CHAPTER 12
DISEASES OF THE MUSCULOSKELETAL SYSTEM

12–1. Musculoskeletal System

Diseases of the musculoskeletal system are the ones that cripple the most and kill the least. They cause much discomfort. They can lead to permanent deformity, but rarely are they fatal.

12–2. The Skeletal System

a. Skeleton. The skeleton, or bony framework (fig 12–1), in the adult is made up of about 200 bones. Bones are living tissue even though the spaces between bone cells consist of inorganic deposits of calcium. Each bone is a separate organ with its system of blood, lymphatic vessels, and nerves.

(1) The skeleton gives form and stability to the body, protects many organs, furnishes a system of levers which allow the

d manufactures blood cells in the red bone

body to move, an

marrow.

steum, a thin membrane, on the outside of each
or the nourishment, growth, and repair of bone.
uter layer of bone, known as the compact bone,
haft and thin at the ends. It gives bone its great

(2) The perio
bone, is essential fo
The hard, dense, ou
is thick along the sh
strength.

r spongy bone is made of the same material as
it is more porous. It makes the bone lighter
strength. Bone marrow is found mostly in the
es. Within bone marrow, fats are stored and
ls are produced.
t is a structure which holds together separate
s them a working surface which either permits

(3) The inner
compact bone but
without sacrificing
shafts of long bon
new red blood cell

b. Joint. A joint
bones and provides
or inhibits motion.

ts of the human body are inside a fibrous joint
is found in the capsule at the tips of the ones
Cartilage acts as a cushion between the bones
e friction in the joint. Lining the inside of this
vial membrane (fig 12–2). Fluid secreted by the
cushioning and lubricating the joint. On the
psule are tough connective tissues, known as

(1) Most join
capsule. Cartilage
which meet there.
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capsule is the syno
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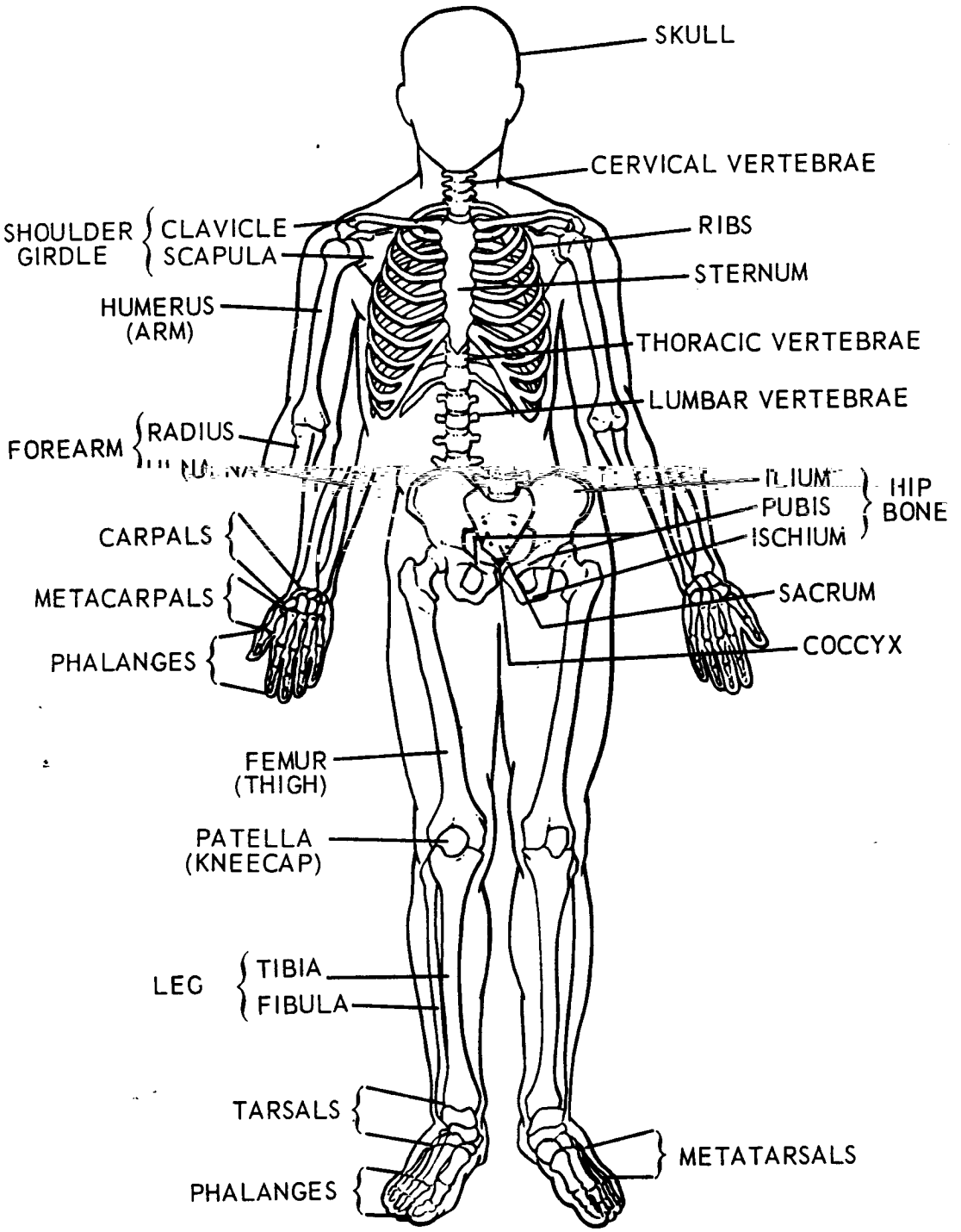


Figure 12–1. The human skeleton.

ligaments, which actively bind the bones together. Most joint injuries involve either the ligaments, synovial membrane, or cartilage.

(2) On the outside of the joint is a closed, slippery, fluid filled sac, called a bursa. Bursae are found between surfaces which glide over each other. For example, they may lie between the tendons and the surfaces on which they glide. (Tendons are connective tissue which join muscle to bones.) Like cartilage and synovial fluid, normal bursae reduce friction.

