with high or intermediate hepatitis A endemicity.

Hepatitis A vaccines are licensed for use in the United States

Two single-antigen Hepatitis A vaccines, HAVRIX® (manufactured by GlaxoSmithKline) and VAQTA® (manufactured by Merck & Co., Inc), are currently licensed in the United States. A combination vaccine, TWINRIX® (manufactured by GlaxoSmithKline), contains both HAV (in a lower dosage) and Hepatitis B virus antigens. All are inactivated vaccines (CDC 2015).

Protection from Hepatitis A vaccine last

A recent review by an expert panel, which evaluated the projected duration of immunity from vaccination, concluded that protective levels of antibody to HAV could be present for at least 25 years in adults and at least 14–20 years in children (CDC 2015).

Hepatitis A vaccine can be administered concurrently with other vaccines:

- Hepatitis B,
- diphtheria,
- poliovirus (inactivated and oral),
- tetanus,
- oral and intramuscular typhoid,
- cholera,
- Japanese encephalitis,
- rabies, and
- yellow fever vaccines and immune globulin

  can all be given at the same time that Hepatitis A vaccine is given, but at a different injection site.

When the second (last) dose of Hepatitis A vaccine is delayed;

The second dose should be administered as soon as possible. The first dose does not need to be re-administered.

Hepatitis A vaccine during pregnancy

The safety of Hepatitis A vaccination during pregnancy has not been determined; however, because the vaccine is produced from inactivated HAV, the theoretical risk to the developing fetus is expected to be low. The risk associated with vaccination, however, should be weighed against the risk for Hepatitis A in women who might be at high risk for exposure to HAV.

Hepatitis A vaccine and immunocompromised individuals .

Because Hepatitis A vaccine is inactivated, no special precautions need to be taken when vaccinating immunocompromised individuals such as persons on hemodialysis or persons with AIDS.

Administering an extra dose(s) of Hepatitis A or Hepatitis B vaccine or to repeat the entire vaccine series if documentation of vaccination history is unavailable.
If it is necessary, administering an extra dose of Hepatitis A or Hepatitis B vaccine is not harmful.

Prevaccination testing
Prevaccination testing is recommended only in specific circumstances to reduce the costs of vaccinating individuals who are already immune to Hepatitis A, including:

- Individuals who were born in geographic areas with a high or intermediate prevalence of HAV infection
- Older adolescents and adults in certain population groups such as American Indians, Hispanics and Alaska Natives.
- Adults in groups that have a high prevalence of infection such as injection drug users.

Prevaccination testing might also be warranted for all older adults. The decision to test should be based on

- The expected prevalence of the immunity,
- The cost of vaccination compared with cost of serologic testing, and
- The likelihood that testing will not interfere with initiation of the vaccination.

Postvaccination testing
Postvaccination testing is not indicated because of the high rate of vaccine response among children and adults. Also, not all testing methods approved for routine diagnostic use in the United States have the sensitivity to detect low, but protective, anti-HAV concentrations after vaccination.

Hepatitis A and International Travel

Who should receive protection against Hepatitis A -before travel

All susceptible individuals traveling to or working in countries that have high or intermediate rates of Hepatitis A should be vaccinated or receive immune globulin (IG) before traveling. Persons from developed countries who travel to developing countries are at high risk for Hepatitis A. The risk for Hepatitis A exists even for travelers to urban areas, those who stay in luxury hotels, and those who report that they have good hygiene and that they are careful about what they drink and eat.

The first dose of Hepatitis A vaccine should be administered as soon as travel is considered.

Previously, Hepatitis A vaccination was recommended to be administered at least 2–4 weeks before departure to an area with intermediate or high rates of Hepatitis A. Travelers who were departing in less than 2 weeks were recommended to receive immune globulin (IG) for short-term protection.

However, on the basis of data indicating that immune globulin and vaccine have equivalent postexposure efficacy among healthy persons aged ≤40 years, the Advisory Committee on Immunization Practices (ACIP) has amended its guidelines for Hepatitis A vaccination for travelers.

ACIP now recommends that one dose of single-antigen Hepatitis A vaccine administered at any time before departure may provide adequate protection for most healthy persons.

For optimal protection, older adults, immunocompromised persons, and individuals with chronic liver disease or other chronic medical conditions who are planning to depart in ≤2 weeks should receive the initial dose of vaccine and also can simultaneously be administered IG (0.02 mL/kg) at a separate anatomic injection site.

