UNIT I

Introduction to Health and Disease

CHAPTER 1

Health Versus Disease

OUTLINE

Overview
Study of Pathophysiology
  Developments in Pathophysiology
  Vocabulary of Pathophysiology
Classifications of Disease
Patient History
Physical Examination
Diagnosis of Disease
Treatment
Summary
Review Questions
Case Studies
Websites

LEARNING OBJECTIVES

After completion of the chapter the reader should be able to

1. Describe how disease affects homeostasis.
2. Identify the major classifications of human diseases.
3. Discuss how a pathologic condition or disease may develop.
4. List at least 10 vocabulary terms related to pathophysiology that appear in this chapter.
5. Explain the importance of patient history in the treatment of diseases.
6. List the various steps involved in maintaining homeostasis.
7. Describe the differences between acute, subacute, and chronic disease.
8. Describe the various types of diagnostic tests and procedures discussed in this chapter.

KEY TERMS

Angiogram: an x-ray image produced by angiography, which involves injecting a radiopaque substance into the blood vessels.

Arteriogram: an x-ray image produced by arteriography, which involves injecting a radiopaque substance into the arteries.

Autopsy: medical examination of a dead body to discover the cause and manner of death.

Biopsy: a surgical procedure wherein a piece of tissue is removed for further diagnostic study. Some biopsies require general anesthesia, whereas others are minor procedures done with local anesthesia or no anesthesia at all.

Degeneration: deterioration of tissue to a less functionally active form.

Electrocardiogram: a printed readout of the electrical activity of the heart.

Electroencephalogram: a printed readout of the electrical activity of the brain.

Electromyogram: a printed readout of the electrical activity of skeletal muscles.

Endoscopy: a procedure that allows the viewing of internal body structures through the use of tubular devices with cameras and other equipment attached.

Hemophilia: the body's inability to control normal blood clotting or coagulation.

Homeostasis: the regulation and stabilization of a normal internal body environment.

Iatrogenic: pertaining to a disease or condition caused by a physician's treatment. For example, side effects of drugs are sometimes referred to as iatrogenic conditions.

Idiopathic: pertaining to a disease or condition of unknown cause.

Isotopes: substances that emit characteristic radiation, used to label various substances to determine their uptake and excretion.

Laparoscope: a device used for minimally invasive procedures that require small incisions; it allows internal body structures to be viewed either by

KEY TERMS CONTINUED

an attached camera or a remote camera that is connected by cabling.

Mammogram: an x-ray of the breast, used to detect tumors and other abnormalities.

Microscopic: requiring a microscope to be seen.

Probability: the likelihood that something will occur.

Radioactive: capable of giving off alpha, beta, or gamma rays.

Radiopaque: not allowing the passage of x-rays or other types of radiation.

Ultrasound: the use of ultrasonic waves to form images of interior body organs.

Overview

In the understanding of the human body, it is important to comprehend normal body structures and functions and how functional or physiologic changes affect the body. *Pathophysiology* is the branch of science that studies structural and functional changes in tissues and organs that lead to disease. Disease causes either obvious or hidden changes to normal anatomy and physiology. Pathophysiology also encompasses *pathology*, which is the study of changes to cells and tissues associated with disease.

Disease is a term describing any deviation from the normal state of health or wellness. It includes physical, mental, and social conditions. Disease leads to a disruption of **homeostasis** in the body. Minor changes are usually corrected by the body, which eventually returns to its normal state. A "normal" body state is measured with indicators such as pulse or blood pressure, using specific figures that represent an *average* range signifying normal health. Age, gender, family history, environment, and levels of activity all influence an individual's normal state.

In general, maintaining homeostasis involves several different steps:

- Avoid smoking, second-hand smoke, and environmental pollutants
- Be physically active, no less than 3–4 days per week, as indicated by the American Council on Exercise (www.acefitness.org)
- Perform self-screening checks for cancer and have regular medical checkups that include cancer screening
- Follow all instructions at leisure, home, and work that concern health and safety
- Eat 5 to 10 servings of fruits and vegetables per day, as indicated by the American Dietetic Association
- Limit alcoholic beverages to no more than two servings per day
- Limit exposure to the sun to the amount recommended (no more than 15 minutes three times per week), and use sunscreen before any extended exposure
- Visit the doctor or dentist regularly as well as when changes to your normal health occur

Study of Pathophysiology

Based on losses of function or changes in function to normal body structures, pathophysiology uses the knowledge of basic human anatomy and physiology. Disorders that affect each organ or body system usually have specific signs and symptoms. For example, with liver damage, clotting factors are not produced normally, resulting in excessive bleeding. The skin and sclera of the eyes may become yellowed in color as the liver cannot normally excrete bilirubin. If the liver is inflamed, the capsule surrounding it stretches, causing pain in the *right hypochondriac region* of the abdomen.

This chapter focuses on major diseases. The principles of pathophysiology apply to all disease states. Health care is focused on the prevention of disease. The knowledge of previous cases and their outcomes is used to develop new treatment strategies. For example, before 1981 there were no available treatments for what we now know as AIDS, because the condition was yet to be diagnosed. Since then, knowledge of the disease and its transmission has helped in the development of many drugs that have successfully slowed the activity of the virus.

More significant prevention is attained by the use of routine vaccinations, genetic screening, blood pressure testing, and other programs. Combined, ongoing learning about disease processes is vital because of the difficulties of diagnosis and treatment, the complexity of disease states, and the many different options for testing that are available.

Ongoing study of disease also raises ethical, legal, and social issues. Although genetic research strives to prevent genetic disorders, the altering of genetic factors is controversial. Legal and ethical issues take longer to resolve compared with scientific advances.