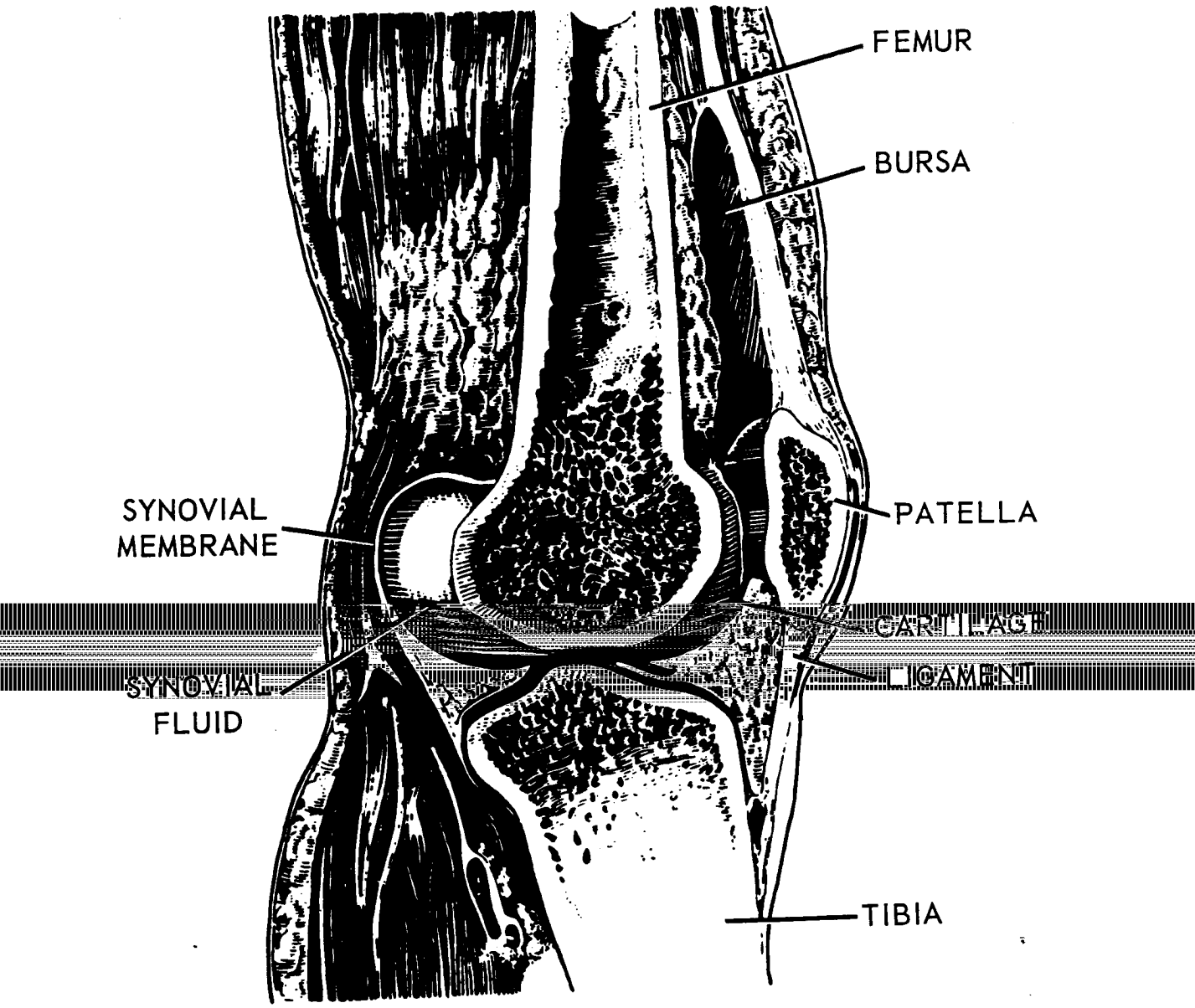


Figure 12–2. The knee joint and its parts.

12–3. Muscles

Muscles are organs of voluntary or involuntary action which provide motion by their ability to contract. Muscle tissue is found throughout the body and makes up 40 to 50 percent of the body's weight. According to their type of nervous control, muscles are classified as either voluntary or involuntary in action.

a. Voluntary muscle, or skeletal muscle, is called "voluntary" because it is under the direct conscious control of the brain. Most skeletal muscles are attached directly to the skeleton. By contraction, they move various parts of the body. Besides enabling the body to move, the skeletal muscles maintain posture, aid in respiration, and produce most of the body heat.

b. Involuntary, or smooth muscle, is not under the direct conscious control of the brain. Smooth muscles act more or less automatically. They are found in the walls of blood vessels, respiratory

passages, gastrointestinal tract, ureters and urinary bladder, and some glands. They regulate the size of blood vessels, move food through the gastrointestinal tract, regulate the air passages in the lungs, and aid in the transport of urine from the kidneys to the outside.

c. Cardiac (heart) muscle is unique. Physically it resembles skeletal muscle but its function is similar to that of smooth muscle.

12–4. Useful Terms

a. Atrophy. A wasting away resulting in a reduction in size.

b. Ankylosis. Stiff joint; abnormal immobility and consolidation of a joint.

c. Articulation. A joint; joining together of bones.

d. Deltoid. The triangular muscle over the shoulder joint, commonly called the "pin cushion of the Army," which raises and extends the arm.

e. Inter. A prefix meaning situated or occurring between; an example is intercostal, meaning between the ribs.

f. Intercostal Muscles. Muscles between the ribs which aid in respiration.

g. Intervertebral Disk. A layer of cartilage, shaped like a round plate, which acts as a cushion between adjacent vertebrae.

h. Myo. A prefix denoting relationship to muscle, as in myositis, inflammation of a voluntary muscle.

i. Osteo. A prefix denoting relationship to a bone or bones, as in osteomyelitis, inflammation of bone marrow and bone.

j. Sign. A measurable objective occurrence of the body, such as pulse, temperature, respiration, or blood pressure.

k. Symptom. A subjective complaint or feeling expressed by a patient and not measurable. Examples of symptoms are pain, dizziness, nausea, cyanosis, jaundice, and ache.

l. Trauma. A wound or injury.

12–5. Diseases of Joints

a. Arthritis. Arthritis means inflammation of joints. The inflammation may lead to deformity of the joint. Symptoms are pain, swelling, redness, and stiffness. Other symptoms and signs may include infections elsewhere in the body in the case of infectious arthritis and a low grade fever. After repeated episodes of inflammation, a joint may become permanently stiff with limitation in motion due to scarring of the joint surfaces.

(1) Infectious arthritis is produced by various bacteria including the staphylococcus, streptococcus, pneumococcus, gonococcus, and meningococcus. Usually the infecting organisms are carried to the joint in the blood from infection elsewhere in the body.

(2) Degenerative joint disease, also called osteoarthritis or hypertrophic arthritis, is a chronic arthritis of middle-aged and elderly people. The cause is unknown. Continued joint injury may contribute to the disease. Injury causes the joint cartilage to split and thin out, with a bony spur developing at the articular ends of the bone. Joints are stiff and painful.

(3) Rheumatoid arthritis, or atrophic arthritis, is chronic inflammation of the synovial membrane and the joint capsule. The articular cartilage is destroyed and the bones atrophy at their articular ends. Swelling and pain occur in joints, marked deformity results, and ankylosis and muscular atrophy occur.

b. Rheumatic Fever. Active rheumatic fever may involve only joints, but often involves the heart or nervous system. Rheumatic fever is an allergic reaction to streptococcus infection. The joints become swollen and painful. Usually the joint disease is migratory; that is, one or two joints are affected for a few days, they get better, and then arthritis appears in another joint. Fever is also present. A heart murmur may be present if the heart is involved or involuntary movements may occur if the nervous system is involved.

c. Bursitis. Many bursae (para 12–2*b*(2)) are present in the body, especially over bony prominences. Repeated trauma or possibly an infection causes inflammation in bursae. Fluid accumulates in the bursae, with pain and occasionally redness. Diagnosis is based on tenderness over a bursa. The most common sites for bursitis are over the elbow, knee, and shoulder. Treatment is with aspirin. The disposition is routine evacuation.

12–6. Myositis

Myositis is an inflammation of muscle caused by infection, trauma, chemical irritation. The most common type of myositis is due to
ral infection, with involvement of the back muscles in particular.
flammation produces muscle spasm, which results in pain, stiffess, and pain on motion. Usually there are no signs or symptoms
her than the localized muscle symptoms.

a. A patient with myositis often gives a history of exposure to
a recent upper respiratory infection, or infection an injury
. Many times there is no history to suggest the
urbance. A frequently encountered example is
eck. The patient relates usually that he awakes
ff neck. The pain is unilateral and the least move-
brings on a spasm of the involved muscles of the
and a sudden occurrence of pain. Other muscle
e muscles of the shoulder, the neck, or the chest
yositis. Examination will reveal the involved
der and hard due to spasm.

element, weather
to a muscle mass
cause of the dist
referable to the n
with a painful, sti
ment of the neck
neck and shoulder
masses such as th
are subject to m
muscles to be ten

officer is indicated when the tactical situation tion to a medical permits.

k Conditions

n. Backache is one of the commonest symptoms musculoskeletal system. Backache has many he lifting of heavy objects which may produce ain, inflammation of muscle, and diseases of t, abdominal cavity, or pelvis. It is also a com-laint. If a soldier has a mild backache and it is h another symptom, such as fever, nausea, sis, you may treat him in the field for a short and back-stretching exercises. If the backache t, or associated with other signs and symptoms, te the patient to a medical officer when the ermits.

he. This backache is usually caused by trauma. esult from the lifting of heavy objects causing k muscles, or from a blow or fall, that injures ckache from strain is localized in the lumbar ted by motion of the spine. A patient with acute ry cautiously, stooped forward so that he does is spine. Mild acute backache due to trauma d to manage. Treatment in the field should be cs and as much rest as possible for a few days. sistent backache should be evacuated to a medi-backache can result also from meningitis, en-tis, kidney or bladder infections, and localized e vertebral column. Meningitis and encephalitis eadaches and a stiff neck. Infections in the additional urinary symptoms of frequency, ainful or difficult urination). Severe direct er localized back infections. Kidney stones ck pain which radiates from the lumbar roin and the inner aspects of the thigh on

