Digestive System

CHAPTER 6

Chapter Outline

Objectives

Upon completion of this chapter, you will be able to:

- Locate the major organs of the digestive system and describe their structure and function.
- Describe the functional relationship between the digestive system and other body systems.
- Recognize, pronounce, spell, and build words related to the digestive system.
- Describe pathological conditions, diagnostic and therapeutic procedures, and other terms related to the digestive system.
- Explain pharmacology related to the treatment of digestive disorders.
- Demonstrate your knowledge of this chapter by completing the learning and medical record activities.

Anatomy and Physiology

The digestive system, also called the ***gastrointestinal* (GI)** system, consists of a digestive tube called the ***GI tract*** or ***alimentary canal,*** and several accessory organs whose primary function is to break down food, prepare it for absorption, and eliminate waste. The GI tract, extending from the mouth to the anus, varies in size and structure in several distinct regions:

- mouth
- pharynx (throat)
- esophagus
- stomach
- small intestine
- large intestine
- rectum
- anus.

Food passing along the GI tract is mixed with digestive enzymes and broken down into nutrient molecules, which are absorbed in the bloodstream. Undigested waste materials not absorbed by the blood are then eliminated from the body through defecation. Included in the digestive system are the accessory organs of digestion: the liver, gallbladder, and pancreas. (See Figure 6–1.)

Mouth

The process of digestion begins in the mouth. The mouth, also known as the (1) **oral cavity** or **buccal cavity,** is a receptacle for food. It is formed by the cheeks (**bucca**), lips, teeth, tongue, and hard and soft palates. Located around the oral cavity are three pairs of salivary glands, which secrete saliva. Saliva contains important digestive enzymes that help begin the chemical breakdown of food. In the mouth, food is broken down mechanically (by the teeth) and chemically (by saliva), and then formed into a **bolus.**

Teeth

The (2) **teeth** play an important role in initial stages of digestion by mechanically breaking down food (**mastication**) into smaller pieces as they mix it with saliva. Teeth are covered by a hard enamel, giving them a smooth, white appearance. Beneath the enamel is **dentin,** the main structure of the tooth. The innermost part of the tooth is the **pulp,** which contains nerves and blood vessels. The teeth are embedded in pink, fleshy tissue known as gums (**gingiva**).

Tongue

The (3) **tongue** assists in the chewing process by manipulating the bolus of food during chewing and moving it to the back of the mouth for swallowing (**deglutition**). The tongue also aids in speech production and taste. Rough projections on the surface of the tongue called ***papillae*** contain taste buds. The four basic taste sensations registered by chemical stimulation of the taste buds are sweet, sour, salty, and bitter. All other taste perceptions are combinations of these four

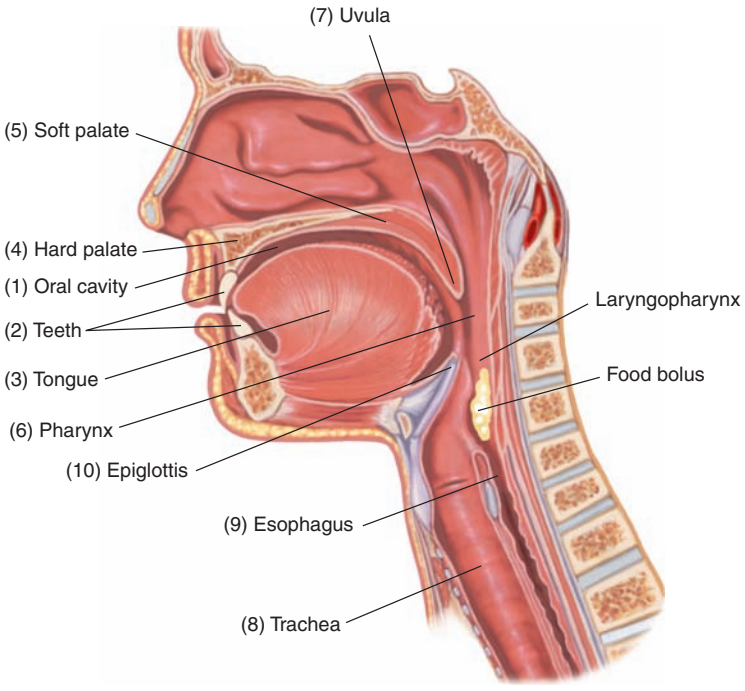


Figure 6-1. Sagittal view of the head showing oral, nasal, and pharyngeal components of the digestive system.

Anatomy and Physiology Key Terms

This section introduces important terms, along with their definitions and pronunciations. Word analyses for selected terms are also provided.

Term	Definition
bilirubin bĭl-ĭ-ROO-bĭn	Orange-colored or yellowish pigment in bile ***Bilirubin is formed principally by the breakdown of hemoglobin in red blood cells after termination of their normal lifespan.***
bolus BŌ-lŭs	Mass of masticated food ready to be swallowed
exocrine ĔKS-ō-krĭn *exo-:* outside, outward *-crine:* secrete	Denotes a gland that secretes its products through excretory ducts to the surface of an organ or tissue or into a vessel
sphincter SFĬNGK-tĕr	Circular band of muscle fibers that constricts a passage or closes a natural opening of the body ***An example of a sphincter is the lower esophageal (cardiac) sphincter that constricts once food has passed into the stomach.***

Pronunciation Help

Long Sound	ā—rate	ē—rebirth	ī—isle	ō—over	ū—unite
Short Sound	ă—alone	ĕ—ever	ĭ—it	ŏ—not	ŭ—cut

basic flavors. In addition, sense of taste is intricately linked with sense of smell, making taste perception very complex.

Hard and Soft Palates

The two structures forming the roof of the mouth are the (4) **hard palate** (anterior portion) and the (5) **soft palate** (posterior portion). The soft palate, which forms a partition between the mouth and the nasopharynx, is continuous with the hard palate. The entire oral cavity, like the rest of the GI tract, is lined with mucous membranes.

Pharynx, Esophagus, and Stomach

As the bolus is pushed by the tongue into the (6) **pharynx** (throat), it is guided by the soft, fleshy, V-shaped structure called the (7) *uvula.* The funnel-shaped pharynx serves as a passageway to the respiratory and GI tracts and provides a resonating chamber for speech sounds. The lowest portion of the pharynx divides into two tubes: one that leads to the lungs, called the (8) **trachea,** and one that leads to the stomach, called the (9) **esophagus.** A small flap of cartilage, called the (10) **epiglottis,** folds back to cover the trachea during swallowing, forcing food to enter the esophagus. At all other times, the epiglottis remains upright, allowing air to freely pass through the respiratory structures.

The **stomach,** a saclike structure located in the left upper quadrant (LUQ) of the abdominal cavity, serves as a food reservoir that continues mechanical and chemical digestion. (See Figure 6–2.) The stomach extends from the (1) **esophagus** to the first part of the small intestine, the (2) **duodenum.** The terminal portion of the esophagus, the (3) **lower esophageal (cardiac) sphincter,** is composed of muscle fibers that constrict once food has passed into the stomach. It prevents the stomach contents from regurgitating back into the esophagus. The (4) **body** of the stomach, the large central portion, together with the (5) **fundus,** the upper portion, are mainly storage areas. Most digestion takes place in the funnel-shaped terminal portion, the (6) **pylorus.** The interior lining of the stomach is composed of mucous membranes and contains numerous macroscopic longitudinal folds called (7) **rugae** that gradually unfold as the stomach fills. Located within the rugae, digestive glands produce hydrochloric acid (HCl) and enzymes. Secretions from these glands coupled with the mechanical churning of the stomach turn the bolus into a semiliquid form called *chyme*

that slowly leaves the stomach through the (8) **pyloric sphincter** to enter the duodenum. This **sphincter** regulates the speed and movement of chyme into the small intestine and prohibits backflow. Food is propelled through the entire GI tract by coordinated, rhythmic muscle contractions called ***peristalsis.***

Small Intestine

The small intestine is a coiled, 20-foot long tube that begins at the pyloric sphincter and extends at the large intestine. (See Figure 6–3.) It consists of three parts:

- (1) **duodenum,** the uppermost segment, which is about 10 inches long
- (2) **jejunum,** which is approximately 8 feet long
- (3) **ileum,** which is about 12 feet long

Digestion is completed in the small intestine with the help of additional enzymes and secretions from the (4) **pancreas** and (5) **liver.** Nutrients in chyme are absorbed through microscopic, finger-like projections called *villi.* Nutrients enter the bloodstream and lymphatic system for distribution to the rest of the body. At the terminal end of the small intestine, a sphincter muscle called the *ileocecal valve* allows undigested or unabsorbed material from the small intestine to pass into the large intestine and eventually be excreted from the body.

Large Intestine

The large intestine is about 5 feet long. It begins at the end of the ileum and extends to the anus. No digestion takes place in the large intestine. The only secretion is mucus in the colon, which lubricates fecal material so it can pass from the body. The large intestine has three main components: cecum, colon, and rectum. The first 2 or 3 inches of the large intestine is called the (6) **cecum,** a small pouch that hangs inferior to the ileocecal valve. Projecting downward from the cecum is a wormlike structures called the (7) **appendix.** The function of the appendix is unknown; however, problems arise if it becomes infected or inflamed. The cecum merges with the colon. The main functions of the colon are to absorb water and minerals and eliminate undigested material. The colon is divided into ascending, transverse, descending, and sigmoid portions:

- The (8) **ascending colon** extends from the cecum to the lower border of the liver and turns abruptly to form the (9) **hepatic flexure.**
- The colon continues across the abdomen to the left side as the (10) **transverse colon,** curving beneath the lower end of the (11) **spleen** to form the (12) **splenic flexure.**
- As the transverse colon turns downward, it becomes the (13) **descending colon.**
- The descending colon continues until it forms the (14) **sigmoid colon** and the (15) **rectum.** The rectum, the last part of the GI tract, terminates at the (16) **anus.**

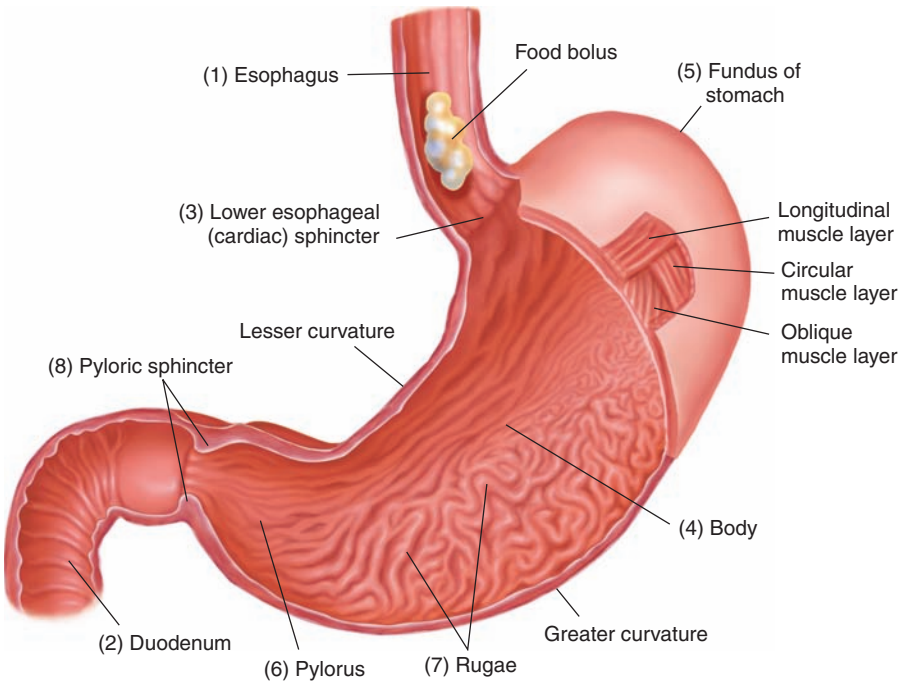


Figure 6-2. Anterior view of the stomach showing muscle layers and rugae of the mucosa.