Health care practitioners must always strive to recognize disease complications as quickly as possible. Delays may cause a disease to become more severe and even deadly. Detailed discussions between patients, their families, significant others, caregivers, and health care professionals are encouraged to ensure thorough understanding of conditions, treatments, and outcomes. Current technology allows the possibility of better diagnosis and treatment than ever before. Nontraditional therapies outside "conventional" medicine may have complementary benefits when used along with traditional medical treatments.

RED FLAG

The study of pathophysiology is essential for the physical therapist assistant (PTA) to understand the complexity of diseases and the ongoing study of disease, which raises ethical, legal, and social issues.

Developments in Pathophysiology

The cause of disease may be intrinsic or extrinsic in nature. Examples of intrinsic causes of disease include age, inheritance, or sex. Examples of extrinsic causes include infectious agents or behaviors such as inactivity, illegal drug abuse, or smoking. In certain cases a disease may have no known cause and is referred to as **idiopathic**.

Health care professionals must stay current on medical advances and information because developments in medicine occur very rapidly. As the knowledge of pathophysiology increases, diagnostic tests improve and more effective drugs are developed. Many disorders can now be controlled, prevented, or even cured due to technologic advances. For example, newly developed drugs can now control HIV. Various vaccines can prevent many communicable diseases. Radiation therapy can cure certain types of leukemia.

Continual study of new pathophysiology advances is essential, and developments are ongoing. For example, patients with diabetes can use blood-measuring devices that operate as minicomputers to read blood glucose levels more quickly and accurately, with less pain, than ever before. Although sometimes costly, these developments are balanced against the long-term costs of hospitalization or when patients are unable to maintain employment due to their disease process. Disease information is coordinated throughout the world by agencies such as the World Health Organization, Centers for Disease Control and Prevention, and the U.S. Public Health Service.

RED FLAG
The PTA should always stay current on the discovery of new diseases, diagnostic tools, and patient treatments.

Vocabulary of Pathophysiology

A solid knowledge foundation of anatomy and physiology is critical in understanding the effects of disease on the body. Abnormal conditions usually involve changes that may occur at the cellular (**microscopic**) level. Pathologic conditions begin with cellular changes. In the laboratory, pathology studies attempt to establish or determine the cause of a disease. These studies commonly involve examining tissue specimens from **biopsy** or surgical procedures. Body fluids are commonly analyzed for diagnosis. After death, an **autopsy** may be conducted to fully understand the factors that contributed to a fatal disease. Pathophysiologic changes may indicate the basic causes of disease, regardless of whether it is from genetics, neoplasms, or infections. Common terms used in pathophysiology are listed in **Table 1–1**. **Figure 1–1** illustrates the occurrence of disease.

RED FLAG
The PTA must be familiar with the terminology of many diseases and conditions to understand the concepts of pathology.

TABLE 1–1 Pathophysiology Vocabulary

Term	Definition	Comments
Acute	Short-term, with extreme symptoms	An acute disease lasts for a short time but develops quickly, with marked signs such as fever and pain (such as in acute appendicitis)
Chronic	Long-term, developing gradually with lesser symptoms, usually causing more permanent damage	Often, a chronic disease involves intermittent acute episodes; example: rheumatoid arthritis
Communicable	Infections that can be spread from one person to another	Certain communicable diseases must be reported to health authorities; an example of a communicable disease is *measles*
Comorbidities	Two or more coexisting but unrelated medical conditions	Posttraumatic stress disorder with borderline personality disorder
Complications	New additional (secondary) problems arising after an original disease begins	Example: a heart attack patient develops congestive heart failure as a complication
Diagnosis	Identification of a specific disease via evaluation of signs and symptoms	Laboratory tests or other tools are often used to verify several factors to confirm a diagnosis; for example, pain, swelling, and position may indicate a broken leg bone, but confirmation is via x-rays
Diagnostic tests	Laboratory tests that assist in diagnosing a specific disease	May also be used to monitor responses to treatment or progression of disease; may involve chemical analyses, examination of specimens, identification of microorganisms, or radiologic studies
Epidemics	Outbreaks of disease that occur over a given area, with many cases of the disease	Example: influenza (which also may occur sporadically or as a pandemic)
Epidemiology	The science of tracking the occurrence or pattern of disease	Includes data on transmission and distribution of disease, which is used to detect patterns yearly by major data collection centers such as the CDC and WHO
Etiology	The causative factors of a particular disease; when the cause is unknown, it is termed *idiopathic*; if a treatment, procedure, or error is responsible, it is termed *iatrogenic*	Etiologic agents include congenital defects, genetic or inherited disorders, viruses, bacteria, immune dysfunction, metabolic conditions, degenerative changes, malignancy, burns, etc.

(*Continues*)

TABLE 1–1 Pathophysiology Vocabulary (*Continued*)