For travelers who cannot receive Hepatitis A vaccine

Travelers who are allergic to a vaccine component, who elect not to receive vaccine, or who are aged <12 months should receive a single dose of IG (0.02 mL/kg), which

provides effective protection against Hepatitis A virus infection for up to 3 months. Travelers whose travel period exceeds 2 months should be administered IG at 0.06 mL/kg; administration must be repeated if the travel period exceeds 5 months.

For travelers less than 12 months of age

Immune globulin is recommended because Hepatitis A vaccine is currently not approved for use in this age group.

Postexposure Prophylaxis for Hepatitis A

CDC guidelines for postexposure protection against Hepatitis A;

Until recently, an injection of immune globulin (IG) was the only recommended way to protect individuals after they have been exposed to Hepatitis A virus. In June 2007, U.S. guidelines were revised to allow for Hepatitis A vaccine to be used after exposure to prevent infection in healthy persons aged 1–40 years.

Individuals who have recently been exposed to HAV and who have not been vaccinated previously should be administered a single dose of single-antigen Hepatitis A vaccine or IG (0.02 mL/kg) as soon as possible, within 2 weeks after exposure**.** The guidelines vary by age and health status:

- For healthy persons aged 12 months–40 years, single-antigen Hepatitis A vaccine at the age-appropriate dose is preferred to IG because of the vaccine's advantages, including long-term protection and ease of administration, as well as the equivalent efficacy of vaccine to IG.
- For persons aged 40 years and older, IG is preferred because of the absence of information regarding vaccine performance in this age group and because of the more severe manifestations of Hepatitis A in older adults. The magnitude of the risk of HAV transmission from the exposure should be considered in decisions to use vaccine or IG in this age group.
- Vaccine can be used if IG cannot be obtained.
- IG should be used for children aged less than12 months, immunocompromised persons, individuals with chronic liver disease, and persons who are allergic to the vaccine or a vaccine component.

Hepatitis B Virus (HBV)

Hepatitis B virus (HBV) is a pathogenic microorganism that can cause potentially life threatening disease in humans. HBV infection is transmitted through exposure to blood and other potentially infectious materials (OPIM), as defined in the OSHA Bloodborne Pathogens standard, 29 CFR 1910.1030. HBV is found in highest concentrations in blood and in lower concentrations in other body fluids (e.g., semen, vaginal secretions and wound exudates) The HBV vaccine is very effective.

The CDC states that health care workers who have received hepatitis B vaccine and have developed immunity to the virus are at virtually no risk for infection. For an unvaccinated person, the risk from a single needlestick or a cut exposure to HBV-infected blood ranges from 6%–30% and depends on the hepatitis B e antigen (HBeAg) status of the source individual. Individuals who are both hepatitis B surface antigen (HBsAg) positive and HBeAg positive have more viruses in their blood and are more likely to transmit HBV.

Transmission, Symptoms, and Treatment

HBV is transmitted through activities that involve percutaneous such as puncture through the skin, or mucosal contact with infectious blood or body fluids for example saliva, semen including:

- Sex with an infected partner
- Injection drug use that involves sharing needles, syringes, or drug-preparation equipment
- Birth to an infected mother
- Contact with blood or open sores of an infected person
- Needle sticks or sharp instrument exposures
- Sharing items such as razors or toothbrushes with an infected person

HBV is not spread through food or water, sharing eating utensils, breastfeeding, hugging, kissing, hand holding, coughing, or sneezing.

HBV survive outside the body;

HBV can survive outside the body at least 7 days and still be capable of causing infection.

To remove HBV from environmental surfaces:

Any blood spills which include dried blood (which can still be infectious) should be cleaned using 1:10 dilution of one part household bleach to 10 parts of water for disinfecting the area. Gloves should be used when cleaning up any blood spills.

Risk for HBV infection

The following populations are at increased risk of becoming infected with HBV:

- Infants born to infected mothers
- Sex partners of infected persons
- Sexually active persons who are not in a long-term, mutually monogamous relationship for example more than1 sex partner during the previous 6 months
- Men who have sex with men
- Injection drug users
- Household contacts of persons with chronic HBV infection
    - Health care and public safety workers at risk for occupational exposure to blood or blood-contaminated body fluids
    - Hemodialysis patients
    - Residents and staff of facilities for developmentally disabled persons
    - Travelers to countries with intermediate or high prevalence of HBV infection.