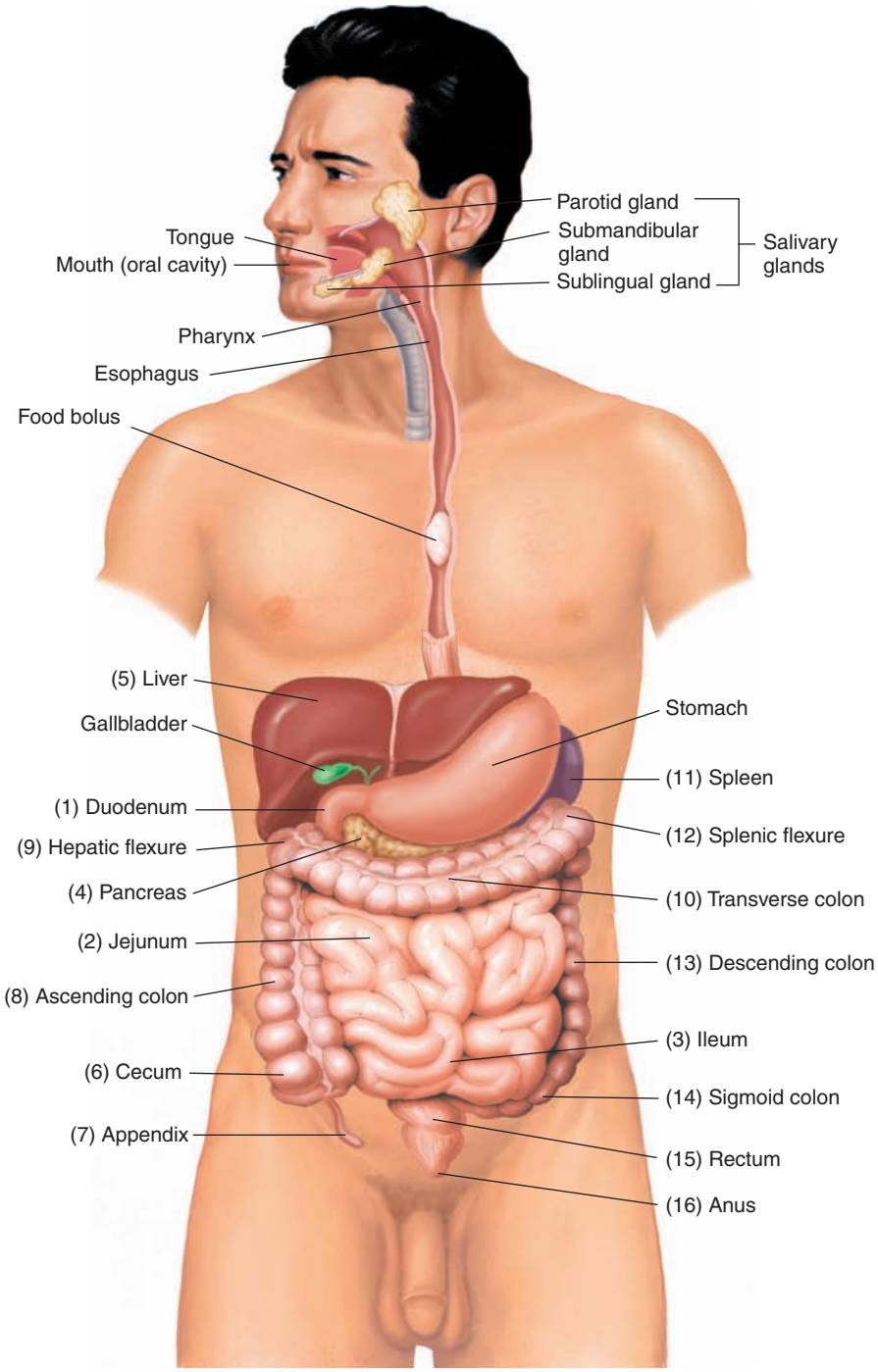


Figure 6-3. Anterior view of the trunk and digestive organs.

It is time to review digestive structures by completing Learning Activity 6–1.

Accessory Organs of Digestion

Although the liver, gallbladder, and pancreas lie outside the GI tract, they play a vital role in the proper digestion and absorption of nutrients. (See Figure 6–4.)

Liver

The (1) **liver**, the largest glandular organ in the body, weighs approximately 3 to 4 lb. It is located beneath the diaphragm in the right upper quadrant (RUQ) of the abdominal cavity. The liver performs

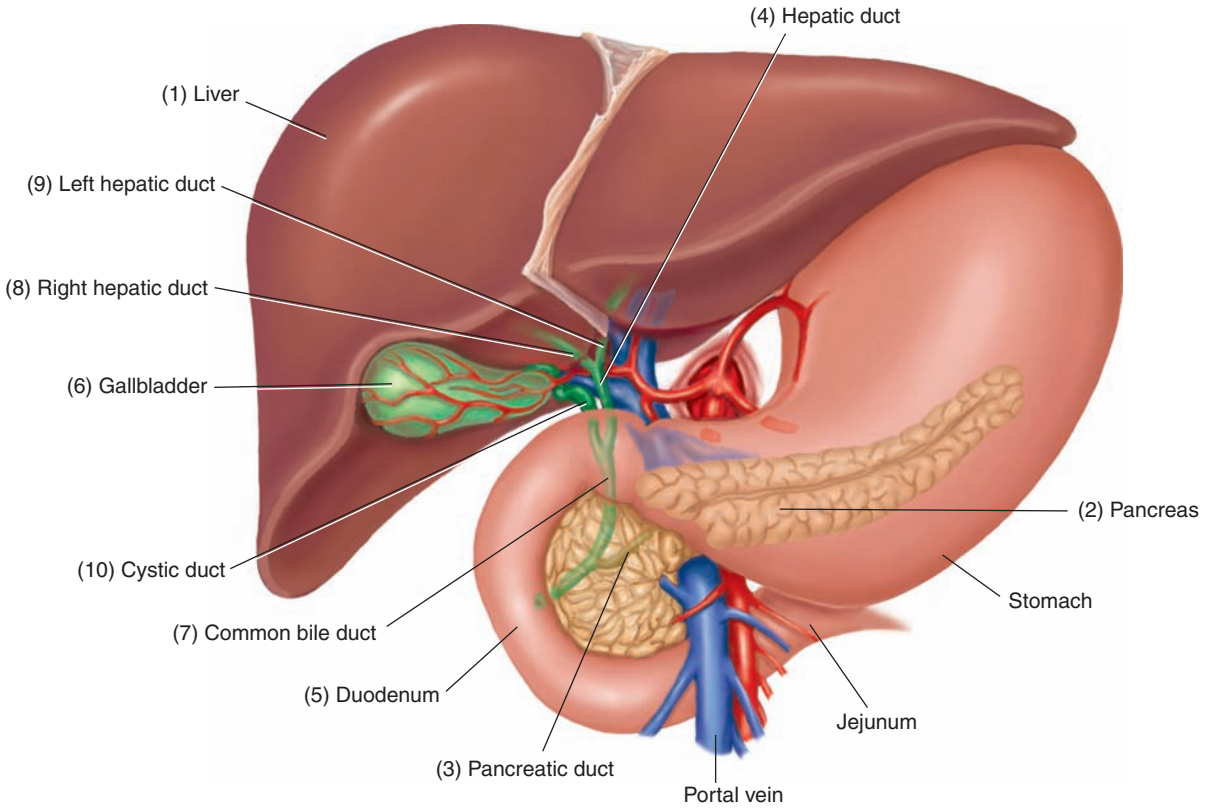


Figure 6-4. Liver, gallbladder, pancreas, and duodenum with associated ducts and blood vessels.

many vital functions and death occurs if it ceases to function. Some of its important functions include:

- producing bile, used in the small intestine to emulsify and absorb fats
- removing **glucose** (sugar) from blood to synthesize **glycogen** (starch) and retain it for later use
- storing vitamins, such as B_{12}, A, D, E, and K
- destroying or transforming toxic products into less harmful compounds
- maintaining normal glucose levels in the blood
- destroying old **erythrocytes** and releasing **bilirubin**
- producing various blood proteins, such as prothrombin and fibrinogen, that aid in blood clotting.

Pancreas

The (2) **pancreas** is an elongated, somewhat flattened organ that lies posterior and slightly inferior to the stomach. It performs both endocrine and **exocrine** functions. As an **endocrine** gland, the pancreas secretes insulin directly into the bloodstream to maintain normal blood glucose levels. For a comprehensive discussion of the endocrine function of the pancreas, review Chapter 13. As an **exocrine** gland, the pancreas produces digestive enzymes that pass into the duodenum through the (3) **pancreatic duct.** The pancreatic duct extends along the pancreas and, together with the (4) **hepatic duct** from the liver, enters the (5) **duodenum**. The digestive enzymes produced by the pancreas contain trypsin, which breaks down proteins; amylase, which breaks down carbohydrates; and lipase, which breaks down fat.

Gallbladder

The (6) **gallbladder,** a saclike structure on the inferior surface of the liver, serves as a storage area for bile, which is produced by the liver. When bile is needed for digestion, the gallbladder releases it into the duodenum through the (7) **common bile duct**. Bile is also drained from the liver through the (8) **right hepatic duct** and the (9) **left hepatic duct.** These two structures eventually form the hepatic duct. The (10) **cystic duct** of the gallbladder merges with the hepatic duct to form the common bile duct, which leads into the duodenum. Bile production is stimulated by hormone secretions, which are produced in the duodenum, as soon as food enters the small intestine. Without bile, fat digestion is not possible.

It is time to review anatomy of the accessory organs of digestion by completing Learning Activity 6–2.

Connecting Body Systems–Digestive System

The main function of the digestive system is to provide vital nutrients for growth, maintenance, and repair of all organs and body cells. Specific functional relationships between the digestive system and other body systems are discussed below.

Blood, lymph, and immune

- Liver regulates blood glucose levels.
- Digestive tract secretes acids and enzymes to provide a hostile environment for pathogens.
- Intestinal walls contain lymphoid nodules that help prevent invasion of pathogens.
- Digestive system absorbs vitamin K for blood clotting.

Cardiovascular

- Digestive system absorbs nutrients needed by the heart.

Endocrine

- Liver eliminates hormones from the blood to end their activity.
- Pancreas contains hormone-producing cells.

Female reproductive

- Digestive system provides adequate nutrition, including fats, to make conception and normal fetal development possible.
- Digestive system provides nutrients for repair of endometrium following menstruation.

Genitourinary

- Digestive system provides adequate nutrients in the development of viable sperm.
- Liver metabolizes hormones, toxins, and drugs to forms that can be excreted in urine.

Integumentary

- Digestive system supplies fats that provide insulation in the dermis and subcutaneous tissue.
- Digestive system absorbs nutrients for maintenance, growth, and repair of the skin.

Musculoskeletal

- Digestive system provides nutrients needed for energy fuel.
- Digestive system absorbs calcium needed for bone salts and muscle contraction.
- Liver removes lactic acid (resulting from muscle activity) from the blood.

Nervous

- Digestive system supplies nutrients for normal neural functioning.
- Digestive system provides nutrients for synthesis of neurotransmitters and electrolytes for transmission of a nervous impulse.
- Liver plays a role in maintaining glucose levels for neural function.

Respiratory

- Digestive system absorbs nutrients needed by cells in the lungs and other tissues in the respiratory tract.
- The pharynx is shared by the digestive and respiratory systems. The lowest portion of the pharynx divides into two tubes: one that leads to the lungs, called the trachea, and one that leads to the stomach, called the esophagus.

Medical Word Elements

This section introduces combining forms, suffixes, and prefixes related to the digestive system. Word analyses are also provided.