Term	Definition	Comments
Exacerbations	Increased signs of disease	Along with remissions, they mark progression of a disease
Latent	An initial "silent" disease stage, in which no clinical signs are evident	May be referred to as the incubation period, lasting between 1 day and several weeks
Lesion	A specific local change in tissue that may be microscopic or highly visible	Example: blisters or pimples on the skin
Manifestations	Clinical evidence or effects (signs and symptoms) of disease	Examples: redness, swelling, fever
Morbidity	The disease rates within a group	Sometimes indicates the functional impairment that certain conditions cause upon the population
Mortality	Indicates the relative number of deaths from a particular disease	Example: the mortality rates of heart disease and cancer are higher than other diseases
Occurrence	A disease's occurrence is tracked by its incidence (number of new cases) and prevalence (number of existing cases)	Prevalence of disease is always a higher number than incidence
Onset	The speed of development of disease, which may be sudden and obvious (acute) or insidious, with gradual progression and vague or mild signs	Examples: acute onset describes gastroenteritis, whereas insidious onset describes hepatitis
Pathogenesis	Development of a disease	Also refers to the sequence of events involved in tissue changes that relate to the disease process
Precipitating factors	Conditions that trigger acute episodes; they differ from predisposing factors	Example: a high-cholesterol diet may predispose a patient to angina, but the actual angina attack is precipitated by extreme physical activity
Predisposing factors	Those that indicate a high risk for a disease but not certain development	Example: exposure to asbestos is a predisposing factor for cancer
Prevention	Related to disease, prevention is closely linked to predisposing factors and etiology	Preventive measures include dietary changes, lifestyle changes, vaccinations, environmental changes, and quitting smoking or drinking alcohol
Probability	The likelihood that something will occur	Example: the more occlusion that exists in the coronary arteries, the higher the probability of myocardial infarction
Prodromal	The time in early disease development when a patient is aware of a nonspecific change in the body	Examples: fatigue, headache, loss of appetite
Prognosis	The **probability** or likelihood for recovery or other outcomes	Averages are used to determine probability figures used in the prognosis of a disease
Recovery	Period of recuperation or convalescence and return to normal health	It may last for several days or months
Remissions	Subsiding disease symptoms	Along with exacerbations, remissions mark the progress of a disease
Sequelae	Potential unwanted outcomes of a primary condition	Example: paralysis after recovery from a stroke
Signs	Objective indicators of disease that are obvious to others	Examples: fever or a skin rash
Subacute	A state that is neither acute nor chronic but rather in between, having a rather recent onset or relatively rapid change	Example: subacute bacterial endocarditis, in which the condition worsens for up to 1 year before it is fatal; requires the presence of a previous heart valve disease for the bacterium to colonize and develop
Subclinical	A state existing in some pathologic conditions wherein no obvious manifestations occur	Example: kidney damage progressing to renal failure before any signs manifest
Symptoms	Subjective feelings	Examples: pain or nausea
Syndrome	A collection of signs and symptoms occurring together	Usually occurs in response to a certain condition
Therapy	Therapeutic interventions or treatment measures to promote recovery or slow the progress of a disease	May include drugs, surgery, behavior modification, or physiotherapy

CDC, Centers for Disease Control and Prevention; WHO, World Health Organization.

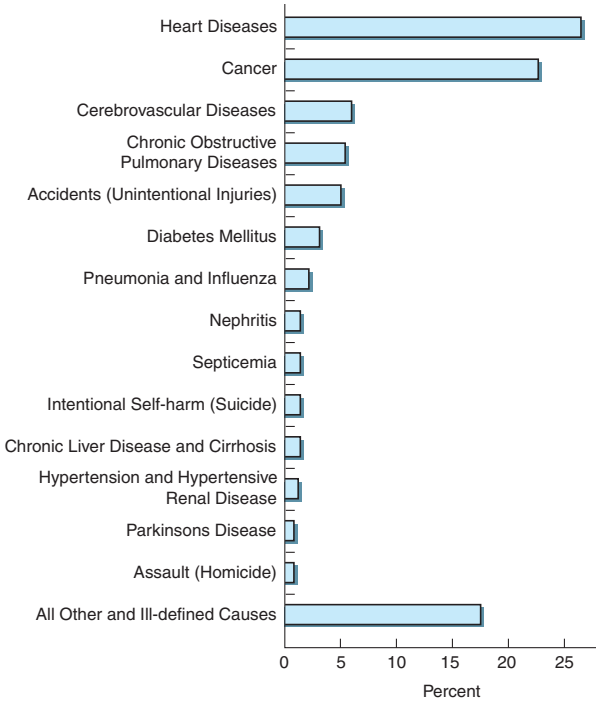


Figure 1–1 Occurrence of disease.

Source: Kung HC, Hoyert DL, Xu J, Murphy SL. Deaths: Final data for 2005. National Vital Statistics Reports; vol. 56, no. 10. Hyattsville, MD: National Center for Health Statistics; 2008.

Classifications of Disease

Diseases are generally classified into broad categories. Those in each category may not be closely related, and many diseases from different categories have similar morphology or pathogenicity. These categories are as follows:

- Congenital and hereditary diseases: Caused by developmental disturbances such as chromosomal and genetic abnormalities, intrauterine injury, or a combination of environmental and genetic factors. Examples include **hemophilia** and congenital heart disease due to German measles (rubella).
- Chronic (or steadily worsening) diseases: Cause **degeneration** of various body parts, often as a result of aging. Degeneration often occurs sooner in the life of the patient and is not linked to aging. Examples of degenerative diseases include certain types of arthritis and arteriosclerosis (hardening of the arteries).
- Inflammatory diseases: Those in which the body reacts to injury or harmful agents with inflammation. Causes include various microorganisms, allergic reactions, hypersensitivity states, and autoimmunity states. Some inflammatory diseases may be of unknown origin. Examples of inflammatory diseases include pneumonia, sore throat, and hay fever.
- Metabolic diseases: Cause disturbances in normal metabolic processes. Examples of metabolic diseases include diabetes, thyroid conditions, endocrine gland disturbances, and fluid and electrolyte imbalances.
- Neoplastic diseases: Characterized by abnormal cell growth. These diseases lead to various benign and malignant tumors.