. This is backache which is present inter- for weeks, months, or longer. A chronic rom any conditions, except meningitis or acute backache. Arthritis of the spine and ses of chronic backache. Trauma may cause back strain but a herniated disk or a rup-e of a patient with a herniated or ruptured ber in location, with pain radiating down legs when the patient strains, coughs, or

12–7. Abnormal Bac

a. Low Back Pai referable to the causes, including t a sprain or a str organs in the chest mon neurotic comp not associated wit diarrhea, or paraly time with aspirin is severe, persisten you should evacua tactical situation p

b. Acute Backac The trauma may r a strain of the bac the back. Acute ba region and aggrava backache walks ve not jar or move h usually is not hard limited to analgesi A patient with per cal officer. Acute cephalitis, prostati infections about th usually involve severe h urinary tract have the urgency, and dysuria (p tenderness is present ov also produce severe ba region down into the g the involved side.

c. Chronic Backache. mittently or constantly backache may result f encephalitis, that cause trauma are notable caus not only a chronic low tured disk. The backach disk is most often lum the back of one or both

sneezes. Arthritis may involve any portion of the vertebral column. Chronic low back pain may be due to poor posture or repeated trauma to the back. Signs and symptoms may be the same as for acute trauma or arthritis. Treatment in the field is limited to analgesics. You may suggest limitations in duty assignments.

12–8. Differential Diagnosis

Swelling of joints	Arthritis (all types), rheumatic fever, sprains.
Pain	Arthritis (all types), rheumatic fever, infections, inflammation.
Joint pain and stiffness, improves with activity	Rheumatoid arthritis.
Joint pain and stiffness, worsens with activity	Osteoarthritis and other types of arthritis except rheumatoid arthritis; sprain; fracture; gout.
Redness	Arthritis, bursitis.
Stiffness	Arthritis.
Elevated temperature	Rheumatic fever, all infections.
Infections elsewhere in the body	Meningitis, encephalitis, kidney, bladder, prostate.
Stiff neck, headache	Meningitis, encephalitis.
Back pain radiating down leg	Slipped disc, kidney stone.
Deformity	Osteoarthritis, rheumatoid arthritis.
Is condition migratory?	Rheumatoid arthritis, rheumatic fever.
Pain on motion	Arthritis, bursitis, myositis.
Is pain localized?	Arthritis, bursitis, localized infections, trauma.
Nausea or vomiting *	Viral myositis.
Diarrhea *	Viral myositis.
Urinary symptoms *	Urinary infections including prostatitis.
Muscle spasms	Muscle strain.

* Associated with musculoskeletal symptoms or signs.

CHAPTER 13
DISEASES OF THE RESPIRATORY SYSTEM

13–1. Exchange of Gases

The cells of the body require oxygen for life. Oxygen is used by the cells and then converted to the waste gas, carbon dioxide, which is removed from the body. Oxygen and carbon dioxide are continually being exchanged, both between the body and the atmosphere and within the body. The respiratory system performs this essential exchange of gases, taking oxygen from the air and releasing carbon dioxide into the air.

13–2. Structure and Function of the Respiratory System

The respiratory system consists of the nose, paranasal air sinuses, pharynx, trachea, bronchi, lung, and diaphragm. Figure 13–1 depicts the upper respiratory organs.

a. The nose provides a passage for air, warms and moistens the inspired air, and removes dust. Fine hairs filter out coarse particles of dust and the lining of the mucous membrane traps fine particles. The mucous membrane also warms and moistens the air.

b. Paranasal air sinuses are passages lined with mucous membrane which warm and moisten the air and act as resonance chambers for the voice.

c. The pharynx, or throat, connects the nose and mouth with the lower air passages and esophagus (fig 13–1). It contains masses of lymphoid tissue, such as adenoids and tonsils.

d. The larynx, or voice box, connects the pharynx with the trachea. It forms the "Adam's apple" in the neck. During swallowing, the epiglottis closes the larynx, keeping food or liquid out of the trachea.

e. The trachea, or windpipe, is a tube which carries air from the larynx to the bronchi. It is held open by rings of cartilage.

f. The trachea ends as it branches into two bronchi, one bronchus going to each lung. These bronchi then branch into many smaller bronchi and even smaller bronchioles as they carry air to and from the millions of tiny air sacs (alveoli) in the lungs (fig 13–2).

g. The two lungs (fig 13–2) are the essential organs of respira-

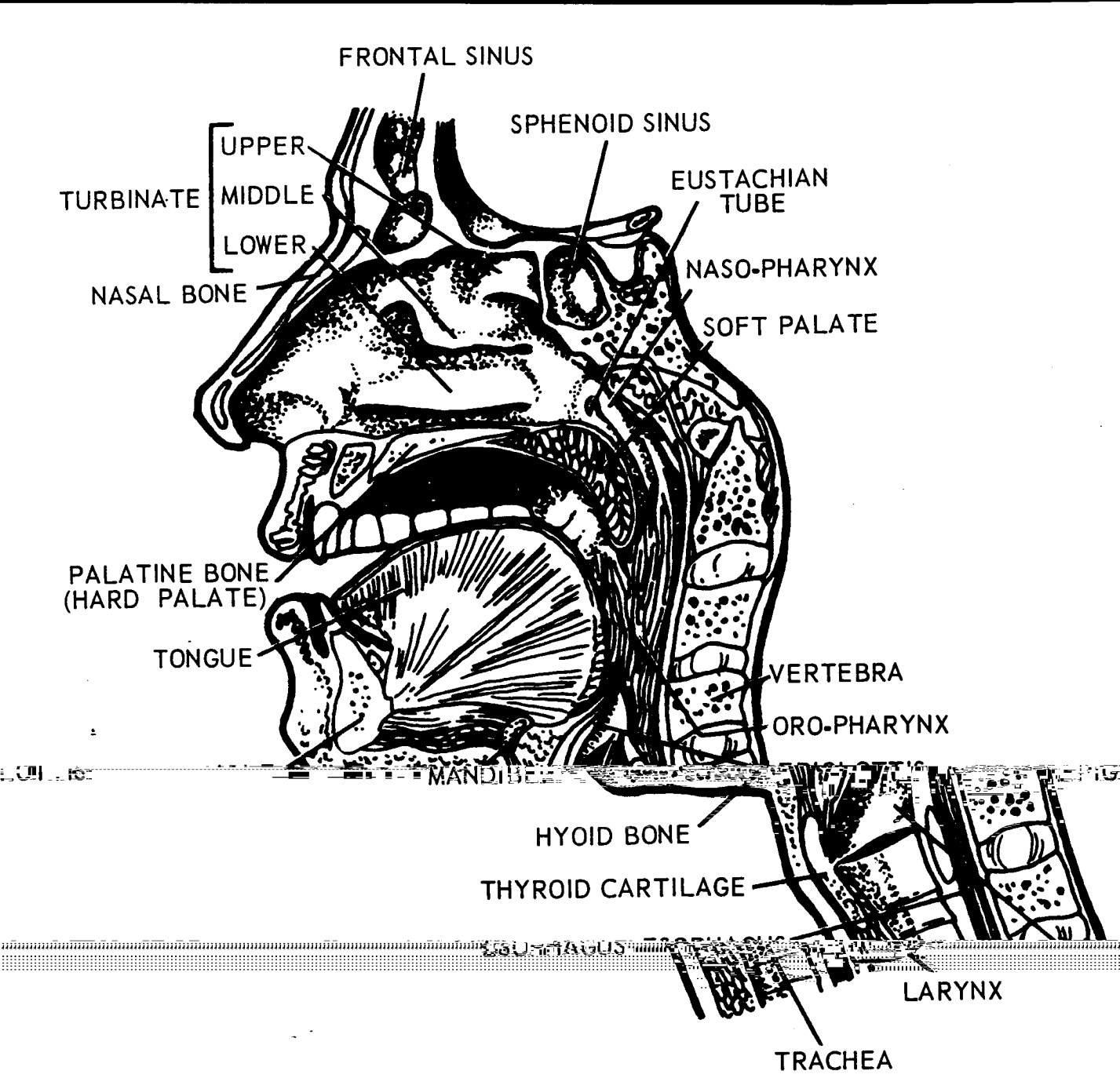


Figure 13–1. Upper respiratory organs.

tion. The right lung is divided into three lobes; the left lung into two. The lungs lie in the thoracic cavity, each lobe enclosed by a membranous sac formed of two layers of serous membrane called pleura. One layer of the pleura, the pulmonary visceral layer, lies next to the lungs. The other layer, the parietal pleura, lines the thoracic cavity. The portions of the two layers which separate the

lightweight organ consisting mostly of "empty" air sacs called alveoli. It is in these air sacs that oxygen is absorbed into the blood and carbon dioxide is released from the blood.