Element	Meaning	Word Analysis
Combining Forms		
Mouth		
or/o	mouth	**or**/al (OR-ăl): pertaining to the mouth *-al:* pertaining to
stomat/o		**stomat**/itis (stŏ-mă-TĪ-tĭs): inflammation of the mouth *-itis:* inflammation
gloss/o	tongue	**gloss**/ectomy (glŏs-ĔK-tō-mē): removal of all or part of the tongue *-ectomy:* excision, removal
lingu/o		**lingu**/al (LĬNG-gwăl): pertaining to the tongue *-al:* pertaining to
bucc/o	cheek	**bucc**/al (BŬK-ăl): pertaining to the cheek *-al:* pertaining to
cheil/o	lip	**cheil**/o/plasty (KĪ-lō-plăs-tē): surgical repair of a defective lip *-plasty:* surgical repair
labi/o		**labi**/al (LĀ-bē-ăl): pertaining to the lips, particularly the lips of the mouth *-al:* pertaining to
dent/o	teeth	**dent**/ist (DĔN-tĭst): specialist who diagnoses and treats diseases and disorders of teeth *-ist:* specialist
odont/o		orth/**odont**/ist (or-thō-DŎN-tĭst): dentist who specializes in correcting and preventing irregularities of abnormally positioned or aligned teeth *orth:* straight *-ist:* specialist
gingiv/o	gum(s)	**gingiv**/ectomy (jĭn-jĭ-VĔK-tō-mē): excision of diseased gingival tissue *-ectomy:* excision, removal ***Gingivectomy is performed as a surgical treatment for periodontal disease.***
sial/o	saliva, salivary gland	**sial/o**/lith (sī-ĂL-ō-lĭth): calculus formed in a salivary gland or duct *-lith:* stone, calculus
Esophagus, Pharynx, and Stomach		
esophag/o	esophagus	**esophag/o**/scope (ē-SŎF-ă-gō-skōp): instrument used to examine the esophagus *-scope:* instrument for examining
pharyng/o	pharynx (throat)	**pharyng/o**/tonsill/itis (fă-rĭng-gō-tŏn-sĭ-LĪ-tĭs): inflammation of the pharynx and tonsils *tonsill:* tonsils *-itis:* inflammation

Medical Word Elements—cont'd

Element	Meaning	Word Analysis
gastr/o	stomach	**gastr**/algia (găs-TRĂL-jē-ă): pain in the stomach; also called *stomachache* *-algia:* pain
pylor/o	pylorus	**pylor/o**/spasm (pī-LOR-ō-spăzm): involuntary contraction of the pyloric sphincter of the stomach, as in pyloric stenosis *-spasm:* involuntary contraction, twitching
Small Intestine		
duoden/o	duodenum (first part of small intestine)	**duoden/o**/scopy (dū-ŏd-ĕ-NŎS-kō-pē): visual examination of the duodenum *-scopy:* visual examination
enter/o	intestine (usually small intestine)	**enter/o**/pathy (ĕn-tĕr-ŎP-ă-thē): disease of the intestine *-pathy:* disease
jejun/o	jejunum (second part of small intestine)	**jejun/o**/rrhaphy (jĕ-joo-NOR-ă-fē): suture of the jejunum *-rrhaphy:* suture
ile/o	ileum (third part of small intestine)	**ile/o**/stomy (ĭl-ē-ŎS-tō-mē): creation of an opening between the ileum and the abdominal wall *-stomy*:* forming an opening (mouth) ***An ileostomy creates an opening on the surface of the abdomen to allow feces to be discharged into a bag worn on the abdomen.***
Large Intestine		
append/o	appendix	**append**/ectomy (ăp-ĕn-DĔK-tō-mē): excision of the appendix *-ectomy:* excision, removal ***Appendectomy is performed to remove a diseased appendix in danger of rupturing.***
appendic/o		**appendic**/itis (ă-pĕn-dĭ-SĪ-tĭs): inflammation of the appendix *-itis:* inflammation
col/o	colon	**col/o**/stomy (kō-LŎS-tō-mē): creation of an opening between the colon and the abdominal wall *-stomy*:* forming an opening (mouth) ***A colostomy creates a place for fecal matter to exit the body other than through the anus.***
colon/o		**colon/o**/scopy (kō-lŏn-ŎS-kō-pē): visual examination of the colon *-scopy:* visual examination ***Colonoscopy is performed with an elongated endoscope called a colonoscope.***
sigmoid/o	sigmoid colon	**sigmoid/o**/tomy (sĭg-moyd-ŎT-ō-mē): incision of the sigmoid colon *-tomy:* incision

(continued)

*When the suffix *–stomy* is used with a combining form that denotes an organ, it refers to a surgical opening to the outside of the body.

Medical Word Elements—cont'd

Element	Meaning	Word Analysis
Terminal End of Large Intestine		
rect/o	rectum	**rect/o**/cele (RĔK-tŏ-sēl): herniation or protrusion of the rectum; also called *proctocele* *-cele:* hernia, swelling
proct/o	anus, rectum	**proct/o**/logist (prŏk-TŎL-ō-jĭst): physician who specializes in treating disorders of the colon, rectum, and anus *-logist:* specialist in the study of
an/o	anus	peri/**an**/al (pĕr-ē-Ā-năl): pertaining to the area around the anus *peri-:* around *-al:* pertaining to
Accessory Organs of Digestion		
hepat/o	liver	**hepat/o**/megaly (hĕp-ă-tō-MĔG-ă-lē): enlargement of the liver *-megaly:* enlargement
pancreat/o	pancreas	**pancreat/o**/lysis (păn-krē-ă-TŎL-ĭ-sĭs): destruction of the pancreas by pancreatic enzymes *-lysis:* separation; destruction; loosening
cholangi/o	bile vessel	**cholangi**/ole (kō-LĂN-jē-ōl): small terminal portion of the bile duct *-ole:* small, minute
chol/e**	bile, gall	**chol/e**/lith (KŌ-lē-lĭth): gallstone *-lith:* calculus, stone ***Gallstones are solid masses composed of bile and cholesterol that form in the gallbladder and common bile duct.***
cholecyst/o	gallbladder	**cholecyst**/ectomy (kō-lē-sĭs-TĔK-tō-mē): removal of the gallbladder *-ectomy:* excision, removal ***Cholecystectomy is performed by laparoscopic or open surgery.***
choledoch/o	bile duct	**choledoch/o**/plasty (kō-LĔD-ō-kō-plăs-tē): surgical repair of the common bile duct *-plasty:* surgical repair
Suffixes		
-emesis	vomit	hyper/**emesis** (hī-pĕr-ĔM-ĕ-sĭs): excessive vomiting *hyper-:* excessive, above normal
-iasis	abnormal condition (produced by something specified)	chol/e/lith/**iasis** (kō-lē-lĭ-THĪ-ă-sĭs): presence or formation of gallstones in the gallbladder or common bile duct *chol/e:* bile, gall *lith:* stone, calculus ***When gallstones form in the common bile duct, the condition is called*** **choledocholithiasis.**

**The *e* in *chol/e* is an exception to the rule of using the connecting vowel *o*.

Medical Word Elements—cont'd

Element	Meaning	Word Analysis
-megaly	enlargement	hepat/o/**megaly** (hĕp-ă-tō-MĔG-ă-lē): enlargement of the liver *hepat/o:* liver ***Hepatomegaly may be caused by hepatitis or infection, fatty infiltration (as in alcoholism), biliary obstruction, or malignancy.***
-orexia	appetite	an/**orexia** (ăn-ō-RĔK-sē-ă): loss of appetite *an-:* without, not ***Anorexia can result from various conditions, such as adverse effects of drugs or various physical or psychological causes.***
-pepsia	digestion	dys/**pepsia** (dĭs-PĔP-sē-ă): epigastric discomfort felt after eating; also called *indigestion* *dys-:* bad; painful; difficult
-phagia	swallowing, eating	aer/o/**phagia** (ĕr-ō-FĀ-jē-ă): swallowing air *aer/o:* air
-prandial	meal	post/**prandial** (pōst-PRĂN-dē-ăl): following a meal *post-:* after, behind
-rrhea	discharge, flow	steat/o/**rrhea** (stē-ă-tō-RĒ-ă): excessive amount of fat discharged in fecal matter *-rrhea:* discharge, flow
Prefixes		
dia-	through, across	**dia**/rrhea (dī-ă-RĒ-ă): abnormally frequent discharge or flow of fluid fecal matter from the bowel *-rrhea:* discharge, flow
peri-	around	**peri**/sigmoid/itis (pĕr-ĭ-sĭg-moy-DĪ-tĭs): inflammation of peritoneal tissue around the sigmoid colon *peri-:* around *-itis:* inflammation
sub-	under, below	**sub**/lingu/al (sŭb-LĬNG-gwăl): pertaining to the area under the tongue *lingu:* tongue *-al:* pertaining to

It is time to review medical word elements by completing Learning Activities 6–3 and 6–4. For audio pronunciations of the above-listed key terms, you can visit www.davisplus.fadavis.com/gylys/systems *to download this chapter's* Listen and Learn! *exercises or use the book's audio CD (if included).*

Pathology

Although some digestive disorders may be without symptoms (**asymptomatic**), many are associated with such symptoms as nausea, vomiting, bleeding, pain, and weight loss. Clinical signs, such as jaundice and edema, may indicate a hepatic disorder. Severe infection, drug toxicity, hepatic disease, and changes in fluid and electrolyte balance can cause behavioral abnormalities. Disorders of the GI tract or any of the accessory organs (liver, gallbladder, pancreas) may result in far-reaching metabolic or systemic problems that can eventually threaten life itself. Assessment of a suspected digestive disorder includes a thorough history and physical examination. A range of diagnostic tests assist in identifying abnormalities of the GI tract, liver, gallbladder, and pancreas.

For diagnosis, treatment, and management of digestive disorders, the medical services of a specialist may be warranted. **Gastroenterology** is the branch of medicine concerned with digestive diseases. The physician who specializes in the

diagnoses and treatment of digestive disorders is known as a **gastroenterologist.** Gastroenterologists do not perform surgeries; however, under the broad classification of surgery, they do perform such procedures as liver biopsy and endoscopic examination.

Ulcer

An **ulcer** is a circumscribed open sore, on the skin or mucous membranes within the body. Peptic ulcers are the most common type of ulcer that occurs in the digestive system. There are two main types of peptic ulcers: gastric ulcers, which develop in the stomach, and duodenal ulcers, which develop in the duodenum, usually in the area nearest the stomach. A third type of ulceration that affects the digestive system is associated with a disorder called colitis. As the name implies, it occurs in the colon.

Peptic Ulcer Disease

Peptic ulcer disease (PUD) develops in the parts of the GI tract that are exposed to hydrochloric acid and pepsin, an enzyme secreted in the stomach that begins the digestion of proteins. Both of these products are found in gastric juice and normally act on food to begin the digestive process. The strong action of these digestive products can destroy the protective defenses of the mucous membranes of the stomach and duodenum, causing the lining to erode. However, current studies have identified the bacterium *Helicobacter pylori* as a leading cause of PUD. The spiral shape of this organism helps it to burrow into the mucosa, weakening it and making it more susceptible to the action of pepsin and stomach acid. Treatment includes antibiotics to destroy *H. pylori* and antacids to treat peptic ulcers. Patients are advised to avoid nonsteroidal anti-inflammatory drugs (NSAIDs), caffeine, smoking, and alcohol, which intensify (**exacerbate**) the symptoms of gastric ulcers. If left untreated, mucosal destruction produces a hole (**perforation**) in the wall lining with resultant bleeding from the damaged area.

Ulcerative Colitis

Ulcerative colitis, a chronic inflammatory disease of the large intestine and rectum, commonly begins in the rectum or sigmoid colon and extends upward into the entire colon. It is characterized by profuse, watery diarrhea containing varying amounts of blood, mucus, and pus. Ulcerative colitis is distinguished from other closely related bowel disorders by its characteristic inflammatory pattern. The inflammation involves only the mucosal lining of the colon, and the affected portion of the colon is uniformly involved, with no patches of healthy mucosal tissue evident. Ulcerative colitis is associated with a higher risk of colon cancer. Severe cases may require surgical creation of an opening (**stoma**) for bowel evacuation to a bag worn on the abdomen.

Hernia

A **hernia** is a protrusion of any organ, tissue, or structure through the wall of the cavity in which it is naturally contained. (See Figure 6–5.) In general, though, the term is applied to protrusions of abdominal organs (**viscera**) through the abdominal wall.

An (1) **inguinal hernia** develops in the groin where the abdominal folds of flesh meet the thighs. In initial stages, it may be hardly noticeable and appears as a soft lump under the skin, no larger than a marble. In early stages, an inguinal hernia is usually reducible; that is, it can be pushed gently back into its normal place. With this type of hernia, pain may be minimal. As time passes, pressure of the abdomen against the weak abdominal wall may increase the size of the opening as well as the size of the hernia lump. If the blood supply to the hernia is cut off because of pressure, a (2) **strangulated hernia** may develop leading to

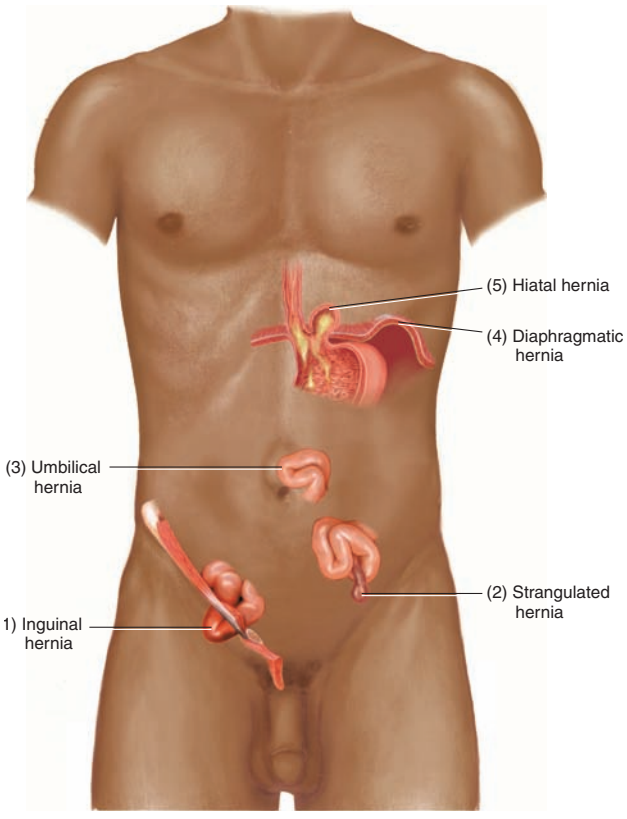


Figure 6-5. Common locations of hernias.

necrosis with gangrene. An (3) **umbilical hernia** is a protrusion of part of the intestine at the navel. It occurs more commonly in obese women and among those who have had several pregnancies. Hernias also occur in newborn infants (**congenital**) or during early childhood. If the defect has not corrected itself by age 2, the deformity can be surgically corrected. Treatment consists of surgical repair of the hernia (**hernioplasty**) with suture of the abdominal wall (**herniorrhaphy**).