International travelers at risk for HBV infection

The risk for HBV infection in international travelers is generally low, except for certain travelers to regions where the prevalence of chronic HBV infection is high or

intermediate (hepatitis B surface antigen prevalence of ≥2%). hepatitis B vaccination should be administered to unvaccinated persons traveling to those countries.

Signs and symptoms of HBV infection

The presence of signs and symptoms varies by age.

Most children under age 5 years and newly infected immunosuppressed adults are asymptomatic, whereas 30%–50% of persons aged ≥5 years have initial signs and symptoms.

When present, signs and symptoms can include:

- Fever
- Fatigue
- Loss of appetite
- Nausea
- Vomiting
- Abdominal pain
- Dark urine
- Clay-colored bowel movements
- Joint pain
- Jaundice

Individuals with chronic HBV infection might be:

- Asymptomatic,
- have no evidence of liver disease, or
- have a spectrum of disease ranging from chronic hepatitis to cirrhosis or hepatocellular carcinoma (a type of liver cancer).

Incubation period for hepatitis B

Symptoms begin an average of 90 days (range: 60–150 days) after exposure to HBV.

Symptoms of acute hepatitis B

Symptoms typically last for several weeks but can persist for up to 6 months.

Acute infection ranges from asymptomatic or mild disease to rarely fulminant (severe and sudden in onset) hepatitis. Disease is more severe among adults aged >60 years. The fatality rate among acute cases reported to CDC is 0.5%–1%.

Chronic HBV infection

Approximately 25% of those who become chronically infected during childhood and 15% of those who become chronically infected after childhood die prematurely from cirrhosis or liver cancer, and the majority remain asymptomatic until onset of cirrhosis or end-stage liver disease. In the United States, chronic HBV infection results in an estimated 2,000–4,000 deaths per year.

The risk for chronic infection varies according to the age at infection and is greatest among young children. Approximately 90% of infants and 25%–50% of children aged 1–5 years will remain chronically infected with HBV. By contrast, approximately 95% of adults recover completely from HBV infection and do not become chronically infected.

Treating HBV infection

For acute infection, no medication is available; treatment is supportive.

For chronic infection, several antiviral drugs (adefovir dipivoxil, interferon alfa-2b, pegylated interferon alfa-2a, lamivudine, entecavir, and telbivudine) are available. individuals with chronic HBV infection require medical evaluation and regular monitoring to determine whether disease is progressing and to identify liver damage or hepatocellular carcinoma.

Hepatitis B Serology

Different hepatitis B serologic markers mean;

Hepatitis B surface antigen (HBsAg): A protein on the surface of HBV; it can be detected in high levels in serum during acute or chronic HBV infection. The presence of HBsAg indicates that the person is infectious. The body normally produces antibodies to

HBsAg as part of the normal immune response to infection. HBsAg is the antigen used to make hepatitis B vaccine.

Hepatitis B surface antibody (anti-HBs): The presence of anti-HBs is generally interpreted as indicating recovery and immunity from HBV infection. Anti-HBs also develop in a person who has been successfully vaccinated against hepatitis B.

Total hepatitis B core antibody (anti-HBc): Appears at the onset of symptoms in acute hepatitis B and persists for life. The presence of anti-HBc indicates previous or ongoing infection with HBV in an undefined time frame.

IgM antibody to hepatitis B core antigen (IgM anti-HBc): Positivity indicates recent infection with HBV (≤6 months). Its presence indicates acute infection.

Hepatitis B e antigen (HBeAg): A secreted product of the nucleocapsid gene of HBV that is found in serum during acute and chronic hepatitis B. Its presence indicates that the virus is replicating and the infected person has high levels of HBV.

Hepatitis B e antibody (HBeAb or anti-HBe): Produced by the immune system temporarily during acute HBV infection or consistently during or after a burst in viral replication. Spontaneous conversion from e antigen to e antibody (a change known as seroconversion) is a predictor of long-term clearance of HBV in patients undergoing antiviral therapy and indicates lower levels of HBV.

Positive blood test (HBsAg-positive)

HBsAg will be detected in an infected individual’s blood an average of 4 weeks (range: 1–9 weeks) after exposure to the virus. About 1 of 2 patients will no longer be infectious by 7 weeks after onset of symptoms, and all patients who do not remain chronically infected will be HBsAg-negative by 15 weeks after onset of symptoms.