13–3. Useful Descriptive Terms

a. Antitussive. Relieving or preventing cough.

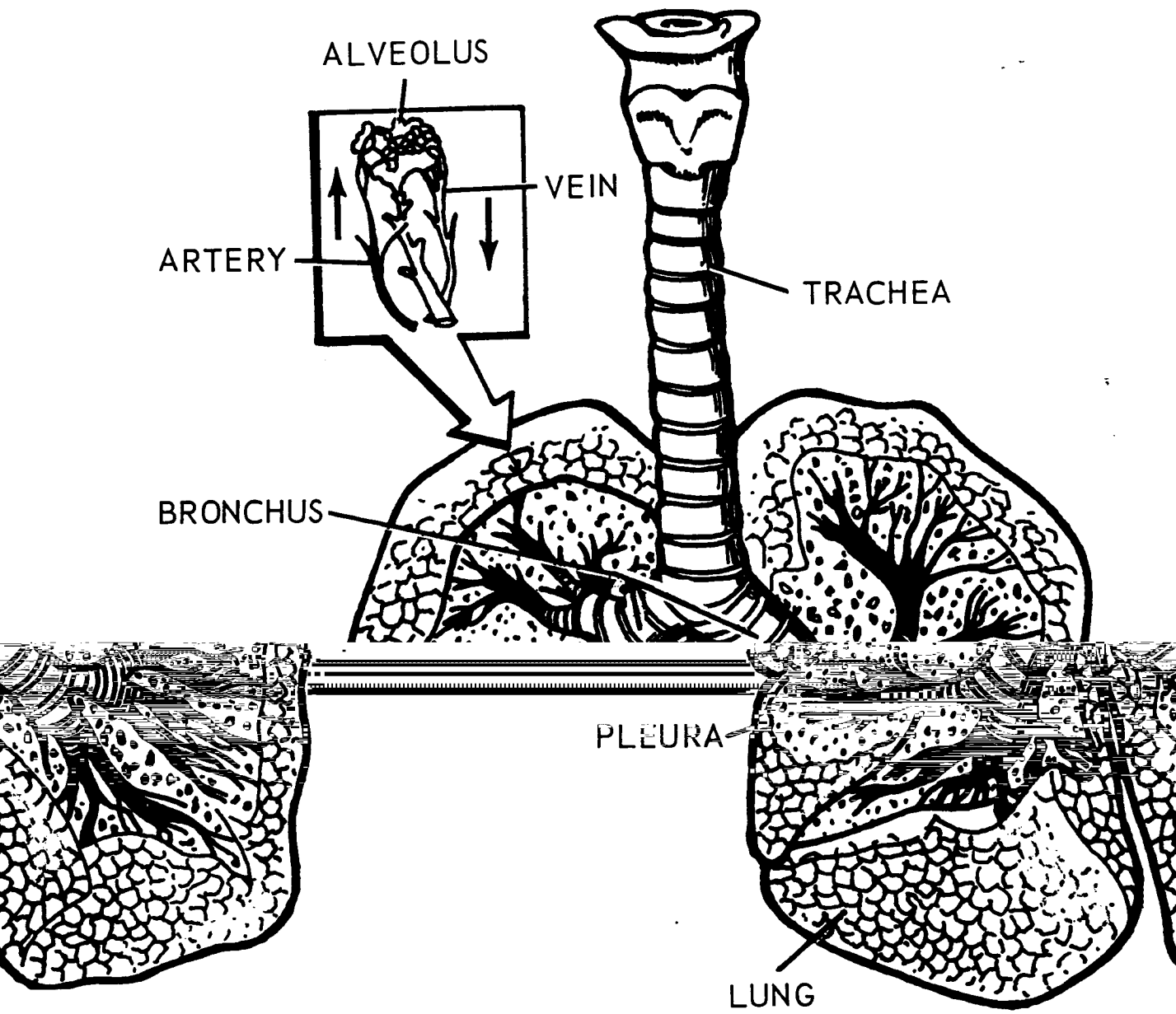
b. Apnea. Absence of respiration.

c. Atelectasis. A partial or complete collapse or airless state of the lungs.

d. Breast Bone. The sternum.

e. Bronchitis. Inflammation of the bronchi.

f. Cyanosis. A bluish discoloration of the skin, especially around fingernails, toenails, lips, and ear lobes, due to lack of oxygen in the blood.



passages.

Figure 13–2. The lungs and air

g. Embolus. A clot or other substance such as air or fat which travels through the circulation, lodges in a vessel, and obstructs the flow of blood.

h. Hemoptysis. The coughing up of blood or bloodstained sputum.

i. Infarct. Death of tissue because of a lack of blood supply.

j. Malaise. A vague feeling of bodily discomfort.

k. Neuralgia. Pain which extends along the course of one or more nerves.

l. Pallor. Paleness; absence of skin coloration.

m. Pleurisy. Pain due to inflammation of the pleura (pleuritis).

n. Pleural Effusion. Presence of excess fluids in the pleural cavity.

o. Pneumothorax. Air in the pleural cavity.

p. Pulmonary. Pertaining to the lungs.

q. U.R.I. Upper respiratory infection.

13–4. General Signs and Symptoms of Respiratory Diseases

a. Cough. An adequate history is essential for the proper evaluation of a patient with a cough. If the patient does not volunteer the information, ask him how long the cough has been present, whether it has been constant or intermittent, when it is worse, what aggravates it, the color and amount of sputum produced, whether associated symptoms such as shortness of breath are present, and whether he has a history of heart or lung disease. A cough will be eiher nonproductive (dry) or productive.

(1) A dry cough is seen early in the course of acute bronchitis, pneumonia, tuberculosis, and carcinoma (cancer) of the lung, or as the result of aspiration of a foreign body or an irritant into the airway. As any of these conditions persists, the sputum usually becomes mucoid (thick and white) purulent (usually yellow, green, or brown). Asthma produces large amounts of mucoid sputum. Sometimes pneumonia and bronchitis produce purulent sputum soon after the start of the dry cough.

(2) A productive cough is one in which the patient coughs up sputum. It is important to make sure the patient is talking about sputum and not saliva, which is always present. Sputum comes from the trachea or from deeper in the air passages. Sputum is usually classified as mucoid, purulent, or bloody. Mucoid sputum is typical of mild bronchial infections and allergies such as asthma. Purulent sputum occurs with bacterial infections such as in pneumonia or severe bronchitis. Bloody sputum may simply be streaked with small amounts of blood. This is a common result of any acute inflammation of the air passages, especially when a hacking cough is present. Sputum which is completely bloody generally has a

more serious implication. It is associated with traumatic chest injury, lung cancer, and tuberculosis.