Although hernias most commonly occur in the abdominal region, they may develop in the diaphragm. Two forms of this type include (4) **diaphragmatic hernia,** a congenital disorder, and (5) **hiatal hernia,** in which the lower part of the esophagus and the top of the stomach slides through an opening (**hiatus**) in the diaphragm into the thorax. With hiatal hernia, stomach acid backs up into the esophagus, causing heartburn, chest pain, and swallowing difficulty. Although many hiatal hernias are asymptomatic, if the disease continues for a prolonged period, it may cause **gastroesophageal reflux disease (GERD).**

Intestinal Obstruction

An intestinal obstruction is a partial or complete blockage in the small or large intestine that prevents forward flow of digestive products. Complete obstruction in any part of the intestine constitutes a medical emergency and requires rapid diagnosis and treatment within a 24-hour period to prevent death.

The two forms of intestinal obstructions include *mechanical blockage,* also called *ileus*, where contents of the intestine are prevented from moving forward due to an obstacle or barrier that blocks the lumen. The second form, *nonmechanical blockage*, also called *paralytic ileus*, where peristaltic movement is lacking or absent and contents are no longer propelled through the intestine.

Mechanical obstructions include tumors, scar tissues (**adhesions**), intestinal twisting (**volvolus**), intestinal "telescoping" where part of the intestine slips into another part just beneath it (**intussusceptions**), strangulated hernias, or the presence of foreign bodies, such as fruit pits and gallstones.

Nonmechanical blockages often result after abdominal surgeries or with spinal cord lesions where peristalsis or other neurogenic stimuli are affected. Other less common causes include thrombosis or embolism of mesenteric vessels and trauma or bacterial injury to the peritoneum.

The primary medical treatment for an intestinal obstruction is insertion of an intestinal tube. If the intestinal tube is ineffective in relieving the obstruction, surgery is indicated.

Hemorrhoids

Enlarged veins in the mucous membrane of the anal canal are called ***hemorrhoids***. Often they may bleed, hurt, or itch. They may occur inside (**internal**) or outside (**external**) the rectal area. Hemorrhoids are usually caused by abdominal pressure, such as from straining during bowel movement, pregnancy, and standing or sitting for long periods. They may also be associated with some disorders of the liver or the heart.

A high-fiber diet as well as drinking plenty of water and juices plays a pivotal role in hemorrhoid prevention. Temporary relief from hemorrhoids can usually be obtained by cold compresses, sitz baths, stool softeners, or analgesic ointments. Treatment of an advanced hemorrhoidal condition involves surgical removal (**hemorrhoidectomy**).

Hepatitis

Hepatitis is an inflammatory condition of the liver. The usual causes include exposure to toxic substances, especially alcohol; obstructions in the bile ducts; metabolic diseases; autoimmune diseases; and bacterial or viral infections. A growing public health concern is the increasing incidence of viral hepatitis. Even though its mortality rate is low, the disease is easily transmitted and can cause significant morbidity and prolonged loss of time from school or employment.

Although forms of hepatitis range from hepatitis A through hepatitis E, the three most common forms are: hepatitis A, also called ***infectious hepatitis;*** hepatitis B, also called ***serum hepatitis;*** and hepatitis C. The most common causes of hepatitis A are ingestion of contaminated food, water, or milk. Hepatitis B and hepatitis C are usually transmitted by routes other than the mouth (**parenteral**), such as from blood transfusions and sexual contact. Because of patient exposure, health-care personnel are at increased risk for contracting hepatitis B, but a vaccine that provides immunity to hepatitis B is available. There is no vaccine available for hepatitis C. Patients with hepatitis C may remain asymptomatic for years or the disease may produce only mild flulike symptoms. Treatment for hepatitis includes antiviral drugs; however, there is no cure. As the disease progresses, scarring of the liver becomes so serious that liver transplantation is the only recourse.

One of the major symptoms of many liver disorders, including hepatitis and cirrhosis, is a yellowing of the skin, mucous membranes, and sclerae of the eyes (**jaundice, icterus**). This occurs because the liver is no longer able to remove bilirubin, a yellow

compound formed when erythrocytes are destroyed. Jaundice may also result when the bile duct is blocked, causing bile to enter the bloodstream.

Diverticulosis

Diverticulosis is a condition in which small, blisterlike pockets (**diverticula**) develop in the inner lining of the large intestine and may balloon through the intestinal wall. These pockets occur most commonly in the sigmoid colon. They usually do not cause any problem unless they become inflamed (**diverticulitis**). (See Figure 6–6.) Signs and symptoms of diverticulitis include pain, often in the left lower quadrant (LLQ) of the abdomen; extreme constipation (**obstipation**) or diarrhea; fever; abdominal swelling; and occasional blood in bowel movements. The usual treatment for diverticulitis consists of bed rest, antibiotics, and a soft diet. In severe cases, however, excision of the diverticulum (**diverticulectomy**) may be advised.

Oncology

Although stomach cancer is rare in United States, it is common in many parts of the world where food preservation is problematic. It is an important medical problem because of its high mortality rate. Men are more susceptible to stomach cancer than women. The neoplasm nearly always develops from the epithelial or mucosal lining of the stomach in the form of a cancerous glandular tumor (**gastric adenocarcinoma**). Persistent indigestion is one of the important warning signs of stomach cancer. Other types of GI carcinomas include **esophageal** carcinomas, **hepatocellular** carcinomas, and **pancreatic** carcinomas.

Colorectal cancer arises from the epithelial lining of the large intestine. Signs and symptoms, which depend largely on the location of the malignancy, include changes in bowel habits, passage of blood and mucus in stools, rectal or abdominal pain, anemia, weight loss, obstruction, and perforation. An obstruction that develops suddenly may be the first symptom of cancer involving the colon between the cecum and the sigmoid. In this region, where bowel contents are liquid, a slowly developing obstruction will not become evident until the lumen is almost closed. Cancer of the sigmoid and rectum causes symptoms of partial obstruction with constipation alternating with diarrhea, lower abdominal cramping pain, and distention.

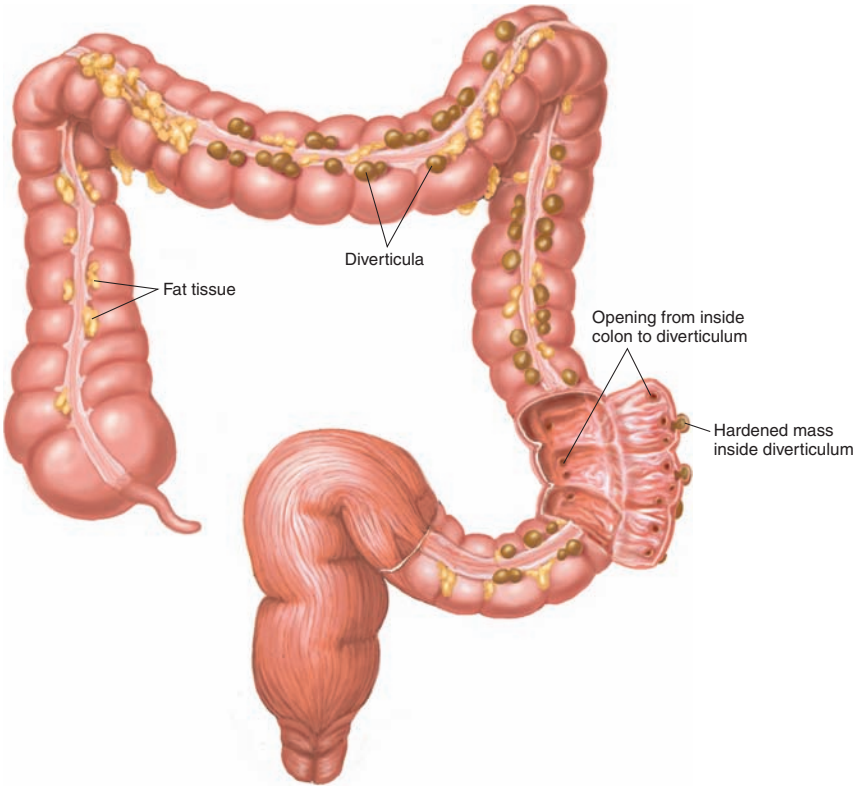


Figure 6-6. Diverticula of the colon.

Diagnostic, Symptomatic, and Related Terms

This section introduces diagnostic, symptomatic, and related terms and their meanings. Word analyses for selected terms are also provided.

Term	Definition
anorexia ăn-ō-RĚK-sē-ă *an-:* without, not *-orexia:* appetite	Lack or loss of appetite, resulting in the inability to eat ***Anorexia should not be confused with anorexia nervosa, which is a complex psychogenic eating disorder characterized by an all-consuming desire to remain thin. Anorexia nervosa and a similar eating disorder called* bulimia nervosa *are discussed in Chapter 14.***
appendicitis ă-pĕn-dĭ-SĪ-tĭs *appendic:* appendix *-itis:* inflammation	Inflammation of the appendix, usually due to obstruction or infection ***If left undiagnosed, appendicitis rapidly leads to perforation and peritonitis. Treatment is appendectomy within 24 to 48 hours of the first symptoms because delay usually results in rupture and peritonitis as fecal matter is released into the peritoneal cavity. (See Figure 6–7.)***
ascites ă-SĪ-tēz	Abnormal accumulation of fluid in the abdomen ***Ascites is most commonly associated with cirrhosis of the liver, especially when caused by alcoholism. Failure of the liver to produce albumin (a protein that regulates the amount of fluid in the circulatory system), combined with portal hypertension forces fluid to pass from the circulatory system and accumulate in the peritoneum.***

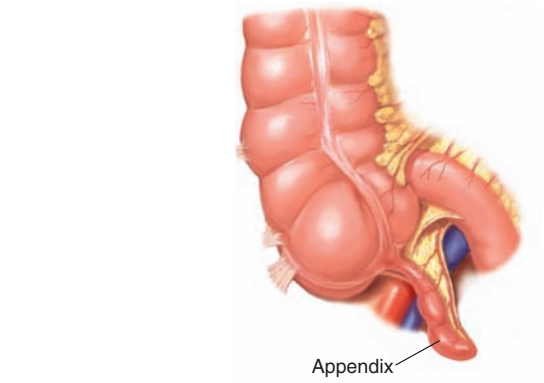


Figure 6-7. Appendectomy.

(continued)

Diagnostic, Symptomatic, and Related Terms—cont'd

Term	Definition
borborygmus bōr-bō-RĬG-mŭs	Rumbling or gurgling noises that are audible at a distance and caused by passage of gas through the liquid contents of the intestine
cachexia kă-KĔKS-ē-ă	Physical wasting that includes loss of weight and muscle mass; commonly associated with AIDS and cancer.
cholelithiasis kō-lē-lĭ-THĪ-ă-sĭs *chol/e:* bile, gall *lith:* stone, calculus *-iasis:* abnormal condition (produced by something specified)	Presence or formation of gallstones in the gallbladder or common bile duct ***Cholelithiasis may or may not produce symptoms.*** **(See Figure 6–8.)**
cirrhosis sĭr-RŌ-sĭs	Scarring and dysfunction of the liver cause by chronic liver disease ***Cirrhosis is most commonly caused by chronic alcoholism. It may also be caused by toxins, infectious agents, metabolic diseases, and circulatory disorders. In this disorder, functional hepatic cells are replaced by nonfunctioning fibrous tissue that impairs the flow of blood and lymph within the liver, resulting in hepatic insufficiency.***
colic KŎL-ĭk	Spasm in any hollow or tubular soft organ especially in the colon, accompanied by pain
Crohn disease KRŌN	Chronic inflammation, usually of the ileum, but possibly affecting any portion of the intestinal tract; also called *regional enteritis* ***Crohn disease is a chronic disease distinguished from closely related bowel disorders by its inflammatory pattern. It may cause fever, cramping, diarrhea, and weight loss.***
deglutition dē-gloo-TĬSH-ŭn	Act of swallowing

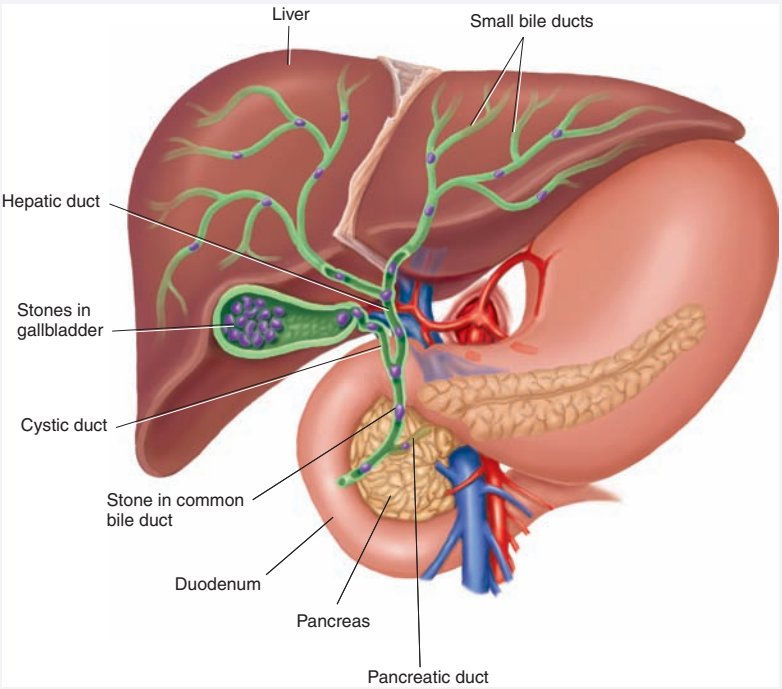


Figure 6-8. Sites of gallstones.