Hepatitis B Vaccination

The Advisory Committee on Immunization Practices recommends that the following individuals be vaccinated against hepatitis B:

- Infants, beginning at birth
- All children aged <19 years who have not been previously vaccinated
- Susceptible sex partners of hepatitis B surface antigen (HBsAg)-positive persons
- Sexually active individuals who are not in a long-term, mutually monogamous relationship for example >1 sex partner during the previous 6 months)
- Individuals seeking evaluation or treatment for a sexually transmitted disease
- Men who have sex with other men
- Injection drug users
- Susceptible household contacts of HBsAg-positive individuals
- Healthcare workers and public safety workers at risk for exposure to blood or blood-contaminated body fluids
- Individuals with end-stage renal disease, including predialysis, home dialysis, peritoneal dialysis, and hemodialysis patients
- Residents and employees of facilities for developmentally disabled persons
- Travelers to regions with intermediate or high rates of endemic HBV infection
- Individuals with chronic liver disease
- Individuals with HIV infection
- Unvaccinated adults with diabetes mellitus who are aged 19 through 59 years (discretion of clinicians for unvaccinated adults with diabetes mellitus who are aged ≥60 years)
- All other individuals seeking protection from HBV infection.

Hepatitis B vaccination recommended in certain settings;

In certain health care, evaluation, or treatment settings, a high proportion of clients have known risk factors for HBV infection. The Advisory Committee on Immunization Practices recommends universal vaccination of adults who receive care in those settings, including:

- Sexually transmitted disease treatment institutions /facilities
- HIV testing and treatment institutions /facilities
- Facilities / institutions providing drug-abuse treatment and prevention services
- Healthcare settings targeting services/ programs to injection drug users
- Correctional institution/ facilities

- Healthcare facilities /settings that target services to men who have sex with men
- Chronic hemodialysis facilities/ institution and end-stage renal disease programs
- Institutions/ facilities and nonresidential day care facilities for individuals who are developmentally disabled.

Hepatitis B vaccines licensed for use in the United States

Two single-antigen vaccines and three combination vaccines are currently licensed in the United States.

Single-antigen hepatitis B vaccines

- ENGERIX-B®
- RECOMBIVAX HB®

Combination vaccines

- PEDIARIX®: Combined hepatitis B, diphtheria, tetanus, acellular pertussis (DTaP), and inactivated poliovirus (IPV) vaccine. Cannot be administered before age 6 weeks or after age 7 years.
- TWINRIX®: Combined Hepatitis A and hepatitis B vaccine. Recommended for persons aged ≥18 years who are at increased risk for both Hepatitis A virus and HBV infections.
- COMVAX® (discontinued for purchase as of December 2014): Combined hepatitis B-Haemophilus influenzae type b (Hib) conjugate vaccine. Cannot be administered before age 6 weeks or after age 71 months.

Recommended schedules for hepatitis B vaccination

The vaccination schedule most often used for children and adults is;

- 3 intramuscular injections,
- the second and third doses administered 1 and 6 months, respectively, after the first dose.

Alternate schedules have been approved for certain vaccines and/or populations.

Can Administration of hepatitis B vaccine

When hepatitis B vaccine has been administered at the same time as other vaccines, no interference with the antibody response of the other vaccines has been demonstrated.

Separate body sites and syringes should be used for simultaneous administration of injectable vaccines.

Protection from hepatitis B vaccine last;

Studies indicate that immunologic memory remains intact for at least 20 years among healthy vaccinated individuals who initiated hepatitis B vaccination >6 months of age. The vaccine confers long-term protection against clinical illness and chronic hepatitis B virus infection. Cellular immunity appears to persist even though antibody levels might become low or decline below detectable levels.

Among vaccinated cohorts who initiated hepatitis B vaccination at birth, long-term follow-up studies are ongoing to determine the duration of vaccine-induced immunity.

Infants and hepatitis B vaccine at birth before hospital discharge

Infants born to HBV-infected mothers require hepatitis B vaccine and hepatitis B immune globulin (HBIG) within 12 hours of birth to protect them from infection. However, because errors or delays in documenting, testing, and reporting maternal HBsAg status can and do occur, administering the first dose of hepatitis B vaccine soon after birth to all infants acts as a safety net, reducing the risk for perinatal infection when maternal HBsAg status is either unknown or incorrectly documented at delivery. Also, initiating the hepatitis B vaccine series at birth has been shown to increase a child's likelihood of completing the vaccine series on schedule.