(3) Management of a cough depends on its cause, type, severity, duration, associated signs and symptoms, and type of sputum. A patient with a cough which has been present intermittently or constantly for more than a week should be referred to a medical officer for evaluation. A dry, harassing cough associated not with temperature elevation but with other symptoms suggestive of a common cold may be relieved by a teaspoonful of terpin hydrate every 4 hours. The same treatment is proper for a cough producing small amounts of mucoid sputum. A patient producing a purulent sputum has a bacterial infection somewhere in his tracheobronchial tree, perhaps an acute bacterial bronchitis or pneumonia. He should be sent to a medical officer for evaluation. Any patient with bloody sputum must be seen by a medical officer.

b. Dyspnea (Shortness of Breath). Dyspnea is usually due to some form of body oxygen shortage. It occurs temporarily after exercise, for example. It may also be the result of diminished oxygen content in the surrounding air. This is best illustrated by the shortness of breath experienced by unacclimatized troops while working at an altitude higher than they are accustomed to. Any disease or injury that keeps enough oxygen from getting into the blood by the lungs can produce dyspnea. Likewise, a disease or injury that prevents proper circulation of the blood and oxygen to all parts of the body will cause dyspnea. A condition that impairs the nervous control of respiration so that breathing is no longer automatic also will cause dyspnea. Persistent dyspnea in the

of strenuous exercise is a serious condition requiring absence
on by a medical officer. Consequently, if a patient com- evaluati
f shortness of breath, ask how long the symptom has been plains o
and whether he has just finished exercise. Emotional upset present
duce dyspnea, but if it is persistent, the patient should be can prod
to a medical officer. referred

est Pain. Pain in the chest originates in the heart, chest *c. Che*
abdominal organs. It may also be psychogenic—that is, wall, or
d by the mind in the absence or organic disease. Careful produced
ing about the nature of the pain will help you determine question
causing the chest pain. Pain involving the heart (cardiac what is
discussed in paragraph 14–9. pain) is
Pleural pain is caused by irritation or inflammation of (1)
tal pleura (pleurisy). It is due most often to infections, the parie
or cancer spreading from the lungs to the pleura. Pleural trauma,
sually characteristic. It may be present in either side of pain is u
and is well localized. The pain is aggravated by a deep the chest
on, coughing, or sneezing, and is sticking, stabbing, or inspirati

cutting. It disappears if the breath is held in expiration. Often associated signs and symptoms are cough, sputum, fever, and dyspnea. A patient with pleuritic pain should be evacuated for evaluation.

(2) Pain arising in the outer structures of the chest wall (skin, muscles, ribs) is usually aggravated by deep inspiration, but disappears when the breath is held. Among the possible causes of this pain are a broken rib, intercostal muscle sprain, herpes zoster, inflamed rib cartilages, and nerve root irritation. If the patient twists or bends the thorax laterally while holding his breath, the pain recurs. The pain also often encircles one or both sides of the thorax, and a localized area of tenderness can be elicited in the region of the pain. Cough and fever may not present. Dyspnea may occur. The pain is managed by local application of heat several times daily for ½ hour, by massage, and administration of two aspirin every 4 hours. If the patient does not improve within a week, he should be seen by a medical officer.

(3) Pain referred to the chest may be felt in any area from the tip of the shoulder to the lower rib margin. It is usually due to disease of abdominal organs near the diaphragm, such as the liver, gallbladder, stomach, transverse colon, or spleen. It is differentiated from disease in the chest by the presence of abdominal tenderness and symptoms referrable to the abdomen, such as nausea, vomiting, distention, constipation, or diarrhea. Refer the patient to a medical officer as soon as possible. Do not give him anything by mouth or to relieve the pain.

(4) Psychogenic chest pain is precipitated by anxiety. It may mimic cardiac pain. The correct diagnosis is based upon your ability to question the patient carefully about upsetting events, duration of the pain, and what brought it on. The better you know the men you serve, the better you can detect psychogenic symptoms. One common cause of psychogenic chest pain is news that a close relative or friend has suffered a heart attack.

(5) For information on cardiac pain, see paragraph 14–9.

13–5. Upper Respiratory Infections

a. Common Cold (Acute Coryza). The common cold is caused by a virus. It is characterized by a watery, nonpurulent nasal discharge. Other symptoms include coughing, hoarseness with laryngitis, blockage of nasal passages, and sore throat. The patient may also have a mild fever of less than 101° F., general feeling of discomfort, and easy fatigability. The ordinary cold persists for several days to a week, gradually improving after 2 to 3 days. There is no specific treatment for coryza. Symptomatic treatment that may be used includes aspirin, antihistamines, cough syrup, increased intake of fluids, and rest.

b. Pharyngitis and Tonsillitis. These conditions are caused by invasion of the mucous membrane of the throat or tonsils by viruses or bacteria, especially streptococcus. Both conditions are characterized by severe sore throat, fever, intense inflammation of the throat, malaise, weariness, and often swelling of the lymph nodes and tenderness in the neck. The throat will show a fiery redness of the pharynx or the tonsils, or both. In streptococcal infections, white spots of pus may be present on the tonsils. Occasionally, an infection spreads from the tonsils to localize in the tissue around them, causing a peritonsillar abscess. Specific therapy includes antibiotics for bacterial pharyngitis and tonsillitis. Very helpful for sore throat of any cause is warm salt water gargle. Have the patient mix a teaspoonful of salt into a glass of warm water and gargle it for 5 to 10 minutes four times a day.

c. Influenza (Flu, Grippe). Influenza is similar to the common cold except that the symptoms are more severe. The primary cause of influenza is a virus; however, many secondary infectors may invade the body weakened by the influenza virus. The patient is listless, has headache and muscular aches, particularly in the back, and may feel very ill. His fever is usually moderately high, 101° to 103° F. He may also have a sore throat, watering eyes, nasal discharge, cough, nausea, and vomiting. A patient with the flu should be evacuated. Treatment is directed toward relieving the symptoms. Specific treatment for any secondary infection should be started early by the medical officer.

12-6. Lower Respiratory Infections

. This is an inflammation of the mucous irways (bronchi) into the lungs. It may be terial infections or by physical or chemical ng symptom is cough. Other symptoms are infection such as fever and malaise. The ductive or productive of either mucoid or nchitis usually is a mild disease of short progress into pneumonia in a debilitated ith rest, fluids, cough mixtures, and specific y a medical officer.

onia.

ymptoms of bacterial pneumonia are chills, ne chest, and greenish-yellow sputum which blood. The temperature is high (102° to (120–140). Respiration is fast. In a severe ult and cyanosis is present. Chills are often pearing suddenly in an apparently healthy evious symptoms. The pain in the chest is vated by breathing and coughing (pleuritic).

a. Acute Bronchitis.

membrane lining the a
caused by viral or bact
agents. The outstandin
general symptoms of
cough may be nonpro
purulent sputum. Bro
duration, but it may
patient. It is treated w
antibiotics prescribed b

b. Bacterial Pneumo

(1) The typical s
fever, cough, pain in th
may be streaked with
104° F.). Pulse is fast
case, breathing is diffic
the first symptom, app
individual without pre
often severe and aggra

(2) You cannot treat pneumonia adequately in the field. The patient must be evacuated to a medical treatment site with laboratory facilities. Evacuation is usually by routine or priority, depending on the severity of the case.

c. Virus Pneumonia. This is also called primary atypical pneumonia. The symptoms are similar to bacterial pneumonia, except that they are often less severe. Therefore, diagnosis is more difficult without X-rays. The onset of virus pneumonia may be more gradual than that of bacterial pneumonia. The temperature is often lower and more variable than in bacterial pneumonia. The cough is seldom productive. Chest pains are described as more of an ache. Pulse and respiration are slower. An X-ray is often necessary to conclude a diagnosis of virus pneumonia. The patient must be evacuated to a medical treatment facility with complete laboratory and X-ray capabilities.

13–7. Asthma

Asthma is a chronic, recurrent allergic disease usually beginning in childhood. The patient is sensitive to an agent such as pollen which, when it enters his body, causes constriction of the smooth muscles of the bronchial tree, swelling of the mucous membrane lining, and increased secretions of the glands in the bronchial walls. This results in partial blockage of the air passages. The patient must forcibly exert his respiratory muscles to breathe. Asthmatic attacks usually last about 2 to 4 hours.

a. Characteristic of asthma is the wheezing noise of air being forced through the patient's narrowed and wet bronchial tree. Coughing spells often accompany the attack.

b. Ideal treatment of asthma consists of isolating the substance producing the reaction and either having the patient avoid the substance or desensitizing him against it. Desensitization is the procedure of administering the substance (foreign protein) in progressively larger doses as the body gradually accommodates to it. Acute asthmatic attacks are treated with antihistamines such as Tedral, Benadryl, or Pyrabenzamine. This is because large amounts of histamine are released during an attack and the histamine actually produces the symptoms. In extremely severe attacks, injections of epinephrine may be required to keep the airway open.

c. The best way to prevent asthma is to avoid the causative allergen. A soldier may need to be evacuated from a certain area if the allergen is abundant there.