Diagnostic, Symptomatic, and Related Terms—cont'd

Term	Definition
dysentery DĬS-ĕn-tĕr-ē	Inflammation of the intestine, especially the colon, that may be caused by ingesting water or food containing chemical irritants, bacteria, protozoa, or parasites, which results in bloody diarrhea ***Dysentery is common in underdeveloped countries and in times of disaster when sanitary living conditions, clean food, and safe water are not available.***
dyspepsia dĭs-PĔP-sē-ă *dys-:* bad; painful; difficult *-pepsia:* digestion	Epigastric discomfort felt after eating; also called *indigestion*
dysphagia dĭs-FĀ-jē-ă *dys-:* bad; painful; difficult *-phagia:* swallowing, eating	Inability or difficulty in swallowing; also called *aphagia*
eructation ĕ-rūk-TĀ-shŭn	Producing gas from the stomach, usually with a characteristic sound; also called *belching*
fecalith FĒ-kă-lĭth	Fecal concretion
flatus FLĀ-tŭs	Gas in the GI tract; expelling of air from a body orifice, especially the anus
gastroesophageal reflux disease (GERD) găs-trō-ĕ-s-ŏf-ă-JĒ-ăl RĒ-flŭks *gastr/o:* stomach *esophag:* esophagus *-eal:* pertaining to	Backflow of gastric contents into the esophagus due to a malfunction of the sphincter muscle at the inferior portion of the esophagus ***GERD may occur whenever pressure in the stomach is greater than that in the esophagus and may be associated with heartburn, esophagitis, hiatal hernia, or chest pain.***
halitosis hăl-ĭ-TŌ-sĭs	Offensive, or "bad," breath
hematemesis hĕm-ăt-ĔM-ĕ-sĭs *hemat:* blood *-emesis:* vomiting	Vomiting of blood from bleeding in the stomach or esophagus ***Hematemesis can be caused by an esophageal ulcer, esophageal varices (dilation of veins), or a gastric ulcer. Treatment requires correction of the underlying cause.***
irritable bowel syndrome (IBS)	Symptom complex marked by abdominal pain and altered bowel function (typically constipation, diarrhea, or alternating constipation and diarrhea) for which no organic cause can be determined; also called *spastic colon* ***Contributing or aggravating factors of IBS include anxiety and stress.***
malabsorption syndrome măl-ăb-SORP-shŭn SĬN-drōm	Symptom complex of the small intestine characterized by the impaired passage of nutrients, minerals, or fluids through intestinal villi into the blood or lymph ***Malabsorption syndrome may be associated with or due to a number of diseases, including those affecting the intestinal mucosa. It may also be due to surgery, such as gastric resection and ileal bypass, or antibiotic therapy.***

(continued)

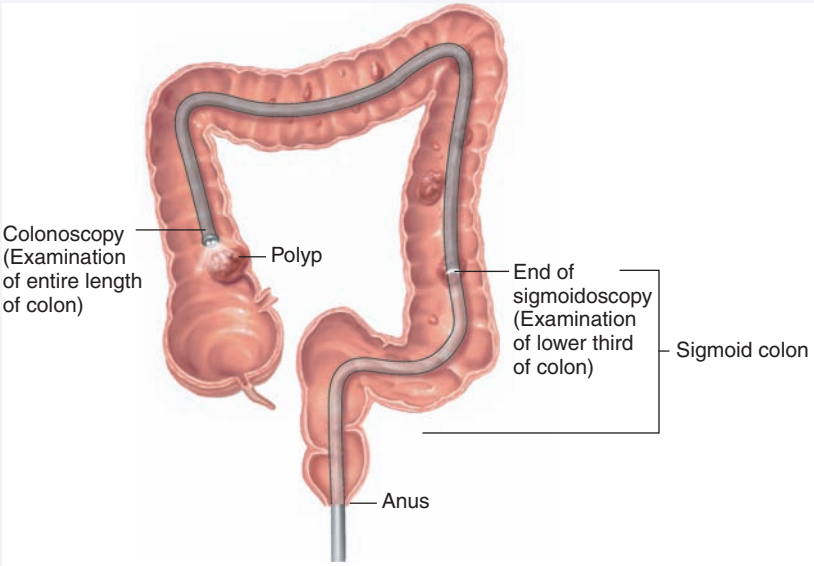
Diagnostic, Symptomatic, and Related Terms—cont'd

Term	Definition
melena MĚL-ĕ-nă	Passage of dark-colored, tarry stools, due to the presence of blood altered by intestinal juices
obesity ō-BĒ-sĭ-tē	Excessive accumulation of fat that exceeds the body's skeletal and physical standards, usually an increase of 20 percent or more above ideal body weight. ***Obesity may be due to excessive intake of food (exogenous) or metabolic or endocrine abnormalities (endogenous).***
morbid obesity ō-BĒ-sĭ-tē	Body mass index (BMI) of 40 or greater, which is generally 100 or more pounds over ideal body weight. ***Morbid obesity is a disease with serious psychological, social, and medical ramifications and one that threatens necessary body functions such as respiration.***
obstipation ŏb-stĭ-PĀ-shŭn	Severe constipation; may be caused by an intestinal obstruction
oral leukoplakia OR-ăl loo-kō-PLĀ-kē-ă *leuk/o:* white *-plakia:* plaque	Formation of white spots or patches on the mucous membrane of the tongue, lips, or cheek caused primarily by irritation ***Oral leukoplakia is a precancerous condition usually associated with pipe or cigarette smoking or ill-fitting dentures.***
peristalsis pĕr-ĭ-STĂL-sĭs	Progressive, wavelike movement that occurs involuntarily in hollow tubes of the body, especially the GI tract
pyloric stenosis pī-LOR-ĭk stĕ-NŌ-sĭs *pylor:* pylorus *-ic:* pertaining to *sten:* narrowing, stricture *-osis:* abnormal condition; increase (used primarily with blood cells)	Stricture or narrowing of the pyloric sphincter (circular muscle of the pylorus) at the outlet of the stomach, causing an obstruction that blocks the flow of food into the small intestine ***The muscle fibers of the outlet are cut, without severing the mucosa, to widen the opening. After surgery in adults, a stomach tube remains in place and observation is maintained for signs of hemorrhage or blockage of the tube.***
regurgitation rē-gŭr-jĭ-TĀ-shŭn	Backward flowing, as in the return of solids or fluids to the mouth from the stomach
steatorrhea stē-ă-tō-RĒ-ă *steat/o:* fat *-rrhea:* discharge, flow	Passage of fat in large amounts in the feces due to failure to digest and absorb it ***Steatorrhea may occur in pancreatic disease when pancreatic enzymes are not sufficient. It also occurs in malabsorption syndrome.***

It is time to review pathological, diagnostic, symptomatic, and related terms by completing Learning Activity 6–5.

Diagnostic and Therapeutic Procedures

This section introduces procedures used to diagnose and treat digestive system disorders. Descriptions are provided as well as pronunciations and word analyses for selected terms.

Procedure	Description
Diagnostic Procedures	
Endoscopic	
endoscopy ĕn-DŎS-kō-pē *endo-:* in, within *-scopy:* visual examinination	Visual examination of a cavity or canal using a flexible fiberoptic instrument called an *endoscope* ***The organ, cavity, or canal being examined dictates the name of the endoscopic procedure.* (See Figure 4-6.) *A camera and video recorder are commonly used during the procedure to provide a permanent record.***
upper GI	Endoscopy of the esophagus (esophagoscopy), stomach (gastroscopy), and duodenum (duodenoscopy) ***Endoscopy of the upper GI tract is performed to identify tumors, esophagitis, gastroesophageal varices, peptic ulcers, and the source of upper GI bleeding. It is also used to confirm the presence and extent of varices in the lower esophagus and stomach in patients with liver disease.***
lower GI	Endoscopy of the colon (colonoscopy), sigmoid colon (sigmoidoscopy), and rectum and anal canal (proctoscopy) (See Figure 6-9.) ***Endoscopy of the lower GI tract is used to identify pathological conditions in the colon. It may also be used to remove polyps. When polyps are discovered in the colon, they are retrieved and tested for cancer.***
	 **Figure 6-9.** Colonoscopy and sigmoidoscopy.
Laboratory	
hepatitis panel hĕp-ă-TĪ-tĭs *hepat:* liver *-itis: i*nflammation	Panel of blood tests that identify the specific virus—hepatitis A (HAV), hepatitis B (HBV), or hepatitis C (HCV)-causing hepatitis by testing serum using antibodies to each of these antigens

(continued)

Diagnostic and Therapeutic Procedures—cont'd

Procedure	Description
liver function tests (LFTs) LĬV-ĕr FŬNGK-shŭn	Group of blood tests that evaluate liver injury, liver function, and conditions often associated with the biliary tract *LFTs evaluate liver enzymes, bilirubin, and proteins produced by the liver.*
serum bilirubin SĒ-rŭm bĭl-ĭ-ROO-bĭn	Measurement of the level of bilirubin in the blood *Elevated serum bilirubin indicates excessive destruction of erythrocytes, liver disease, or biliary tract obstruction. Bilirubin is a breakdown product of hemoglobin and is normally excreted from the body as bile. Excessive bilirubin causes yellowing of the skin and mucous membranes, a condition called* **jaundice.**
stool culture	Test to identify microorganisms or parasites present in feces *Feces are examined microscopically after being placed in a growth medium.*
stool guaiac GWĪ-ăk	Applying a substance called guaiac to a stool sample to detect presence of occult (hidden) blood in the feces; also called *Hemoccult* (trade name of a modified guaiac test) *Stool test detects presence of blood in the feces that is not apparent on visual inspection. It also helps detect colon cancer and bleeding associated with digestive disorders.*
Radiographic	
barium enema (BE) BĂ-rē-ŭm ĔN-ĕ-mă	Radiographic examination of the rectum and colon following enema administration of barium sulfate (contrast medium) into the rectum; also called lower GI series *Barium is retained in the lower GI tract during fluoroscopic and radiographic studies. It is used for diagnosing obstructions, tumors, or other abnormalities of the colon. (See Figure 6-10.)*

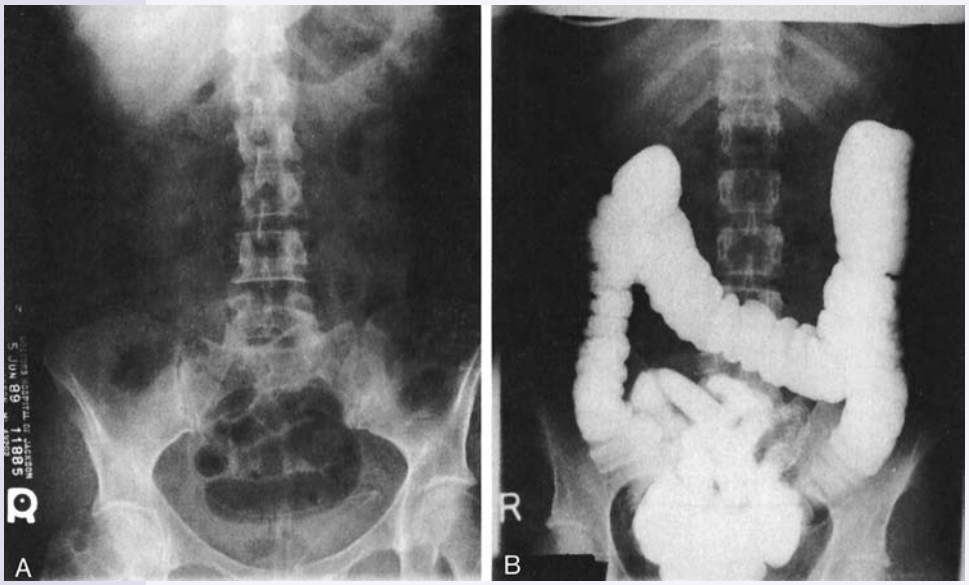


Figure 6-10. Barium enema done poorly (A) and correctly (B).