Hepatitis B vaccine given during pregnancy or lactation

Hepatitis B vaccine contains no live virus, so neither pregnancy nor lactation should be considered a contraindication to vaccination of women. On the basis of limited experience, there is no apparent risk of adverse effects to developing fetuses when hepatitis B vaccine is administered to pregnant women. Meanwhile, new HBV infection

in a pregnant woman might result in severe disease for the mother and chronic infection for the newborn.

Hepatitis B vaccine and immunocompromised individuals (such as individuals on hemodialysis or individuals with HIV infection);

Although a larger vaccine dose is required to induce protective antibody in hemodialysis patients. Larger doses or additional doses might also be necessary for other immunocompromised individuals. Serologic testing of hemodialysis patients and other immunocompromised individuals is recommended 1–2 months after administration of the final dose of the primary vaccine series to determine the need for revaccination.

Hepatitis B vaccine administration and other vaccines

When hepatitis B vaccine has been administered at the same time as other vaccines, no interference with the antibody response of the other vaccines has been demonstrated. Separate body sites and syringes should be used for simultaneous administration of injectable vaccines.

Protection from hepatitis B vaccine last;

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Infant receiving hepatitis B vaccine at birth before hospital discharge

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Hepatitis B vaccine and the immunocompromised individuals(persons on hemodialysis or persons with HIV infection)

Although a larger vaccine dose is required to induce protective antibody in hemodialysis patients. Larger doses or additional doses might also be necessary for other immunocompromised persons.

Serologic testing of hemodialysis patients and other immunocompromised individuals is recommended 1–2 months after administration of the final dose of the primary vaccine series to determine the need for revaccination.

Hepatitis C Virus (HCV)

Hepatitis C (HCV) is a liver disease caused by the Hepatitis C virus (HCV). HCV infection sometimes results in an acute illness, but most often becomes a chronic condition that can lead to cirrhosis of the liver and liver cancer. There is no vaccine for Hepatitis C.

According to the CDC, based on limited studies, the estimated risk for infection after a needlestick or cut exposure to HCV-infected blood is approximately 1.8%. The risk following a blood splash is unknown but is believed to be very small; however, HCV infection from such an exposure has been reported.

Hepatitis C is a contagious liver disease that ranges in severity from a mild illness lasting a few weeks to a serious, lifelong illness that attacks the liver. It results from infection with the Hepatitis C virus (HCV), which is spread primarily through contact with the blood of an infected person. Hepatitis C can be either acute or chronic.

Acute Hepatitis C virus infection is a short-term illness that occurs within the first 6 months after someone is exposed to the Hepatitis C virus. For most people, acute infection leads to chronic infection.

Chronic Hepatitis C virus infection is a long-term illness that occurs when the Hepatitis C virus remains in a person's body. Hepatitis C virus infection can last a lifetime and lead to serious liver problems, including cirrhosis (scarring of the liver) or liver cancer.

Hepatitis C is usually spread when blood from a person infected with the Hepatitis C virus enters the body of someone who is not infected. Today, most individuals become infected with the Hepatitis C virus by sharing needles or other equipment to inject drugs. Before 1992, when widespread screening of the blood supply began in the United States, Hepatitis C was also commonly spread through blood transfusions and organ transplants.

People can become infected with the Hepatitis C virus during such activities as

- Sharing needles, syringes, or other equipment to inject drugs
- Needlestick injuries in health care settings
- Being born to a mother who has Hepatitis C

Less commonly, a person can also get Hepatitis C virus infection through

- Sharing personal care items that may have come in contact with another person's blood, such as razors or toothbrushes
- Having sexual contact with a person infected with the Hepatitis C virus

The Hepatitis C virus can survive outside the body at room temperature, on environmental surfaces, for up to 3 weeks (CDC 2015)

Some individuals are at increased risk for Hepatitis C, including:

- Current injection drug users (currently the most common way Hepatitis C virus is spread in the United States)
- Past injection drug users, including those who injected only one time or many years ago
- Recipients of donated blood, blood products, and organs (once a common means of transmission but now rare in the United States since blood screening became available in 1992)
- People who received a blood product for clotting problems made before 1987
- Hemodialysis patients or persons who spent many years on dialysis for kidney failure
- People who received body piercing or tattoos done with non-sterile instruments
- People with known exposures to the Hepatitis C virus, such as
    - Health care workers injured by needlesticks
    - Recipients of blood or organs from a donor who tested positive for the Hepatitis C virus
- HIV-infected persons
- Children born to mothers infected with the Hepatitis C virus