Patient History

The completion of accurate and thorough patient medical or health histories is vital. When done correctly a patient history can help with planning or treatment, with understanding potential complications of disease, and with assessing related previous conditions, allergies, and drug therapies. Patient histories usually begin with written information provided by the patient. A follow-up discussion with a health care professional allows clarification of the provided information. The question and answer format can help to detect additional problems concerning the patient's health, both past and present.

RED FLAG

The PTA must be concerned with patient history, as obtained by the physical therapist during the initial evaluation, and needs to be aware of the patient's current or past medical history. Acute or chronic disorders may be determined from a detailed patient medical history. Additional information relevant to the patient history that is obtained by the PTA during patient conversation should be reported to the physical therapist and noted in the documentation.

Physical Examination

Specific areas of the body may be examined to determine the initial point or progression of disease or illness. This may involve a physical examination of one or more body regions. If an abnormality is detected, an attempt is made to correlate to the patient's medical history. There may be several potential diagnoses related to the presented signs and symptoms, so a thorough examination and clinical history must be used. In addition, laboratory tests and other diagnostic procedures assist the physical examination as the basis of a diagnosis.

Diagnosis of Disease

The many methods of diagnosing disease available today are classified as either invasive or noninvasive procedures. The PTA must be familiar with all diagnostic methods available. Invasive procedures require the patient's body to be "invaded" and include the use of needles, catheters, and other instruments. With noninvasive procedures, there is either no risk or only minimal risk to the patient. Noninvasive procedures include radiographic procedures and urine testing.

In general, invasive procedures have higher risks for potential damage than noninvasive procedures. The health care professional must weigh the potential benefits versus the potential risks of any procedure before proceeding. Patients must be fully informed about these benefits and risks.

Invasive and noninvasive diagnostic procedures may be classified in a variety of ways. There are eleven major classifications of diagnostic methods:

1. Clinical laboratory tests: Blood and urine testing to check for variations in components such as urea, hemoglobin, cell counts, enzymes, organ function, clearance rates, uptake and excretion rates, amounts of microorganisms, and antibodies.
2. Cytologic or histologic examination of cells and tissues: These tests may reveal the causes of disease based on small samples of tissue removed from affected tissues

or organs. The procedure used in these tests is called a *biopsy*. Instruments used include bronchoscopes, gastroscopes, and other endoscopic instruments.

3. Electrical activity tests: Include **electrocardiogram**, **electroencephalogram**, and **electromyogram**. Electrodes are attached to various body points to measure electrical activity changes in the body. Many heart conditions are determined and assessed with these tests. Brain tumors, strokes, and other alterations to cerebral function are also able to be assessed. Skeletal muscle function may also be determined with these tests.
4. Endoscopy: The use of flexible or rigid tubular instruments to examine various areas of the body. Each instrument is named according to the type of internal examination for which it is used. An **endoscopy** is an examination of the interior of the body, including the esophagus, stomach, trachea, major bronchi, bladder, colon, and rectum. Endoscopes and related instruments use a light source along with a system of lenses. Examples of instruments include
   a. Esophagoscope: to examine the interior of the esophagus
   b. Gastroscope: to examine the stomach
   c. Bronchoscope: to examine the trachea and major bronchi
   d. Cystoscope: to examine the interior of the bladder
   e. Sigmoidoscope: to examine the rectum and sigmoid colon
   f. Colonoscope: to examine the entire length of the colon
5. Laparoscopy: Similar to endoscopy, this procedure uses a **laparoscope** to look inside the abdominal and pelvic organs as well as to remove the gallbladder, appendix, ovary, and for other smaller surgical procedures. During a laparoscopy carbon dioxide is used to inflate the peritoneal cavity, which separates the internal organs so they can be examined more easily. The laparoscope is inserted through a small incision, usually near the umbilicus, in the abdominal wall.
6. X-ray examination: Uses the passage of x-rays through various areas of the body to be examined, with the resulting image exposed on an x-ray film. Lower density tissues absorb little of the x-rays, causing them to appear darker, whereas higher density tissues absorb more, causing them to appear lighter. An x-ray film image is called a *radiograph* or *roentgenogram*. When the breast is examined via this type of procedure, the result is called a **mammogram**. Many internal organs are examined via a combination of x-rays and the administration of a **radiopaque** substance (a *contrast medium*). These substances enhance the visibility of internal organs and structures (**Figure 1–2**).

   Radiopaque oil may be instilled to examine structures such as the bronchi (a bronchogram), which is shown in **Figure 1–3**.

   Another example is an intravenous pyelogram, wherein a radiopaque substance is injected into a vein. As it is excreted in the urine, it outlines the contour of the urinary tract (**Figure 1–4**). Gallstones can be seen

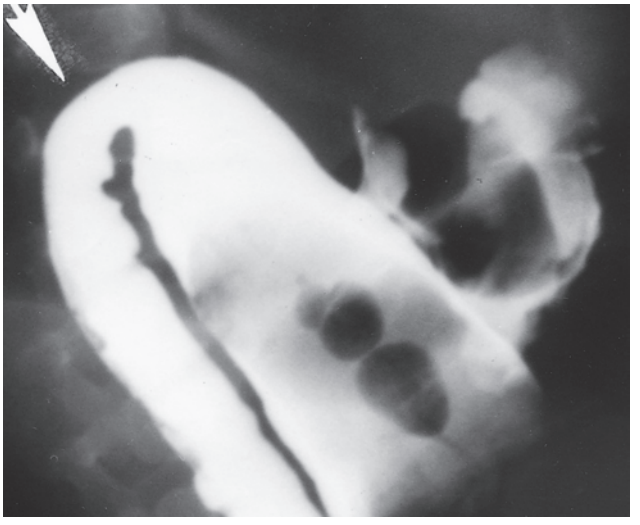


Figure 1–2 X-ray film after injection of radiopaque barium sulfate suspension into colon (barium enema), illustrating narrowed area (arrow) that impedes passage of bowel contents.