Diagnostic and Therapeutic Procedures—cont'd

Procedure	Description
barium swallow BĂ-rē-ŭm	Radiographic examination of the esophagus, stomach, and small intestine following oral administration of barium sulfate (contrast medium); also called *esophagram* and *upper GI series* ***Barium swallow is used to diagnose structural defects of the esophagus and vessels, such as esophageal varices. It may also be used to locate swallowed objects.***
cholecystography kō-lē-sĭs-TŎG-ră-fē *chol/e:* bile, gall *cyst/o:* bladder *-graphy:* process of recording	Radiographic images taken of the gallbladder after administration of a contrast material containing iodine, usually in the form of a tablet ***This test evaluates gallbladder function and identifies the presence of disease or gallstones.***
computed tomography (CT) kŏm-PŪ-tĕd tō-MŎG-ră-fē *tom/o:* to cut *-graphy:* process of recording	Imaging technique achieved by rotating an x-ray emitter around the area to be scanned and measuring the intensity of transmitted rays from different angles ***In CT scanning, a computer is used to generate a detailed cross-sectional image that appears as a slice. (See Figure 4-5D.) In the digestive system, CT scans are used to view the gallbladder, bowel, liver, bile ducts, and pancreas. It is also used to diagnose tumors, cysts, inflammation, abscesses, perforation, bleeding, and obstructions.***
endoscopic retrograde cholangiopancreatography (ERCP) ĕn-dō-SKŎ-pĭk RĔT-rō-grād kŏ-lăn-jē-ō-păn-krē-ă-TŎG-ră-fē *cholangi/o:* bile vessel *pancreat/o:* pancreas *-graphy:* process of recording	Endoscopic procedure that provides radiographic visualization of the bile and pancreatic ducts to identify partial or total obstructions, as well as stones, cysts, and tumors. ***In ERCP, a flexible fiberoptic duodenoscope is placed into the common bile duct. A radiopaque substance is instilled directly into the duct and serial x-ray films are taken.***
percutaneous transhepatic cholangiography (PTCP) pĕr-kū-TĀ-nē-ŭs trăns-hĕ-PĂT-ĭk kō-lăn-jē-ŎG-ră-fē *per-:* through *cutane: s*kin *-ous:* pertaining to *trans-:* through, across *hepat:* liver *-ic:* pertaining to *cholangi/o:* bile vessel *-graphy:* process of recording	Radiographic examination of bile duct structures ***Contrast medium is injected through a needle passed through the skin (percutaneous) and through the liver (transhepatic) directly into the hepatic duct. The bile duct can be viewed for obstructions, anatomical variations, and cysts.***
sialography sī-ă-LŎG-ră-fē *sial/o:* saliva, salivary glands *-graphy:* process of recording	Radiologic examination of the salivary glands and ducts ***Sialography may be performed with or without a contrast medium.***

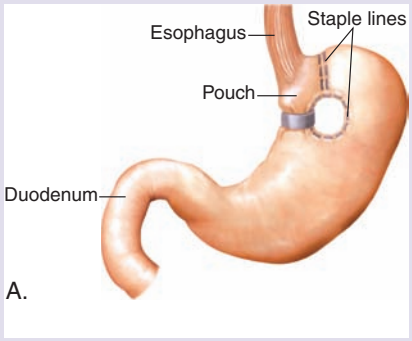
(continued)

Diagnostic and Therapeutic Procedures—cont'd

Procedure	Description
ultrasonography (US) ŭl-tră-sŏn-ŎG-ră-fē *ultra-:* excess, beyond *son/o:* sound *-graphy:* process of recording	Test that uses high-frequency sound waves (ultrasound) to analyze the reflected echos from anatomical structures and convert them into an image on a video monitor; also called *ultrasound, sonography, echo,* and *echogram* ***US detects diseases and deformities in digestive organs, such as the gallbladder, liver, and pancreas. It is also used to locate abdominal masses outside the digestive organs.***
abdominal ăb-DŎM-ĭ-năl *abdomin:* abdomen *-al:* pertaining to	Ultrasound visualization of the abdominal aorta, liver, gallbladder, bile ducts, pancreas, kidneys, ureters, and bladder ***An abdominal US is used to diagnose and locate cysts, tumors, and malformations as well as document the progression of various diseases and guide the insertion of instruments during surgical procedures.***
Surgical	
biopsy (bx) BĪ-ŏp-sē liver	Representative tissue sample removed from a body site for microscopic examination, usually to establish a diagnosis Use of a large-bore needle to remove a core of liver tissue for histological examination
Therapeutic Procedures	
Clinical	
nasogastric intubation nā-zō-GĂS-trĭk ĭn-tū-BĀ-shŭn *nas/o:* nose *gastr:* stomach *-ic:* pertaining to	Procedure that involves insertion of a nasogastric tube through the nose into the stomach to relieve gastric distention by removing gas, food, or gastric secretions; to instill medication, food, or fluids; or to obtain a specimen for laboratory analysis
Surgical	
anastomosis ă-năs-tō-MŌ-sĭs	Surgical joining of two ducts, vessels, or bowel segments to allow flow from one to another
ileorectal ĭl-ē-ō-RĔK-tăl *ile/o:* ileum *rect:* rectum *-al:* pertaining to	Surgical connection of the ileum and rectum after total colectomy, as is sometimes performed in the treatment of ulcerative colitis
intestinal ĭn-TĔS-tĭ-năl	Surgical connection of two portions of the intestines; also called *enteroenterostomy*

Diagnostic and Therapeutic Procedures—cont'd

Procedure	Description
bariatric surgery băr-ē-Ă-trĭk	Group of procedures that treat morbid obesity, a condition which arises from severe accumulation of excess weight as fatty tissue, and the resultant health problems ***Commonly employed bariatric surgeries include vertical banded gastroplasty and Roux-en-Y gastric bypass. (See Figure 6-11.)***
vertical banded gastroplasty	Upper stomach near the esophagus is stapled vertically to reduce it to a small pouch. A band is then inserted that restricts food consumption and delays its passage from the pouch, causing a feeling of fullness.
Roux-en-Y gastric bypass (RGB) rū-ĕn-Ē GĂS-trĭk	Stomach is first stapled to decrease it to a small pouch. Next, the jejunum is shortened and connected to the small stomach pouch, causing the base of the duodenum leading from the nonfunctioning portion of the stomach to form a Y configuration. This configuration decreases the pathway of food through the intestine, thus reducing absorption of calories and fats ***RGB can be performed laparoscopically or as an open procedure (laparotomy), depending on the health of the pateint. RGB is the most commonly performed weight-loss surgery today.***



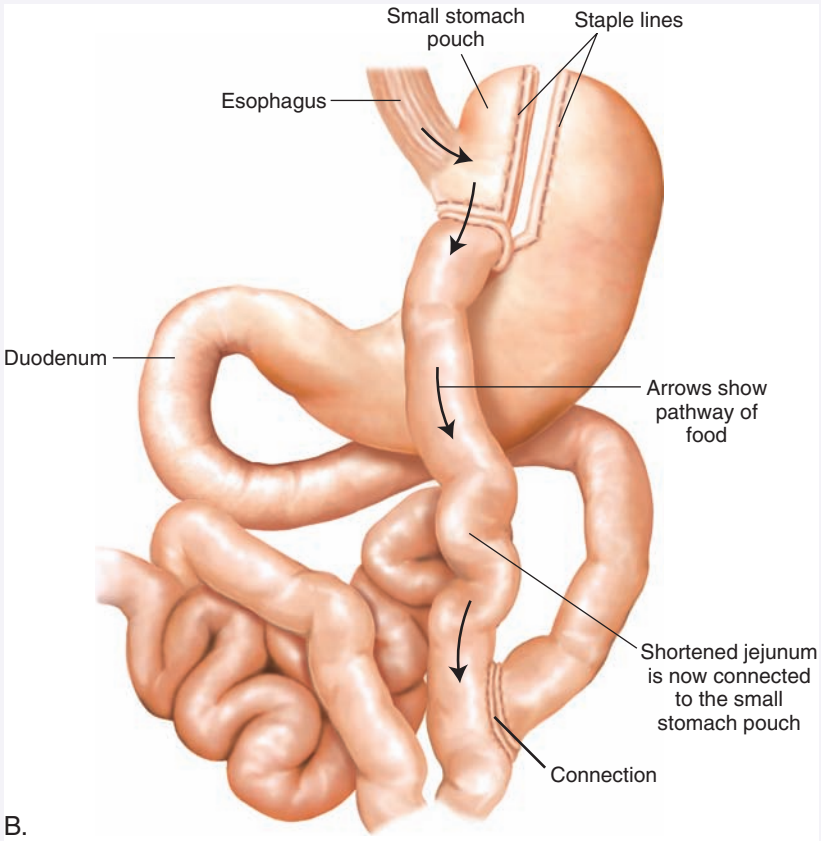


Figure 6-11. Bariatric surgery. (A) Vertical banded gastroplasty. (B) Roux-en-Y gastric bypass.

(continued)

Diagnostic and Therapeutic Procedures—cont'd

Procedure	Description
colostomy kō-LŎS-tō-mē *col/o:* colon	Creation of an opening of a portion of the colon through the abdominal wall to its outside surface in order to divert fecal flow to a colostomy bag (See Figure 6-12.)
lithotripsy LĪTH-ō-trĭp-sē *lith/o:* stone, calculus *-tripsy:* crushing	Procedure for crushing a stone and eliminating its fragments either surgically or using ultrasonic shock waves
extracorporeal shockwave ĕks-tră-kor-POR-ē-ăl SHŎK-wāv	Use of shock waves as a noninvasive method to break up stones in the gallbladder or biliary ducts (See Figure 11-5.) ***In extracorporeal shockwave lithotripsy (ESWL), ultrasound is used to locate the stone(s) and to monitor the destruction of the stones.***

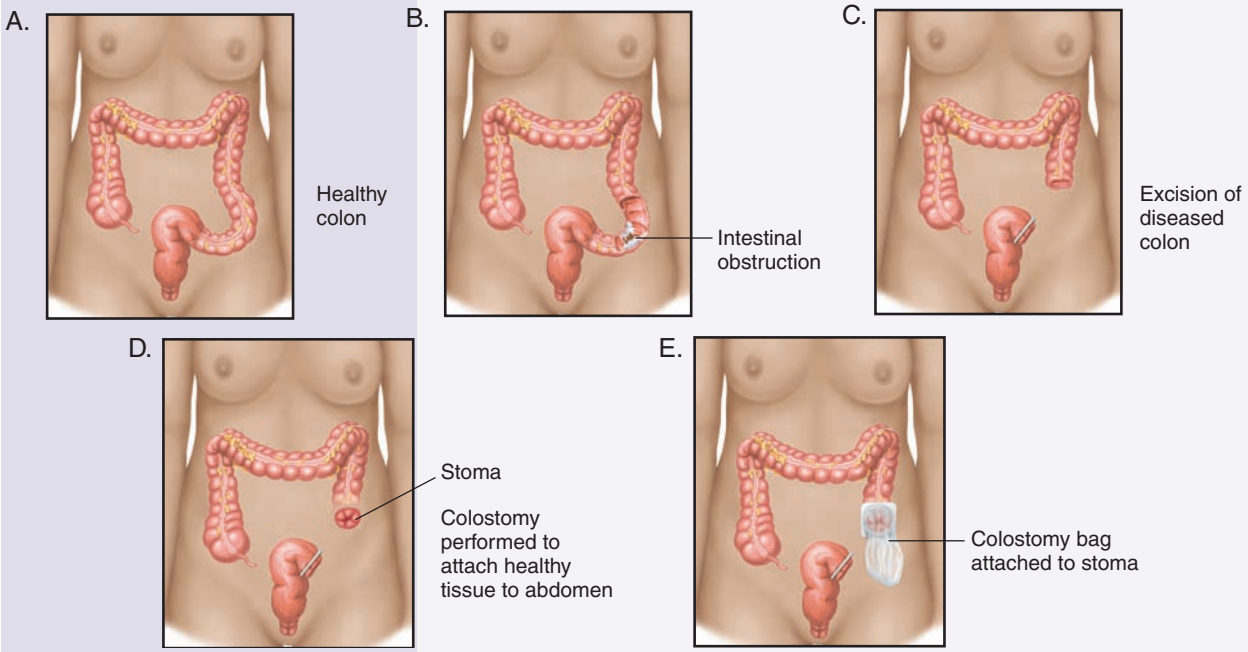


Figure 6-12. Colostomy.