Less common risks include:

- Having sexual contact with an individual who is infected with the Hepatitis C virus
- Sharing personal care items, such as razors or toothbrushes, that may have come in contact with the blood of an infected person

Symptoms of acute Hepatitis C

Approximately 70%–80% of individuals with acute Hepatitis C do not have any symptoms. Some people, however, can have mild to severe symptoms soon after being infected, including

- Fever

- Fatigue
- Loss of appetite
- Nausea
- Vomiting
- Abdominal pain
- Dark urine
- Clay-colored bowel movements
- Joint pain
- Jaundice (yellow color in the skin or eyes)

However, many individuals infected with the Hepatitis C virus do not develop symptoms. If symptoms occur, the average time is 6–7 weeks after exposure, but this can range from 2 weeks to 6 months.

Blood tests used to test for Hepatitis C

Several different blood tests are used to test for Hepatitis C. A doctor may order just one or a combination of these tests. Typically, a person will first get a screening test that will show whether he or she has developed antibodies to the Hepatitis C virus. (An antibody is a substance found in the blood that the body produces in response to a virus.) Having a positive antibody test means that a person was exposed to the virus at some time in his or her life. If the antibody test is positive, a doctor will most likely order a second test to confirm whether the virus is still present in the person's bloodstream.

STATISTICS

According to the CDC, in 2013, there were an estimated 29,718 cases of acute hepatitis C virus infections reported in the United States. An estimated 2.7 million persons in the United States have chronic hepatitis C virus infection. Most people do not know they are infected because they do not look or feel sick. Approximately 75%–85% of people who become infected with Hepatitis C virus develop chronic infection.

HEALTHCARE WORKERS

INFECTION CONTROL IS A MAJOR CONCERN

Infection control refers to guidelines / regulations that are designed for educating, reporting, monitoring, managing and isolating healthcare related and/or community acquired infections. Therefore, infection control measures are important to control, eliminate or minimize employee exposure to bloodborne pathogens and communicable diseases.

Infection

The invasion, multiplication and growth of microorganisms such as Viruses, bacteria and parasites that are not normally present in the body. Microorganisms that live naturally within the body are not considered infections such as bacteria that normally live in the mouth or intestine are not infections.

An infection may remain localized (in a specific body part) or it may spread throughout the entire body; spread to the blood and /or lymphatic vessels and become systemic. An infection may not cause symptoms and remain subclinical, or it may lead to symptoms such as fatigue, fever, pain, tenderness, rash, loss of appetite, nausea, vomiting, diarrhea, redness, swelling of parts of the body, and drainage or discharge from the infected area.

The Process of Infection

For an infection to develop there has to be a source. The source is a pathogen that is capable of causing a disease. The pathogen needs a reservoir where it is able to grow and multiply. Humans and animals are reservoirs for pathogens (microbes). When the individual does have signs and symptoms of the infection, he /she is referred to as a carrier. Carriers are capable of passing the pathogen to others. The pathogen has to be able to leave the reservoir, it leaves through an exit. The exits within the human body include breaks in the skin and in the blood, the gastrointestinal, respiratory, urinary and reproductive tracts. When the pathogen leaves the reservoir it may be transmitted to another individual or host.

Methods of transmission include:

- Air
- direct contact,
- food,
- water,
- animals, and
- Insects.

Microbes may also be transmitted by equipment for personal care, hygiene, dressings etc. The pathogen then has to enter the body through a portal of entry. The portals of entry within the human body include breaks in the skin and in the blood, the gastrointestinal, respiratory, urinary and reproductive tracts.

TIPS

- Avoid patient contact when you have open skin wounds and/or lesions.
- Always wash your hands after contact with the patient.
- Wash immediately if hands and other body parts make contact with blood or body fluids.
- When providing assistance with personal care try to avoid cuts or nicks when shaving a patient.
- When using sharp objects, take caution to avoid injuring yourself or the patient.
- Always use resuscitation devices when you need to perform mouth-to-mouth resuscitation.

Susceptibility of the host

The growth of the pathogen and its ability to multiply within the host, depends on the susceptibility of the host. Human beings have the natural ability and are able to protect itself from infections, but the ability to resist an infection may be related to various factors including but not limited to:

- general health condition,
- age of the individual,
- presence of other illnesses,

- absence of other illnesses,
- sex of the individual,
- fatigue,
- nutritional status, and
- Medications.