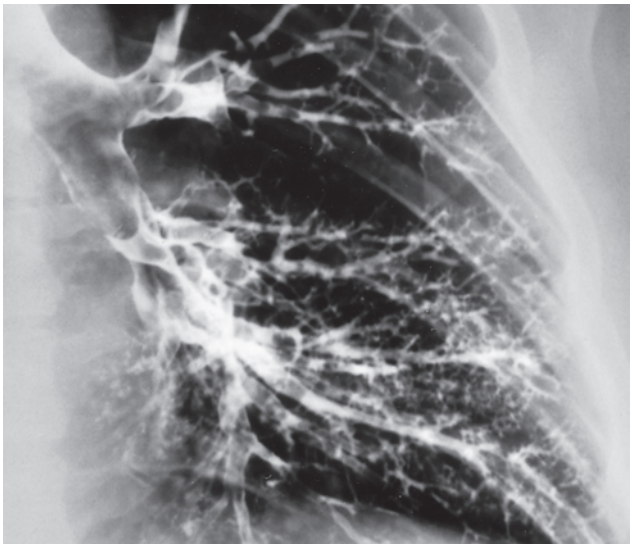
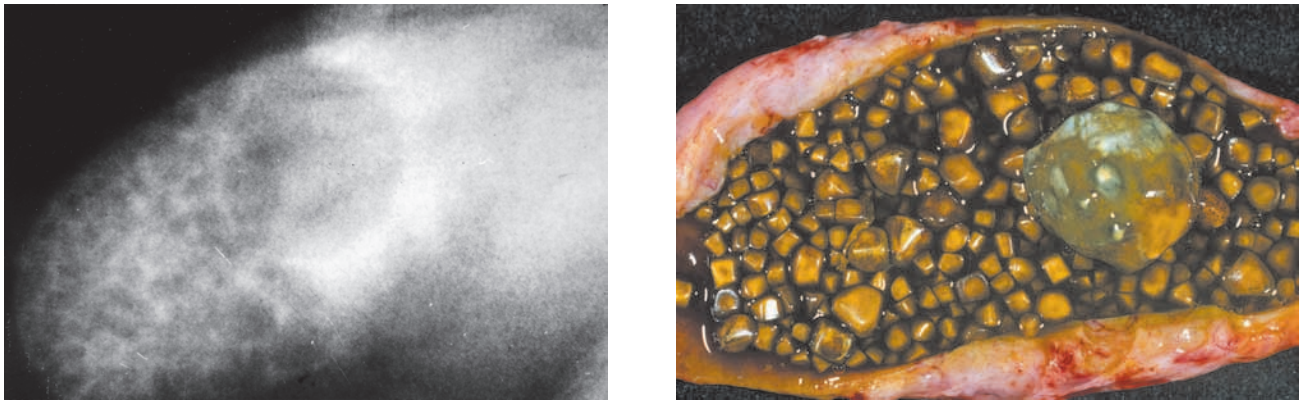


Figure 1–3 Bronchogram illustrating normal branching of bronchi and bronchioles that are normal in caliber and appearance.

Figure 1–4 Intravenous pyelogram (IVP). Arrows outline filling defect caused by a large cyst in kidney that distorts renal pelvis and calyces. The opposite kidney appears normal.



(A) (B)

Figure 1–5 (A) Gallstones demonstrated by means of radiopaque material concentrated in bile. Gallstones occupy space and appear as radiolucent (dark) areas within radiopaque (white) bile. Note the large radiolucent area, indicating a large gallstone, surrounded by smaller radiolucent areas, representing multiple smaller stones. (B) Opened gallbladder removed surgically from the same patient. Compare appearance and location of stones with x-ray appearance.

when they are present in the gallbladder because they show up as irregularities in the radiopaque material that concentrates there (**Figure 1–5**).

When the flow of blood in the arteries is studied, the procedure is called an **arteriogram** or **angiogram**. For example, a common type of angiogram is a *carotid angiogram* (**Figure 1–6**). When blood flow is studied through the heart, it is known as a *cardiac catheterization*. Computed tomography (CT) is used to produce cross-sectional images of the body from various angles.

7. Computed tomography (CT): Uses specialized x-ray machines to produce cross-sectional body images by the rotation of the x-ray tube around the patient at different levels. The patient lies on a table, encircled by many radiation detectors housed in a movable x-ray tube (**Figure 1–7**). The data from the radiation detectors are fed directly into a computer that creates images that are displayed on a monitor and can be recorded on film (**Figures 1–8** and **1–9**).

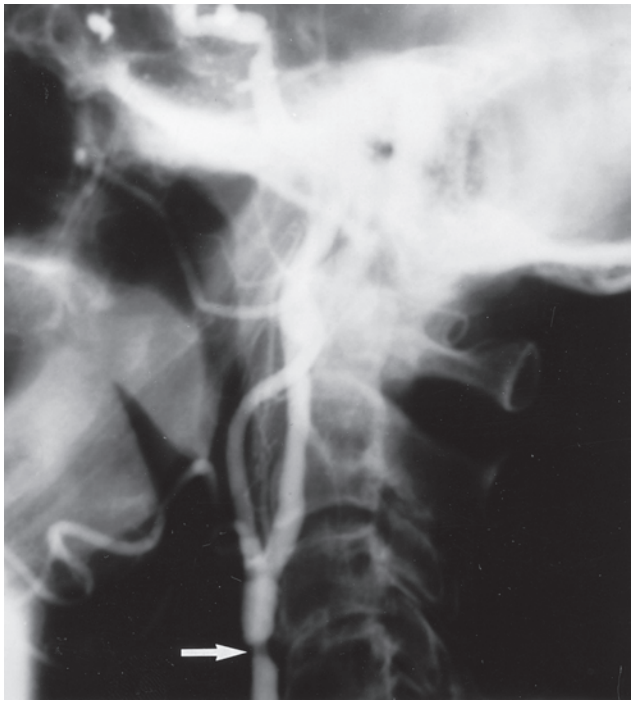


Figure 1–6 Narrowing of carotid artery in neck (arrow) demonstrated by carotid angiogram.