Diagnostic and Therapeutic Procedures—cont'd

Procedure	Description
polypectomy pŏl-ĭ-PĔK-tō-mē *polyp:* small growth *-ectomy:* excision, removal	Excision of a polyp ***When polyps are discovered during sigmoidoscopy or colonoscopy, they are excised for microscopic tissue examination for abnormal or cancerous cells. (See Figure 6-13.)***
pyloromyotomy pī-lō-rō-mī-ŎT-ō-mē *pylor/o:* pylorus *my/o:* muscle *-tomy:* incision	Incision of the longitudinal and circular muscles of the pylorus; used to treat hypertrophic pyloric stenosis

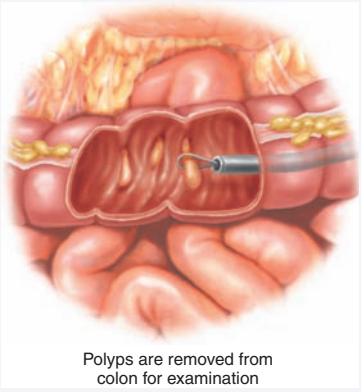


Figure 6-13. Polypectomy.

Pharmacology

Various pharmaceutical agents are available to counteract abnormal conditions that occur in the GI tract. Antacids counteract or decrease excessive stomach acid, the cause of heartburn, gastric discomfort, and gastric reflux. Antidiarrheals and antiemetics are prescribed to preserve water and electrolytes, which are essential for body hydration and homeostasis. Medications that increase or decrease peristalsis are used to regulate the speed at which food passes through the GI tract. These drugs include agents that relieve "cramping" **(antispasmodics)** and those that help in the movement of material through a sluggish bowel **(laxatives)**. (See Table 6–1.)

Table 6-1 Drugs Used to Treat Digestive Disorders

This table lists common drug classifications used to treat digestive disorders, their therapeutic actions, and selected generic and trade names.

Classification	Therapeutic Action	Generic and Trade Names
antacids	Counteract or neutralize acidity, usually in the stomach *Antacids are used to treat and prevent heartburn and acid reflux.*	**calcium carbonate** KĂL-sē-ŭm KĂR-bŏn-āt Mylanta, Rolaids, Tums
antidiarrheals	Control loose stools and relieve diarrhea by absorbing excess water in the bowel or slowing peristalsis in the intestinal tract	**loperamide** lō-PĔR-ă-mīd Imodium **kaolin/pectin** KĀ-ō-lĭn PĔK-tĭn Donnagel-MB, Kapectolin

(continued)

Table 6-1 Drugs Used to Treat Digestive Disorders—cont'd

Classification	Therapeutic Action	Generic and Trade Names
antiemetics	Control nausea and vomiting by blocking nerve impulses to the vomiting center of the brain *Some emetics act by hastening movement of food through the digestive tract.*	**prochlorperazine** prō-klor-PĚR-ă-zēn Compazine, Compro **trimethobenzamide** trī-měth-ō-BĚN-ză-mīd T-Gen, Tigan
antispasmodics	Decrease gastrointestinal (GI) spasms by slowing peristalsis and motility throughout the GI tract *Antispasmodics are prescribed for irritable bowel syndrome (IBS), spastic colon, and diverticulitis.*	**glycopyrrolate** glī-kō-PĬR-rō-lāt Robinul **propantheline** prō-PĂN-thĕ-lēn Pro-Banthine
laxatives	Treat constipation by increasing peristaltic activity in the large intestine or increasing water and electrolyte secretion into the bowel to induce defecation	**senna, sennosides** SĚN-ă, SĚN-ō-sīdz Senokot, Senolax **psyllium** SĬL-ē-ŭm Metamucil, Natural Fiber Supplement

Abbreviations

This section introduces digestive-related abbreviations and their meanings.

Abbreviation	Meaning	Abbreviation	Meaning
Common			
ABC	aspiration biopsy cytology	**EGD**	esophagogastroduodenoscopy
alk phos	alkaline phosphatase	**ERCP**	endoscopic retrograde cholangiopancreatography
ALT	alanine aminotransferase	**GB**	gallbladder
AST	angiotensin sensitivity	**GBS**	gallbladder series (x-ray studies)
Ba	barium	**GER**	gastroesophageal reflux
BaE, BE	barium enema	**GERD**	gastroesophageal reflux disease
BM	bowel movement	**GI**	gastrointestinal
BMI	body mass index	**HAV**	hepatitis A virus
CF	cystic fibrosis	**HBV**	hepatitis B virus
CT	computed tomography	**HCV**	hepatitis C virus

Abbreviations—cont'd

Abbreviation	Meaning	Abbreviation	Meaning
HDV	hepatitis D virus	**PTHC**	percutaneous transhepatic cholangeography
HEV	hepatitis E virus	**stat, STAT**	immediately
IBS	irritable bowel syndrome	**PMH**	past medical history
LFT	liver function test	**PUD**	peptic ulcer disease
NG	nasogastric	**RGB**	Roux-en-Y gastric bypass
PE	physical examination; pulmonary embolism	**R/O**	rule out
Medication time schedule			
a.c.	before meals	**qAM**	every morning
b.i.d.	twice a day	**q.d.**	every day
hs	half strength	**q.h.**	every hour
h.s.	at bedtime	**q.2h.**	every 2 hours
NPO, n.p.o.	nothing by mouth	**q.i.d.**	four times a day
pc, p.c.	after meals	**q.o.d.**	every other day
p.o.	by mouth	**qPM**	every evening
p.r.n.	as required	**t.i.d.**	three times a day

It is time to review procedures, pharmacology, and abbreviations by completing Learning Activity 6–6.

LEARNING ACTIVITIES

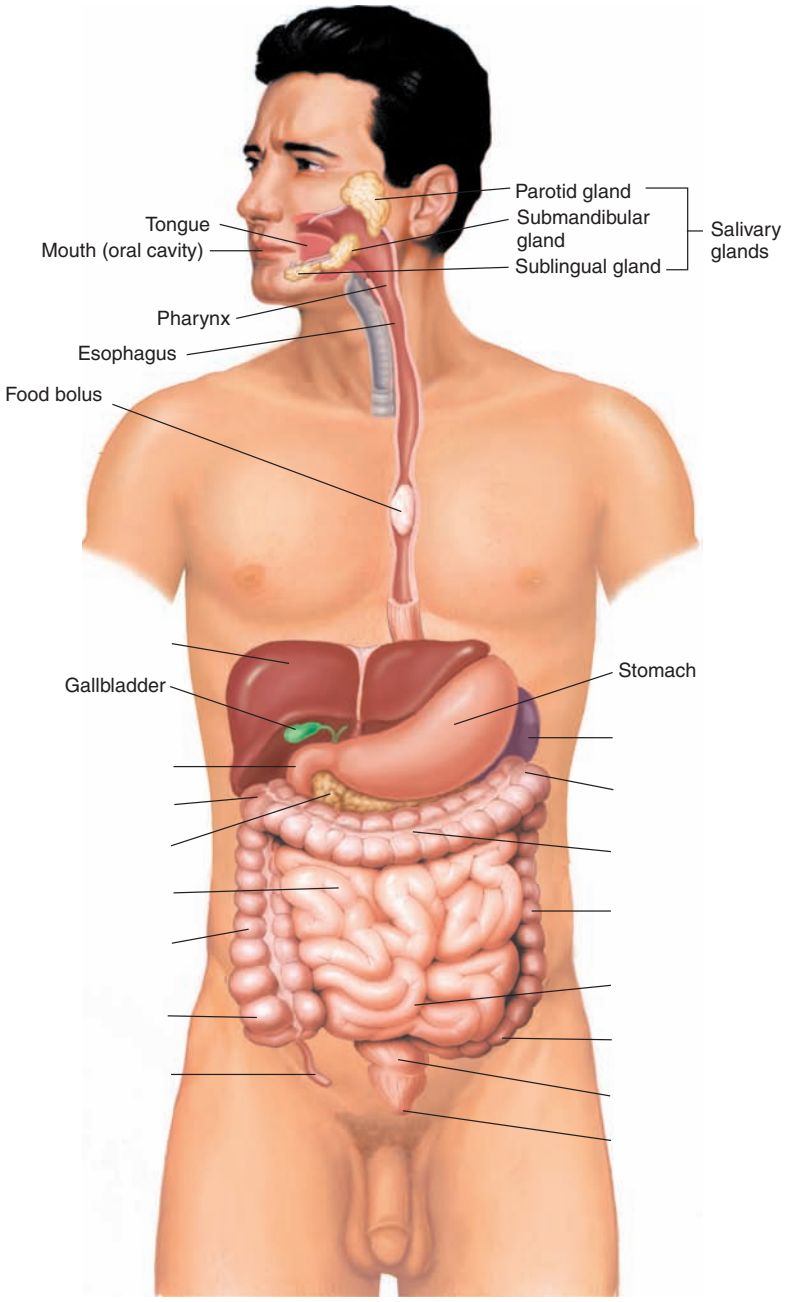
The following activities provide review of the digestive system terms introduced in this chapter. Complete each activity and review your answers to evaluate your understanding of the chapter.

Learning Activity 6-1

Identifying Digestive Structures

Label the illustration on page 109 using the terms listed below.

anus	*hepatic flexure*	*rectum*
appendix	*ileum*	*sigmoid colon*
ascending colon	*jejunum*	*spleen*
cecum	*liver*	*splenic flexure*
descending colon	*pancreas*	*transverse colon*
duodenum		



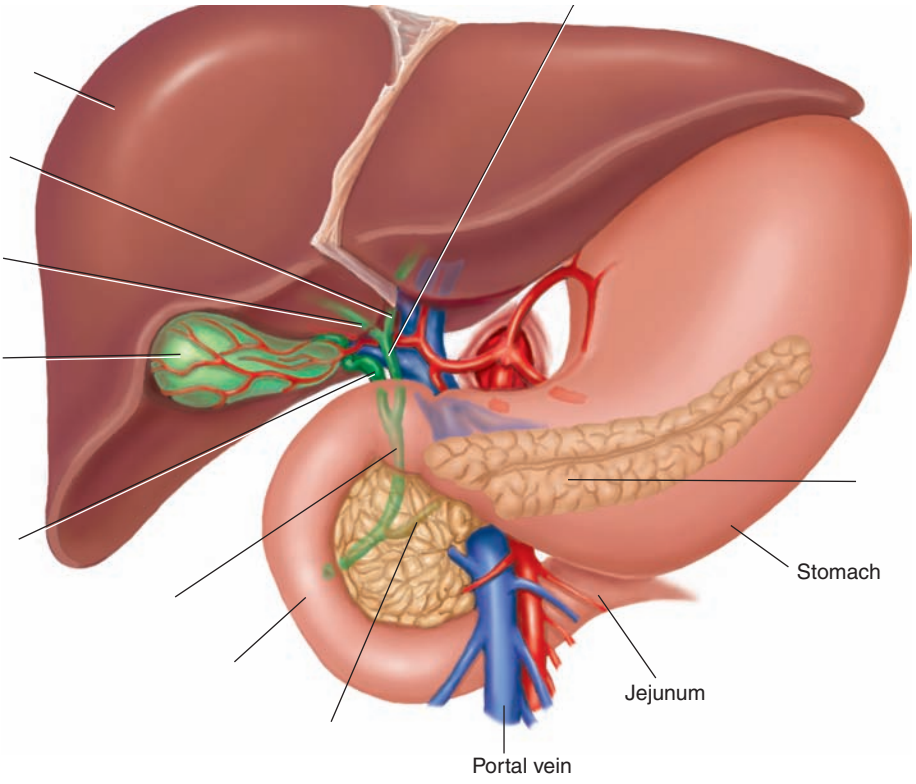
Check your answers by referring to Figure 6–3 on page 109. Review material that you did not answer correctly.

Learning Activity 6-2

Identifying Accessory Organs of Digestion

Label the following illustration using the terms listed below.

common bile duct	*hepatic duct*	*pancreas*
cystic duct	*left hepatic duct*	*pancreatic duct*
duodenum	*liver*	*right hepatic duct*
gallbladder		



Check your answers by referring to Figure 6–4 on page 110. Review material that you did not answer correctly.