Regulations

Infection control standards and policies published by Occupational Safety and Health Administration (OSHA), the Centers for Disease Control and Prevention (CDC) the Association for Professionals in Infection Control and Epidemiology (APIC) and National Institute of Occupational Safety and Health (NIOSH) have made recommendations. These guidelines are designed to reduce the transmission of bloodborne and other pathogens and apply to every patient regardless of their diagnosis. These guidelines reinforce the idea that body substances such as oral and body secretions; blood, breast milk, urine, feces, airborne spray from coughing or droplet, vomits, tissue, wound, or any other drainage; can be a source of infection. These guidelines also explain that the environment can also be a source of infection.

Some of the functions of Occupational Safety and Health Administration (OSHA) include:

- Writing the regulations or standards for workplace safety,
- conducting reviews to ensure compliance, and
- Prosecute Violations of standards.

National Institute of Occupational Safety and Health (NIOSH) is responsible for research into best practices for workplace safety and making recommendations regarding proper procedures and equipment.

The need for Occupational Safety and Health Administration (OSHA) in the healthcare environment came to light with the emergence of the Human Immunodeficiency Virus (HIV) and concerns regarding the possibility of healthcare workers acquiring the virus through patient contact.

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Healthcare workers are occupationally exposed to a several types of infectious diseases while they are on the job performing their duties. During the process of delivering healthcare services, there are a wide variety of workers involve, such as:

- Physicians,
- Nurses,
- CNA/HHA,
- Therapist (Physical, Occupational and Speech)
- Technicians,
- Transporters
- clinical laboratory workers,
- First responders; EMS, Fire Department, Police Officers,
- building maintenance personnel,
- security staff and administrative personnel,
- social workers,
- food service,
- volunteers
- housekeeping,
- Mortuary personnel and so much more.

Several of the healthcare workers can also be found in a variety of workplace environment such as,

- Hospitals,
- nursing care facilities,
- outpatient clinics (medical office, dental offices, and occupational health clinics),
- ambulatory care centers,
- Home Health Care and
- Emergency response settings.

Primary routes of infectious disease transmission in the United States healthcare settings include:

- Contact,
- Droplet, and
- Airborne.

Contact transmission

Contact transmission (sub-divided into direct and indirect contact).

Direct contact transmission

Direct contact transmission involves the transfer of infectious agents to the susceptible individual through physical contact with an infected individual such as, direct skin-to-skin contact.

Indirect contact transmission

Indirect contact transmission occurs whenever infectious agents are transferred to the susceptible individual when the individual makes physical contact with the contaminated items and surfaces such as:

- Contaminated blood draw equipment,
- Door knobs,
- patient-care instruments or equipment,
- bed rails,
- Examination table, etc.

Hand Hygiene

Hand hygiene procedures include the use of alcohol-based hand rubs (containing 60-95% alcohol) and hand washing with soap and water. Alcohol-based hand rub is the preferred method for decontaminating hands, except when hands are visibly soiled for example with dirt, blood, body fluids, or after caring for patients with known or suspected infectious diarrhea such as with Clostridium difficile and norovirus, in such

case soap and water should be used. Hand hygiene stations should be placed to ensure there is easy access.

Washing the hands with liquid soap and water

The components of good hand washing include:

Using adequate amount of soap
Rubbing the hands together to create some friction and
Rinsing under running water

The mechanical action of washing and drying removes most of the transient bacteria that is present. Washing hands thoroughly between patient contacts and after contact with body fluids, blood, excretion, secretion, articles or equipment contaminated by them is an important component of infection control and isolation precautions.

Some institutions recommend use adequate soap, make lather and continue rubbing for *15-20 seconds*. To wash for the correct time, sing “Happy Birthday to You ” twice.
If soap and water are not available, you can use an alcohol based hand rub to clean your hands. These foam gels significantly reduce the number of germs on the skin and are fast acting. Follow your institutions’ policy and procedure.

Clostridium difficile

Clostridium difficile (*C. difficile*) is a bacterium that causes inflammation of the colon, known as colitis. Individuals, who have other illnesses or conditions requiring prolonged use of antibiotics, and the elderly, are at greater risk of acquiring this disease. The bacteria are found in the feces. People can become infected if they touch items or surfaces that are contaminated with feces and then touch their mouth or mucous membranes. Healthcare workers can spread the bacteria to patients or contaminate surfaces through hand contact.