13–8. Hyperventilation

Hyperventilation means abnormally rapid breathing rate. It is a common result of anxiety or fear, typical in combat situations. The patient may not be aware he is breathing too rapidly, and if

the hyperventilation is prolonged, a series of unusual and frightening symptoms occur. The rapid breathing produces an excess of oxygen and not enough carbon dioxide in the blood. The resulting shortage of carbon dioxide in the blood produces numbness of the hands, fingers, and other parts of the body; prickling of the skin; trembling; racing of the heart; light-headedness; fainting; cramping of muscles; curling of the fingers and toes; and extreme anxiety and apprehension. These symptoms frighten the patient and cause him to breathe even faster. This accelerates the symptoms, resulting in a vicious cycle. Hyperventilation is treated by slowing the breathing and elevating the concentration of carbon dioxide in the lungs. The patient must be reassured and firmly encouraged to slow his breathing. A paper bag, a poncho, or a field jacket, may be placed over the patient's nose and mouth to trap the exhaled carbon dioxide, forcing him to rebreathe it. The cover should be left in place for about six respirations and removed for another six. This cycling should continue until he is improved.

13–9. Differential Diagnosis

Dyspnea	Asthma, pneumonia, deceased O_2 supply.
Chill	Pneumonia, malaria.
Productive cough	Bronchitis, pneumonia, asthma.
Nonproductive cough	Bronchitis, cold, flu, pneumonia, foreign body.
Watery sputum	Bronchitis, cold, flu.
Blood-streaked sputum	Pneumonia, tuberculosis, cancer.
Chest pain on exertion	Cardiac, chest wall pain (chap 14).
Chest pain less when holding breath	Pleuritic pain, chest wall pain.
Chest pain with abdominal symptoms	Referred chest pain.
Rapid breathing	Pneumonia, asthma, bronchitis, hyperventilation.
Cyanosis	Pneumonia (severe), asthma (severe), chemical poisoning.
Sore throat	Bacterial or viral pharyngitis or tonsillitis.
Allergy	Asthma, hay fever.
Slightly elevated temperature	Viral infections.
High temperature	Bacterial infections.
Fast or weak pulse	Pneumonia, asthma, shock.

CHAPTER 14
DISEASES OF THE CIRCULATORY SYSTEM

14–1. Circulatory System

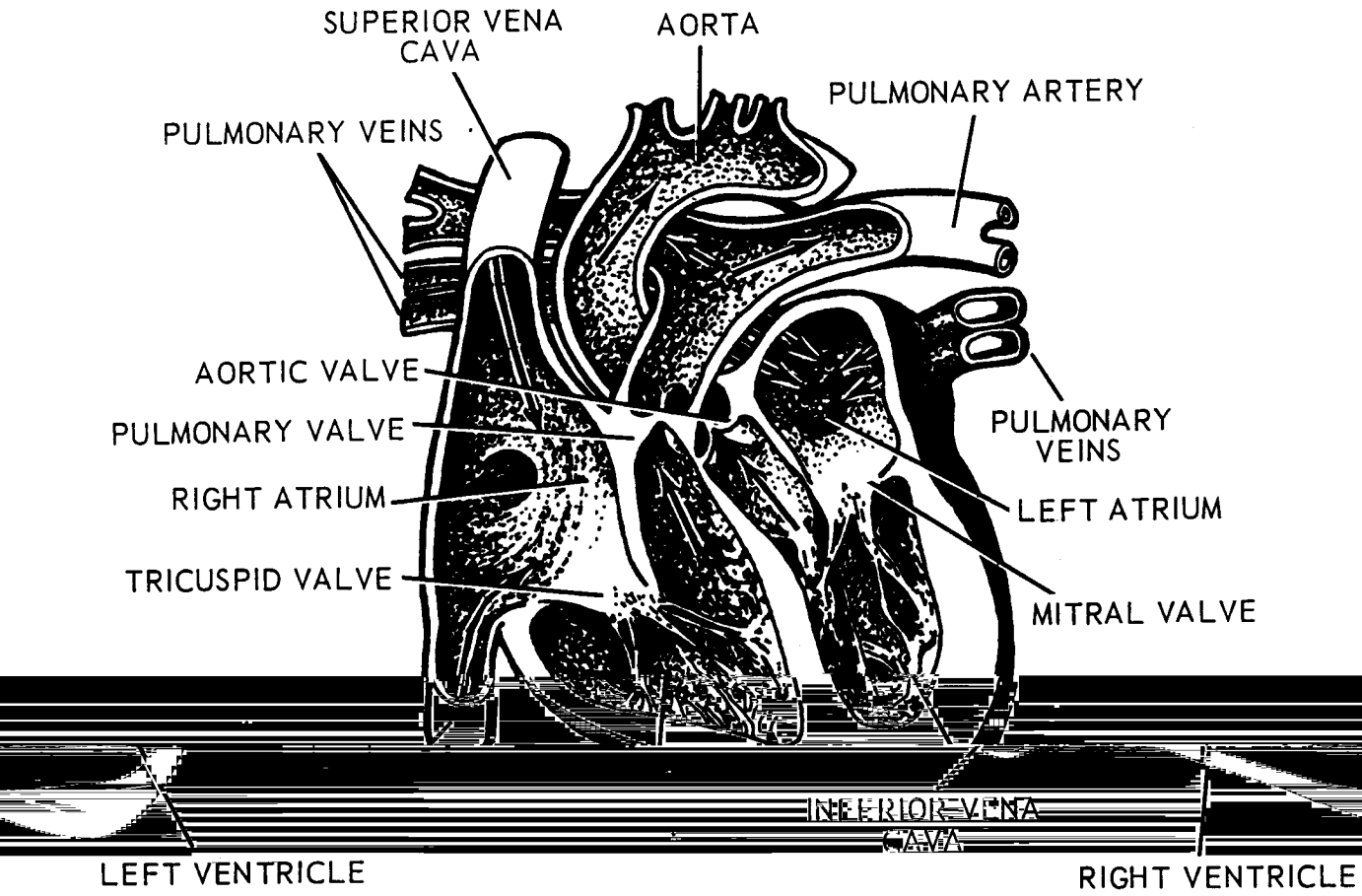
Diseases of the circulatory (cardiovascular) system—the heart and the blood vessels—are the leading cause of death in the United States. They account for more deaths than the next five most common diseases combined. Every cell in the human body must have oxygen almost continuously to live. The circulatory system delivers life-sustaining oxygen in its blood to the cells. In addition, it carries the waste gas, carbon dioxide, away from the cells to the lungs for release into the air. In exchange, the blood picks up more oxygen to carry to the body cells. The main components of the circulatory system are the heart, which pumps the blood; the blood vessels (arteries, veins, and capillaries) which carry the blood; the blood itself; and the lymphatic system.

14–2. The Heart

The heart is a four-chambered pump consisting mainly of muscle tissue. It is about the size of two clenched fists (fig 14–1). Two of the chambers receive blood and two pump blood. The chambers on the right side are filled with blood containing much carbon dioxide. The upper chamber (right atrium) receives blood from the body while the lower chamber (right ventricle) pumps it to the lungs. The left chambers are filled with blood rich in oxygen. The upper chamber (left atrium) receives blood from the lungs while the lower chamber (left ventricle) pumps it to the body. Valves at the outflow sites and between the chambers allow the blood to flow in the correct direction only.

14–3. Arteries

Arteries convey blood away from the heart. Very small arteries are called arterioles. The system of arteries and arterioles is like a tree with a large trunk giving off branches which repeatedly divide and subdivide, becoming progressively smaller. When the heart contracts, it pumps blood into the arteries. The artery from the right ventricle to the lungs is the pulmonary artery. The artery from the left ventricle is the aorta. The aorta then branches to



its parts.