CT scans appear similar to traditional x-rays. Substances that are denser appear lighter, and those that are less dense appear darker. Organs are very distinct because the fat separating them appears only slightly. When a standard x-ray cannot detect an internal abnormality, a CT scan usually can.

RED FLAG

A CT scan subjects the patient to approximately 200 times as much radiation as a traditional x-ray. However, this type of scan allows very detailed three-dimensional imaging, which is essential in specific circumstances such as internal injuries resulting from trauma.

8. Magnetic resonance imaging (MRI): Produces computerized images of organs and tissues, similar to the technology used in CT scans. MRI uses strong magnets and radiofrequency waves to produce images via computerized scanners. MRIs do not use ionizing radiation as do CTs, however. They use the response of hydrogen protons inside water molecules to produce images by causing them to move out of and then return to their original positions. Therefore, MRI is an excellent method of examining body tissues with high water content. MRIs are considered safer than x-rays, CT scans, and similar techniques. MRIs are preferred over CTs for areas with higher bone content such as the spinal cord, eye orbit, or lower skull conditions (**Figure 1–10**). In MRI the patient lies on a table that is slowly moved into the scanner, similar to a CT scan.

RED FLAG

Because MRIs use magnetic waves, they do not expose patients to ionizing radiation as do CTs.

9. Positron emission tomography (PET): First developed in the 1970s, PET scans are techniques used to study body functions by injecting glucose (or other compounds) that have been labeled with positron-emitting

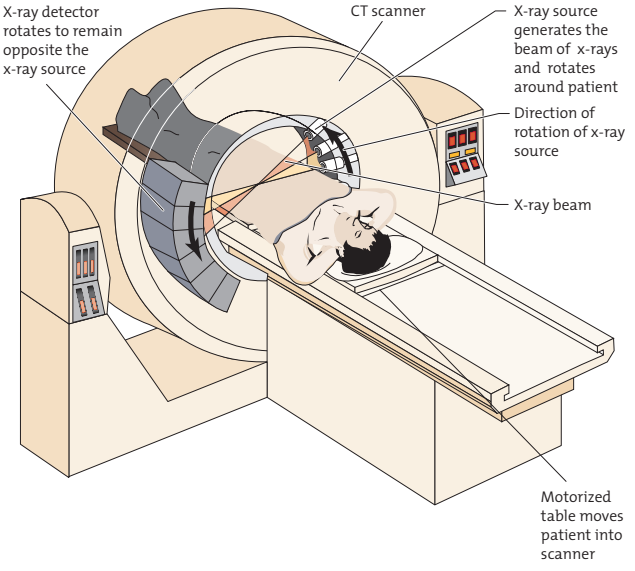


Figure 1–7 Computed tomographic (CT) scan. The patient lies on a table that is gradually advanced into the scanner. X-ray tube mounted in scanner rotates around patient, and radiation detectors also rotate so that detectors remain opposite the x-ray source. Data from radiation detectors generate computer-reconstructed images of the patient's body at multiple levels.

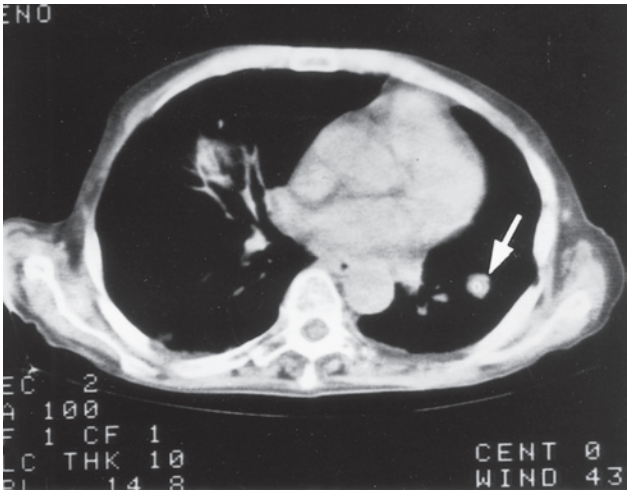


Figure 1–8 CT scan of chest. Mediastinum and heart appear white in the center of scan, with less dense lungs on either side. The arrow indicates a lung tumor, which appears as white nodule in lung.

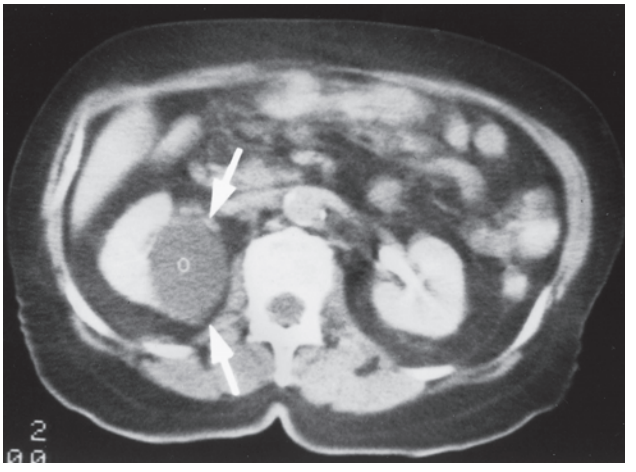


Figure 1–9 CT views of the abdomen at the level of kidneys, illustrating a fluid-filled cyst in the kidney (arrow). The cyst appears less dense than surrounding renal tissue. The opposite kidney (right side of photograph) appears normal.