Symptoms of *Clostridium difficile* include:

- Watery diarrhea (at least three bowel movements per day for two or more days)

- Fever
- Loss of appetite
- Nausea
- Abdominal pain/tenderness

Transmission of Clostridium difficile

Clostridium difficile is shed in feces. Any surface, device, or material such as toilets, bathing tubs, and electronic rectal thermometers that becomes contaminated with feces may serve as a reservoir for the Clostridium difficile spores. Clostridium difficile spores are transferred to patients mainly via the hands of healthcare personnel who have touched a contaminated surface or item. Clostridium difficile can live for long periods on surfaces.

Clostridium difficile (C. difficile) is an important cause of infectious disease death in the United States. *C. difficile* was estimated to cause almost half a million infections in the United States in 2011. Approximately 83,000 of the patients who developed *C. difficile* experienced at least one recurrence and 29,000 died within 30 days of the initial diagnosis.(See the CDC for more information)

Poor prescribing practices put many patients at risk for *Clostridium difficile* infections. More than half of all hospitalized patients will get an antibiotic at some point during their hospital stay, but studies have shown that 30-50% of antibiotics prescribed in hospitals are unnecessary or incorrect.

Clostridium difficile infections can be prevented by using infection control recommendations and more careful antibiotic use.

Clostridium difficile germs move with patients from one health care facility to another, infecting other patients.

Norovirus

Noroviruses were previously called Norwalk-like viruses. They are a group of non-enveloped, single-stranded RNA viruses that cause acute gastroenteritis. Noroviruses belong to the family Caliciviridae that includes sapoviruses, which also causes acute gastroenteritis.

Currently, there are six recognized norovirus genogroups. Three of the genogroups (GI, GII, and GIV) affect humans. More than 25 different genotypes have been identified within these three genogroups.

An individual usually develops symptoms of gastroenteritis 12 to 48 hours after being exposed to norovirus.

Typical symptoms include:

- Acute-onset of vomiting
- watery, non-bloody diarrhea
- Abdominal cramps
- nausea

Some individuals may have low-grade fever, headaches, and myalgias; body aches.

Dehydration is the most common complication, especially in young children and the older adults, that may require medical care.

Gastroenteritis symptoms, usually last 24 to 72 hours. The individual usually recover completely without serious long-term problems. But the norovirus illness can be very serious, especially for older adults, young children and individuals with compromised immune systems. This virus can lead to severe dehydration, hospitalization, and death.

Not everyone who has been exposed to norovirus will become infected. Some individuals who get norovirus infection may not have symptoms, but they may still shed the virus in their stool.

Transmission of the Noroviruses

Noroviruses are highly contagious. An individual with norovirus infection can shed billions of norovirus particles. However it only takes a few viral particles to infect another person.

Noroviruses are mainly spread through:

- Close personal contact with an infected individual or
- Fecal-oral route when the person consumes contaminated food or water.

The virus can also spread through touching contaminated surfaces, objects, or substances.

It is possible for norovirus to spread through aerosolized vomit that lands on surfaces or enters a individual's mouth then he or she swallows it. During outbreaks, norovirus can spread in many different ways. For example, an individual who is infected by eating contaminated food in a restaurant can spread the virus to household members through direct contact or by touching and contaminating objects and surfaces.

Preventing Norovirus

Wash your hands carefully with soap and water: (NOT HAND SANITIZER)

- especially after using the toilet and changing diapers, and
- Always before eating, preparing, or handling food.

Utilizing Personal protective equipment (**PPE)**

Personal protective equipment (PPE) are protective wear, materials, specialized equipment or clothing used to protect the healthcare worker from any splashes or body exposures to blood, body fluids or other contaminates or infectious materials. PPE are equipments such as gloves, scrubs, lab coat, face mask, goggles, gowns, surgical shoe covers, aprons, caps etc. Disposable face masks are to be worn whenever there is a reasonable expectation that droplet transmission may occur.
The selection of personal protective equipment is based on the nature of the patient interaction, potential for exposure to body fluids, blood or infectious agents. For personal protective equipment used for the preparation and handling of antineoplastic and hazardous drugs, follow the recommendations determined in accordance with OSHA and NIOSH.

Appropriate use of PPE is required by the Bloodborne Pathogens standard, if exposure to blood is anticipated.

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