Figure 14–1. The heart and

e is measured by feeling

in emptying directly into
ins emptying into the left
small veins are called
walls, low pressure, and
ackward. Blood is moved
f pressure from behind,
action on them, and valves
rd and not away from the

arry blood from the arte-
de of a thin layer of tissue.
luid, oxygen, and carbon
ue cells.

y as a way of transporting
to another. Blood carries

supply all organs in the body. Pulse rat
blood pulse through an artery.

14–4. Veins

Veins return blood to the heart. The vei
the right atrium is the vena cava. The ve
atrium are the pulmonary veins. Very
venules. Veins are characterized by thin
valves which keep blood from flowing b
through the veins by a combination o
squeezing of the veins by muscular contr
which allow the blood to move only towa
heart.

14–5. Capillaries

Capillaries, the smallest blood vessels, c
rioles to the venules. Their walls are mad
The thin wall permits exchange of f
dioxide between the blood and the tiss

14–6. Blood

a. Function. Blood functions primaril
substances from one part of the body

oxygen from the lungs to the cells, carbon dioxide from the cells to the lungs, food from the digestive tract to the cells, and wastes from the cells to the kidneys. Blood also functions in fighting infection, maintaining the body's temperature, and maintaining the body's chemical balance.

b. Components. Blood is made of plasma and cellular elements. The cells include red blood cells, white blood cells, and platelets, and comprise about one-half the volume of blood. Plasma, the fluid part of blood, forms the other one-half. Plasma is a clear, straw-colored liquid containing many substances in solution. Among them are water, gases, protein, fat, carbohydrates, inorganic salts, enzymes, hormones, and waste products.

(1) Red blood cells carry oxygen from the lungs to the tissue cells. Red blood cells are formed in the bone marrow. In the average adult, they number about 5,000,000 per cubic millimeter of blood. Red cells contain a pigment called hemoglobin, a compound of iron salt and protein, which gives the cell its color. In the presence of oxygen, hemoglobin becomes a brighter red. Therefore, blood in the left atrium just returning from the lungs will be much brighter red than blood in the veins just returning from the tissue.

(2) The function of white blood cells is to fight infection. They are able to ingest and destroy bacteria. They are also capable of ameboid movement and can pass through capillary walls into surrounding tissues. An area of infection, such as a boil, is characterized by a great increase of white blood cells (leukocytes), which gather about the site and try to destroy the bacteria. Pus in a boil is mostly white cells, with bacteria and dissolved tissue. Diseases involving bacterial infection are generally accompanied by an increase in circulating white blood cells, as in appendicitis. White blood cells are formed in the bone marrow and number about 5,000 to 10,000 per cubic millimeter of blood.

(3) The main function of blood platelets is to aid clotting, or coagulation, of blood. Coagulation is the body's method of preventing excessive loss of blood when blood vessels are broken or cut open. Undisturbed blood circulates in its vascular system without clotting. When the blood leaves its natural environment, certain physical and chemical factors are changed, and the platelets break up to start the clotting process. Platelets are also formed in the bone marrow. They number about 250,000 per cubic millimeter of blood.

14–7. Lymphatic System

The lymphatic system consists of the lymph, lymph vessels, lymph nodes, and associated organs including the spleen.

a. Lymph is the fluid which passes out of the capillaries and bathes every cell in the body, supplying nutrient substances and

carrying away wastes. It returns to the bloodstream in the lymph vessels.

b. Lymph vessels start as open-ended ducts within the tissue spaces. As they travel up toward the heart, they unite with other lymph capillaries to form larger lymph vessels resembling veins. Lymph fluid drains from spaces between tissues into these vessels to be returned to the circulatory system. On the way, it passes through one or more lymph nodes.

c. Lymph nodes are small, oval bodies of lymphoid tissue which

ong the course of lymph vessels. Lymph nodes act as filters he removal of infective organisms from the lymph stream. nally lymph nodes cannot be felt through the skin. However, tions can cause lymph nodes to become inflamed and enlarged. rged nodes may sometimes be felt in the groin, armpit, or neck wing infections in those areas. Lymph vessels may become ted also in the area of local infections and appear as red ks in the skin leading away from an infected wound. Other ses of the lymphatic system are rare and will not be discussed

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Useful Descriptive Terms

14–8.

Anemia. A condition in which the number of red blood cells ow normal.

Aneurysm. Localized dilation of an artery.

Aorta. The major artery of the body.

Arterial Pressure. The force which causes blood to flow in the ies away from the heart.

Bradycardia. Abnormal slowness of the heart beat.

Cardio. A word stem indicating the heart, as in cardiology— of the heart.

Carotid Arteries. The principal arteries of the neck; they y blood to the brain, face, and scalp.

Congenital. Existing at or before birth; usually refers to an rmal condition.

Constriction. A narrowing or closing of a blood vessel; a g of tightness or pressure, as in the chest.

Coronary Arteries. Arteries supplying blood to the tissues of eart.

Digitalis. A drug which increases the efficiency of contraction ailing heart.

Edema. An excessive collection of watery fluid in the tissues.

Embolism. The occlusion or blocking of an artery by a clot olus) which has traveled through the circulation from ier area of the body.

Hem, Hema, Hemo, Hemato. Combining forms (stems) mean-

a.
is bel
b.
c.
d.
arter
e.
f.
study
g.
suppl
h.
abnor
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feelin
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the he
k.
in a f
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(emb
anoth
n.

ing blood. Examples: hematology, study of blood; hemoptysis, coughing of blood.

o. Hematoxic. Poisonous to blood.

p. Hemostat. An instrument for constricting a blood vessel to stop flow of blood.

q. Muscle Tone. A state of partial tension (contraction) always found in muscles.

r. Myocardial Infarction. Death of the heart muscle as a result of coronary occlusion (loss of blood supply).

s. Phlebo. A combining form indicating the vein, as in phlebitis, inflammation of a vein.

t. Stenosis. Constricting of a channel.

u. Thrombus. A blood clot inside a vessel which may block flow of blood.

14–9. Heart Attack

Although there are several diseases of the heart which can occur, most are uncommon and of no concern to you. However, a heart attack can occur anywhere, any time, without warning, and it may be fatal.

a. Signs and Symptoms. Heart attack is produced when one of the blood vessels to the heart muscle (coronary arteries) becomes blocked. The part of the heart which is deprived of blood dies rapidly. This usually produces severe chest pain which is generally described as "crushing" and is present in the middle of the chest. Because the heart is damaged, the pulse is often weak, rapid, and irregular. The patient appears severely ill. Sometimes heart attacks are preceded for months or years by many brief episodes of similar but milder chest pain occurring with exertion. This exertional chest pain, called "angina pectoris," indicates narrowing of the coronary arteries.

b. Treatment. The patient with a heart attack needs immediate hospitalization and should receive urgent evacuation. Until evacuation, rest, sedation, and oxygen are the best measures. Administer morphine (¼ grain) for the chest pain. Angina pectoris should be fully evaluated by a medical officer. Indeed, any chest pain which is not readily identifiable as chest wall pain or pain from the abdomen should be referred to a medical officer as soon as possible. This is especially true if the pulse is irregular, rapid, or weak.

14–10. Diseases of Arteries and Veins

a. High Blood Pressure. High blood pressure is defined as blood pressure greater than 140/90. There are many causes of high blood pressure, including diseases of the kidneys and blood vessels and tumors of the adrenal glands, but in most cases the cause is

unknown. Psychologic factors may be present since more hypertension is seen in "worriers" and "hard drivers" than in other types of persons. The disease is dangerous because the high pressure damages various organs, especially the heart, brain, and kidneys. Treatment includes removal of the underlying cause if possible, drugs to lower the blood pressure, rest, sedation, and low-salt diet. The individual should be evaluated by a medical officer.

b. Arteriosclerosis. This is a disease in which there is hardening of the arteries. The wall of the artery thickens due to the formation of fat deposits and fibrous tissue, thus narrowing the artery and interfering with the flow of blood. Blood clots may form, blocking the artery completely. No treatment for the disease is known. It usually affects older persons and may be a natural result of aging. It is especially dangerous when the coronary arteries which supply the heart muscle are affected, because a heart attack may result.

c. Thrombophlebitis. This is a disease in which a vein becomes inflamed and a clot forms in it. Symptoms include fever, tenderness along the course of the vein, swelling if the vein is in an extremity, and the presence of a hard, tender cord if a superficial vein is involved. Treatment is local heat, rest, and elevation if the extremities are involved. The patient should be referred to a medical officer. A serious complication of thrombophlebitis is pulmonary embolism, in which a clot breaks loose from the involved vein, travels through the right heart, and lodges in the pulmonary artery. This may cause death.