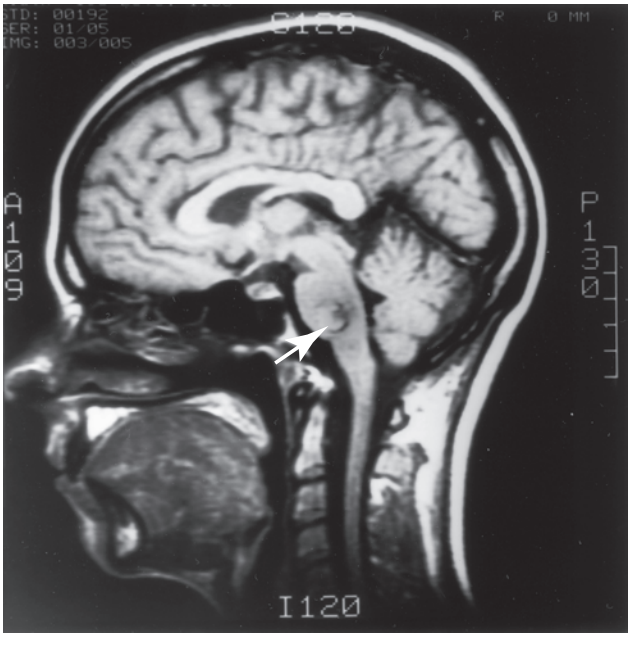


Figure 1–10 MRI view of brain, which is clearly visible because skull bones are not visualized by MRI. The white line surrounding the brain represents scalp tissue. The arrow indicates a malformation composed of blood vessels within the brain stem.

isotopes into the body. They are similar to radioisotope tests (see below). *Positrons* are defined as subatomic particles with the same mass as electrons but carrying a positive charge. PET scans provide information about organ or tissue metabolic activities, sites of metabolism of the injected compound, and blood flow to specific organs. Images that are generated are similar to those obtained from CT scans. PET scans are primarily used for brain function tests. Examples include brain tumors, strokes, Alzheimer's disease, Parkinson's disease, and certain nervous system disorders. They are also used for evaluation of the heart after a heart attack and to determine malignancy of certain tumors. However, PET scans are currently very expensive because of the equipment and compounds that are needed.

10. Radioisotope (radionuclide) tests: Use **radioactive** materials to determine various body functions and states. Specially designed radiation detectors measure the radioisotope's uptake and excretion. These include conditions such as certain types of anemia, thyroid conditions, pulmonary conditions, skeletal conditions, cancers, and cardiovascular conditions. For example, when bone tumors are present, radioisotopes are concentrated around the tumor deposits and can be easily seen on a radioisotope bone scan (**Figure 1–11**).

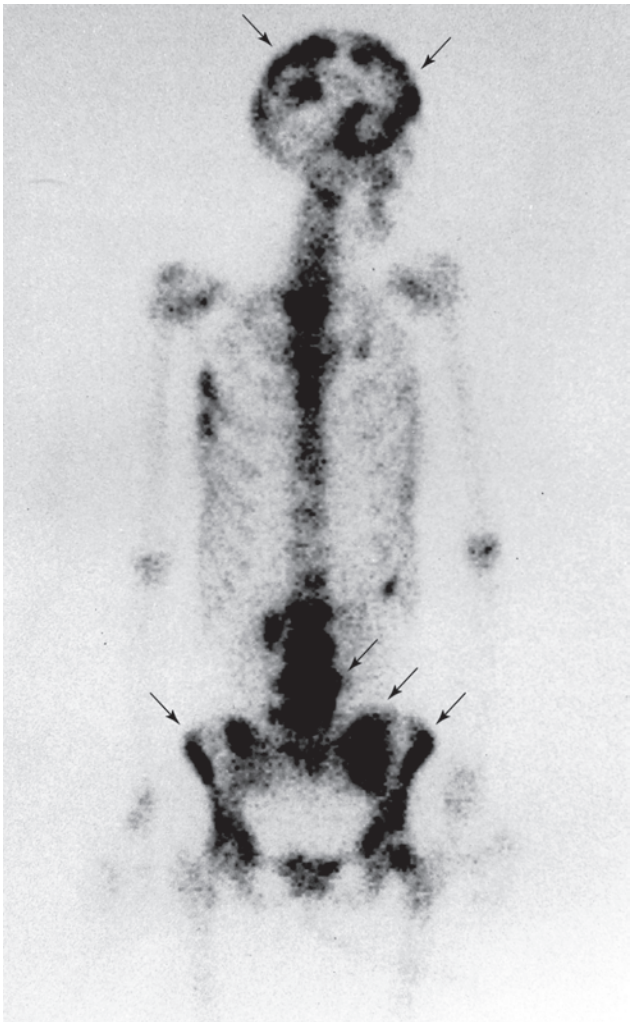


Figure 1–11 Radioisotope bone scan of head, chest, and pelvis. Dark areas (arrows) indicate the concentration of radioisotope around tumor deposits in bone.