DavisPlus.fadavis.com

Enhance your study and reinforcement of word elements with the power of DavisPlus. Visit www.davisplus.fadavis.com/gylys/systems *for this chapter's flash-card activity. We recommend you complete the flash-card activity before completing Activity 6–3 below.*

Learning Activity 6-3

Building Medical Words

Use *esophag/o* (esophagus) to build words that mean:

1. pain in the esophagus _____
2. spasm of the esophagus _____
3. stricture or narrowing of the esophagus _____

Use *gastr/o* (stomach) to build words that mean:

4. inflammation of the stomach _____
5. pain in the stomach _____
6. disease of the stomach _____

Use *duoden/o* (duodenum), *jejun/o* (jejunum), or *ile/o* (ileum) to build words that mean:

7. excision of all or part of the jejunum _____
8. relating to the duodenum _____
9. inflammation of the ileum _____
10. pertaining to the jejunum and ileum _____

Use *enter/o* (usually small intestine) to build words that mean:

11. inflammation of the small intestine _____
12. disease of the small intestine _____
13. inflammation of the small intestine and colon _____

Use *col/o* (colon) to build words that mean:

14. inflammation of the colon _____
15. pertaining to the colon and rectum _____
16. prolapse or downward displacement of the colon _____
17. disease of the colon _____

Use *proct/o* (anus, rectum) or *rect/o* (rectum) to build words that mean:

18. narrowing or constriction of the rectum _____
19. herniation of the rectum _____
20. paralysis of the anus (anal muscles) _____

Use *chol/e* (bile, gall) to build words that mean:

21. inflammation of the gallbladder _____
22. abnormal condition of a gallstone _____

Use *hepat/o* (liver) or *pancreat/o* (pancreas) to build words that mean:

23. tumor of the liver _____
24. enlargement of the liver _____
25. inflammation of the pancreas _____

Check your answers in Appendix A. Review material that you did not answer correctly.

Correct Answers _____ × 4 = _____ % Score

Learning Activity 6-4

Building Surgical Words

Build a surgical word that means:

1. excision of gums (tissue) _____
2. partial or complete excision of the tongue _____
3. repair of the esophagus _____
4. removal of part or all of the stomach _____
5. forming an opening between the stomach and jejunum _____
6. excision of (part of) the esophagus _____
7. forming an opening between the stomach, small intestine, and colon _____
8. surgical repair of the small intestine _____
9. fixation of the small intestine (to the abdominal wall) _____
10. suture of the bile duct _____
11. forming an opening into the colon _____
12. fixation of a movable liver (to the abdominal wall) _____
13. surgical repair of the anus or rectum _____
14. removal of the gallbladder _____
15. surgical repair of a bile duct _____

Check your answers in Appendix A. Review material that you did not answer correctly.

Correct Answers _____ × 6.67 = _____ % Score

Learning Activity 6-5

Matching Pathological, Diagnostic, Symptomatic, and Related Terms

Match the following terms with the definitions in the numbered list.

anorexia	*dysphagia*	*hematemesis*
cachexia	*dyspnea*	*lesion*
cirrhosis	*fecalith*	*melena*
dyspepsia	*halitosis*	*obstipation*

1. vomiting blood _____
2. difficulty swallowing or inability to swallow _____
3. fecal concretion _____
4. "bad" breath _____
5. loss of appetite _____
6. poor digestion _____
7. degenerative liver disease _____
8. state of ill health, malnutrition, and wasting _____
9. intractable constipation _____
10. open sore _____

Check your answers in Appendix A. Review any material that you did not answer correctly.

Correct Answers _____ × 10 = _____ % Score

Learning Activity 6-6

Matching Procedures, Pharmacology, and Abbreviations

Match the following terms with the definitions in the numbered list.

anastomosis	*emetics*	*lower GI series*	*ultrasonography*
antacids	*endoscopy*	*proctosigmoidoscopy*	*upper GI series*
antispasmodics	*gastroscopy*	*PTHC*	
bariatric	*intubation*	*stat.*	
bilirubin	*laxatives*	*stool guaiac*	
choledochoplasty	*liver function tests*	*stomatoplasty*	

1. percutaneous transhepatic radiographic examination of bile ducts _____
2. breakdown product of hemoglobin, excreted from the body as bile _____
3. agents that produce vomiting _____
4. agents that alleviate muscle spasms _____
5. surgical reconstruction of a bile duct _____
6. administration of barium enema while a series of radiographs are taken of the large intestine _____
7. visual examination of the stomach _____
8. surgical reconstruction of the mouth _____
9. insertion of a tube into any hollow organ _____
10. surgical formation of a passage or opening between two hollow viscera or vessels _____
11. detects presence of blood in the feces; also called Hemoccult _____
12. visual examination of a cavity or canal using a specialized lighted instrument _____
13. used to treat constipation _____
14. neutralize excess acid in the stomach and help to relieve gastritis and ulcer pain _____
15. procedure in which high-frequency sound waves produce images of internal body structures that are displayed on a monitor _____
16. measures the levels of certain enzymes, bilirubin, and various proteins _____
17. surgery that treats morbid obesity _____
18. immediately _____
19. endoscopic procedure for visualization of the rectosigmoid colon _____
20. barium solution swallowed for radiographic examination of the esophagus, stomach, and duodenum _____

Check your answers in Appendix A. Review material that you did not answer correctly.

Correct Answers _____ × 5 = _____ % Score

MEDICAL RECORD ACTIVITIES

The two medical records included in the following activities use common clinical scenarios to show how medical terminology is used to document patient care. Complete the terminology and analysis sections for each activity to help you recognize and understand terms related to the digestive system.

Medical Record Activity 6-1

Chart Note: GI Evaluation

Terminology

Terms listed below come from the medical report *Chart Note: GI Evaluation* that follows. Use a medical dictionary such as *Taber's Cyclopedic Medical Dictionary*, the appendices of this book, or other resources to define each term. Then review the pronunciations for each term and practice by reading the medical record aloud.

Term	Definition
appendectomy* ăp-ĕn-DĔK-tō-mē	
cholecystectomy kō-lē-sĭs-TĔK-tō-mē	
cholecystitis kō-lē-sĭs-TĪ-tĭs	
cholelithiasis* kō-lē-lĭ-THĪ-ă-sĭs	
crescendo kră-SHĔN-dō	
decrescendo dā-kră-SHĔN-dō	
defecate DĔF-ĕ-kāt	
flatus FLĀ-tŭs	
heme-negative stool hēm-NĔG-ă-tĭv	
hepatomegaly hĕp-ă-tō-MĔG-ă-lē	
intermittent ĭn-tĕr-MĬT-ĕnt	
nausea NAW-sē-ă	

Term	Definition
PMH	
postoperative pōst-ŎP-ĕr-ă-tĭv	
R/O	
splenomegaly splē-nō-MĔG-ă-lē	
tonsillectomy tŏn-sĭl-ĔK-tō-mē	

*Refer to Figure 6–5 and Figure 6–8 for a visual illustration of these terms.

Listen and Learn Online! *will help you master pronunciations of selected medical words from this medical record activity. Visit* www.davisplus.com/gylys/systems *to find instructions on completing the* Listen and Learn Online! *exercise for this section and then to practice pronunciations.*

CHART NOTE: GI EVALUATION

Jones, Roberta **Age: 50**
March 15, 20xx

HISTORY OF PRESENT ILLNESS: Patient's abdominal pain began 2 years ago when she first had intermittent, sharp epigastric pain. Each episode lasted 2 to 4 hours. Eventually, she was diagnosed as having cholecystitis with cholelithiasis and underwent cholecystectomy. Three to five large calcified stones were found.

POSTOPERATIVE COURSE: Her postoperative course was uneventful until 4 months ago when she began having continuous deep right-sided pain. This pain followed a crescendo pattern and peaked several weeks ago, at a time when family stress was also at its climax. Since then, the pain has been following a decrescendo pattern. It does not cause any nausea or vomiting, does not trigger any urge to defecate, and is not alleviated by passage of flatus. Her PMH is significant only for tonsillectomy, appendectomy, and the cholecystectomy. Her PE findings indicated that there was no hepatomegaly or splenomegaly. The rectal examination confirmed normal sphincter tone and heme-negative stool.

IMPRESSION: Abdominal pain. Rule out hepatomegaly and splenomegaly.

PLAN: Schedule a complete barium workup for possible obstruction.

Juan Perez, MD
Juan Perez, MD

bcg

Analysis

Review the medical record *Chart Note: GI Evaluation* to answer the following questions.

1. While referring to Figure 6–3, describe the location of the gallbladder in relation to the liver.

2. Why did the patient undergo the cholecystectomy?

3. List the patient's prior surgeries.

4. How does the patient's most recent postoperative episode of discomfort (pain) differ from the initial pain she described?

Medical Record Activity 6-2

Operative Report: Esophagogastroduodenoscopy with Biopsy

Terminology

Terms listed below come from the medical report *Operative Report: Esophagogastroduodenoscopy with Biopsy* that follows. Use a medical dictionary such as *Taber's Cyclopedic Medical Dictionary*, the appendices of this book, or other resources to define each term. Then review the pronunciations for each term and practice by reading the medical record aloud.

Term	Definition
Demerol DĔM-ĕr-ŏl	
duodenal bulb dū-ō-DĒ-năl bŭlb	
duodenitis dū-ŏd-ĕ-NĪ-tĭs	
erythema ĕr-ĭ-THĒ-mă	
esophageal varices ĕ-sŏf-ă-JĒ-ăl VĂR-ĭ-sēz	
esophagogastro-duodenoscopy ĕ-SŎF-ă-gō-GĂS-trō-doo-ō-dĕn-ŎS-kō-pē	
etiology ē-tē-ŎL-ō-jē	
friability frī-ă-BĬL-ĭ-tē	
gastric antrum GĂS-trĭk ĂN-trŭm	
gastritis găs-TRĪ-tĭs	
hematemesis hĕm-ăt-ĔM-ĕ-sĭs	
lateral recumbent LĂT-ĕr-ăl rē-KŬM-bĕnt	
oximeter ŏk-SĬM-ĕ-tĕr	
punctate erythema PŬNK-tāt ĕr-ĭ-THĒ-mă	

Term	Definition
tomography tō-MŎG-ră-fē	
Versed VĚR-sĕd	
videoendoscope vĭd-ē-ō-ĚND-ō-skōp	

Listen and Learn Online! *will help you master pronunciations of selected medical words from this medical record activity. Visit* www.davisplus.com/gylys/systems *to find instructions on completing the* Listen and Learn Online! *exercise for this section and then to practice pronunciations.*

OPERATIVE REPORT: ESOPHAGOGASTRODUODENOSCOPY WITH BIOPSY

General Hospital

1511 Ninth Avenue ■■ Sun City, USA 12345 ■■ (555) 802-1887

OPERATIVE REPORT

Date: May 14, 20xx
Patient: Franks, Roberta
Physician: Dante Riox, MD
Room: 703

PREOPERATIVE DIAGNOSIS: Hematemesis of unknown etiology.

POSTOPERATIVE DIAGNOSIS: Diffuse gastritis and duodenitis.

PROCEDURE: Esophagogastroduodenoscopy with biopsy.

SPECIMEN: Biopsies from gastric antrum and duodenal bulb.

ESTIMATED BLOOD LOSS: Nil.

COMPLICATIONS: None.

TIME UNDER SEDATION: 20 minutes.

PROCEDURE AND FINDINGS: After obtaining informed consent regarding the procedure, its risks, and its alternatives, the patient was taken to the GI lab, where she was placed on the examining table in the left lateral recumbent position. She was given nasal oxygen at 3 liters per minute and monitored with a pulse oximeter throughout the procedure. Through a previously inserted intravenous line, the patient was sedated with a total of 50 mg of Demerol intravenously plus 4 mg of Midazolam intravenously throughout the procedure. The Fujinon computed tomography scan videoendoscope was then readily introduced and the following organs evaluated.

Esophagus: The esophageal mucosa appeared normal throughout. No other abnormalities were seen. Specifically, there was prior evidence of esophageal varices.

Stomach: There was diffuse erythema with old blood seen within the stomach. No ulcerations, erosions, or fresh bleeding was seen. A representative biopsy was obtained from the gastric antrum and submitted to the pathology laboratory.

Duodenum: Punctate erythema was noted in the duodenal bulb. There was some friability. No ulcerations, erosions, or active bleeding was seen. A bulbar biopsy was obtained. The second portion of the duodenum appeared normal.

The patient tolerated the procedure well. Patient was transferred to the recovery room in stable condition.

Dante Riox, MD
Dante Riox, MD

dr:bg

D: 5-14-20xx
T: 5-14-20xx

Analysis

Review the medical report *Operative Report: Esophagogastroduodenoscopy with Biopsy* to answer the following questions.

1. What caused the hematemesis?

2. What procedures were carried out to determine the cause of bleeding?

3. How much blood did the patient lose during the procedure?

4. Were there any ulcerations or erosions found during the exploratory procedure that might account for the bleeding?

5. What type of sedation was used during the procedure?

6. What did the doctors find when they examined the stomach and duodenum?