11. Ultrasound procedures: These techniques map the sound vibrations that are produced by high-frequency sound waves transmitted into the body. Changes in tissue density cause echoes to reflect, from which images are produced. **Ultrasound** is used for a variety of procedures, including studies of the uterus and fetus during pregnancy (**Figure 1–12**), the heart valves and structures, for cardiovascular conditions, to detect gallstones, and for prostate abnormalities. Ultrasound is safer than radiologic studies because it does not use radiation.

Treatment

Once a diagnosis has been made, decisions are made as to the best treatment options. These options may be either specific or symptomatic. A *specific treatment* is based on the major cause of the disease. For example, a patient with diabetes may be treated with insulin. However, for many diseases there are no specific treatment regimens. A *symptomatic treatment* alleviates disease symptoms but may or may not affect the underlying course of the disease. For example, coughing is treated by antitussive medications, but these do not necessarily cure the cause of the coughing, which can be varied. Because many diseases do not have specific treatments, the goal of symptomatic treatment is palliative: to reduce patient symptoms during the disease course. Also, a disease or condition may sometimes be caused by a medical treatment. When this occurs, the disease or condition is described as **iatrogenic**.

Figure 1–12 Ultrasound examination of a 22-week-old fetus.

SUMMARY

Disease is defined as a deviation from normal physical, mental, and social well-being that causes a disruption or loss of homeostasis. Pathophysiology is the study of structural and functional changes that are related to disease. Disease effects depend on which organs or tissues are affected. Diseases may be classified as congenital, hereditary, degenerative, inflammatory, metabolic, or neoplastic. Today, various methods are used for the diagnosis of diseases and conditions. The procedures used may be invasive or noninvasive. Examples include clinical laboratory tests, cytology, histology, and diagnostic imaging. The prevention of disease depends on adequate early screening. Physical examination and patient history are also helpful. It is vital that health care practitioners be aware of the latest information about diseases and conditions, testing, and treatments.

REVIEW QUESTIONS

Select the best response to each question.

1. The term that means the body is in a state of equilibrium or balance is
   a. metabolism
   b. homeostasis
   c. physiology
   d. pathology
2. The time in early disease development when a patient is aware of a nonspecific change in the body is referred to as
   a. exacerbation
   b. epidemic
   c. occurrence
   d. prodromal

3. Outbreaks of a disease that occur over a given area with many cases of the disease are called
   a. endemics
   b. pandemics
   c. epidemics
   d. none of the above
4. The causative factors of a particular disease are called its
   a. idiopathy
   b. etiology
   c. pathology
   d. iatrogenicity
5. A disease that lasts for a short time but develops quickly is known as
   a. prodromal
   b. chronic
   c. latent
   d. acute
6. The development of a disease is referred to as
   a. pathology
   b. pathogenesis
   c. pathogen
   d. neoplasm
7. The study of changes to cells and tissues that is associated with a disease is referred to as
   a. cytology
   b. histology
   c. physiology
   d. pathology
8. Prevalence of disease is always a higher number than incidence and is called
   a. morbidity
   b. mortality
   c. prodromal
   d. occurrence
9. The probability or likelihood for recovery from a disease is called
   a. prognosis
   b. prevention
   c. syndrome
   d. convalescence
10. A technique used to study body functions that involves injecting glucose (or other compounds), labeled with isotopes, into the body is known as
    a. MRI
    b. CT scan
    c. PET scan
    d. Ultrasound

CASE STUDIES

Karen Coupe, PT, DPT, MSEd

Case 1

A PTA is performing a chart review for a 72-year-old woman admitted to the hospital for an elective total hip replacement. Two days after surgery the patient began to complain of shortness of breath and chest pain with a postsurgical complication of pulmonary embolism.

1. What do you suspect is the reason for the elective surgical procedure? Would this be classified as an acute or chronic issue? Would this be considered an inflammatory, degenerative or metabolic disorder?
2. What were the clinical manifestations of the pulmonary embolism?
3. The pulmonary embolism was a complication of the surgical procedure. Why is it important for the PTA to understand and be able to react to potential complications of any condition?
4. How could complications affect convalescence?
5. How could complications affect mortality rates?

Case 2

A 58-year-old man was admitted to the hospital complaining of shortness of breath, lightheadedness, and left-sided shoulder pain. Diagnostic testing included a blood workup and an electrocardiogram. Diagnosis: Myocardial infarction. Patient medical history: coronary artery bypass graft 2 years ago, hypertension controlled by medication, borderline type 2 diabetes. Social history: Sedentary lifestyle, smokes one pack of cigarettes a day, social drinker. Prior level of function: Independent in all activities of daily living. Patient was referred to physical therapy for cardiac phase I rehab.

1. What were the clinical manifestations of the myocardial infarction?
2. Explain the basic purpose of the diagnostic tests performed on this patient.
3. Why is it important that the PTA understand the patient medical history? What could be potential consequences of not understanding the patient medical history?
4. What role does the patient's social history have on physical therapy treatment?
5. Explain the rationale behind knowing the prior level of function before beginning physical therapy treatments.

WEBSITES

http://www.americanheart.org/presenter.jhtml?identifier=4720

http://www.cdc.gov/mmwr/

http://www.emedicinehealth.com/gangrene/article_em.htm

http://www.health-disease.org/

http://www.meddean.luc.edu/lumen/MedEd/orfpath/cellch.htm

http://www.medscape.com/viewarticle/421471

http://www.nd.gov/cte/programs/health-careers/ppt/pathophysiology.ppt

http://www.nlm.nih.gov/medlineplus/ency/article/003416.htm

http://www.nova.edu/healthcare/forms/patient_medical_history.pdf

http://www.pathguy.com/autopsy.htm