CHAPTER 15

DISEASES OF THE DIGESTIVE SYSTEM

15–1. Anatomy of the Digestive System

a. The mouth, or oral cavity, is the beginning of the digestive tract (fig 15–1). Here, food is ground into small particles and mixed with saliva for swallowing. Saliva moistens food and makes it easier to chew and to swallow. Enzymes in saliva break starches into sugar, which is the beginning of chemical digestion. About 1,500 cc. of saliva is secreted daily.

b. The main function of teeth is to grind food to make it easier for enzymes to act upon and to lessen difficulty in swallowing. Chewing, swallowing, absorption, peristalsis, and defecation make up the mechanical part of digestion. Diseased or missing teeth may result in improperly chewed food, causing improper digestion deeper in the digestive tract. Swallowing large chunks of improperly chewed food adds to the work of the rest of the digestive tract.

c. The tongue is a muscular organ attached to the back of the floor of the mouth. The tongue works with the teeth by shifting and positioning food so that chewing can occur more efficiently. The tongue then propels the bolus (rounded mass of chewed food) from the mouth into the pharynx. This is the first stage of swallowing. Another function of the tongue is its use in speech and taste.

d. The pharynx is a muscular canal leading from the nose and mouth to the esophagus and larynx. Passage of food from the pharynx into the esophagus is the second stage of swallowing. During swallowing, the epiglottis closes the larynx so that food does not enter there but travels into the esophagus.

e. The esophagus is a muscular tube about 10 inches long, leading from the pharynx to the stomach. It is lined with mucous membrane and positioned directly behind the trachea. Its function is to complete the act of swallowing. Food is moved down the esophagus by waves of muscular contraction called "peristalsis." When vomiting occurs, the peristaltic wave is reversed.

f. The stomach is an expanded portion of the alimentary canal. It is an elongated, pouch-like structure lying just below the

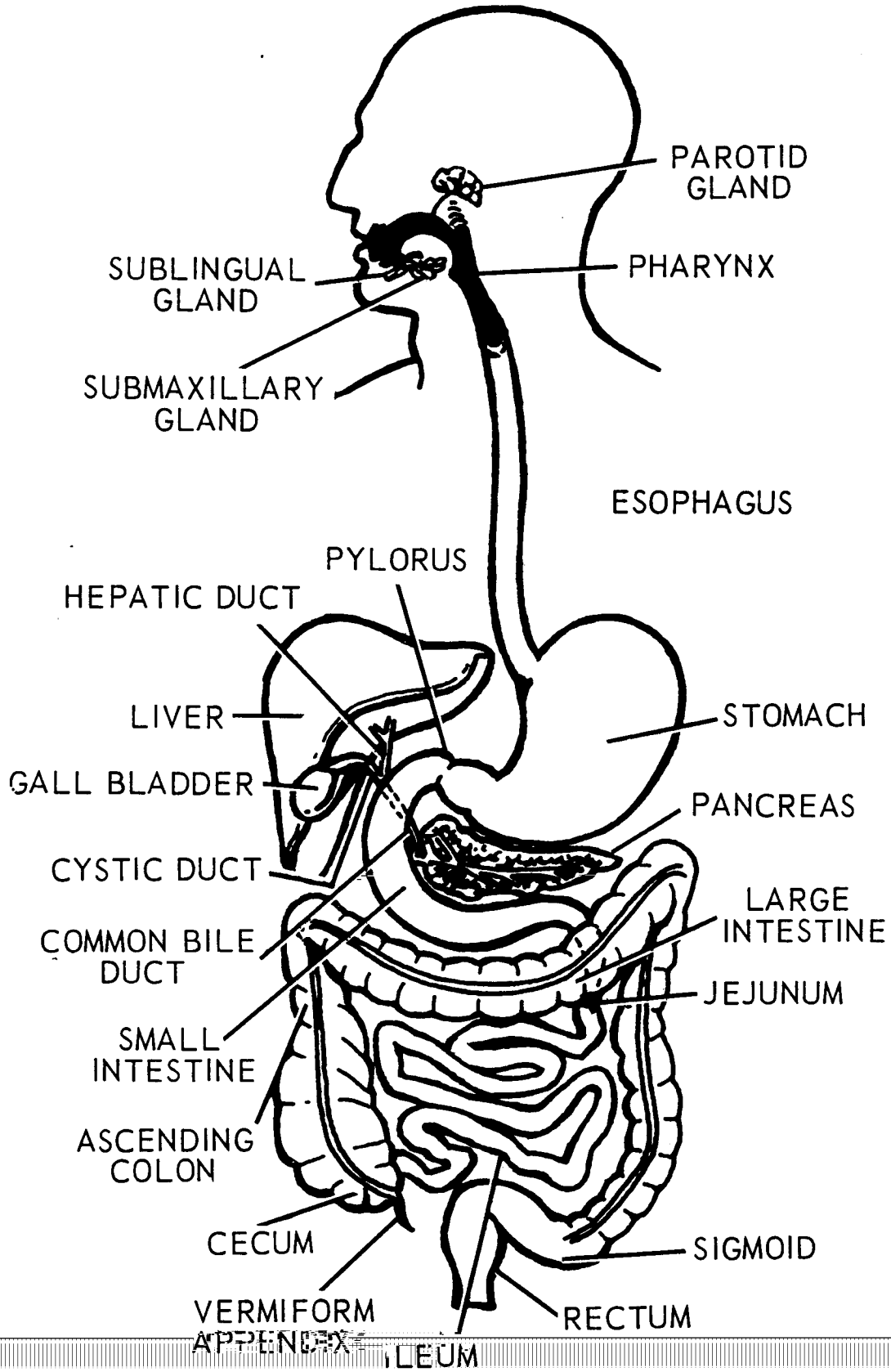

Figure 15–1. The digestive system.

diaphragm, mostly to the left of the midline. Circular sphincter muscles act as valves and guard the openings into and out of the stomach. The stomach has two main functions.

(1) The stomach is a reservoir for food. It expands when receiving food and contracts as it releases its contents through the pyloric valve into the duodenum. In addition, the stomach churns the food and breaks it down further for mixing with the gastric juices.

(2) Glands in the lining of the stomach produce gastric juices and hydrochloric acid. Gastric juices contain two enzymes which break proteins into simpler forms. Mucous membrane lining the stomach protects the stomach itself from being digested by the acid and enzymes. Food leaves the stomach as a semi-liquid.

g. The small intestine is a tube about 22 feet long. It extends from the pyloric valve to the cecum. The pyloric valve is a valve at the lower end of the stomach connecting to the upper end of the small intestine. This valve opens to allow the stomach contents to enter the small intestine. The cecum is the first portion of the large intestine. The small intestine is divided into three parts: duodenum, jejunum, and ileum. The duodenum is lined with small glands which secrete juices for digestion. The food is completely digested and absorbed into the bloodstream in the remainder of the small intestine. Only wastes and water remain to enter the cecum.

h. The large intestine is a tube about 5 feet long. It extends from its junction with the small intestine to the rectum. At the junction of the small and large intestines is the cecum, which is a blind sac located on the lower right side of the abdomen. Attached to the lower end of the cecum is the appendix, a tail-like structure about 3 inches long with no known function. The ascending colon portion of the large intestine extends along the right side of the abdomen from the cecum up to the region of the liver. There the large intestine bends and continues horizontally across the upper portion of the abdomen to the spleen. This portion is known as the transverse colon. The large intestine bends again and continues down the left side of the abdomen (descending colon). The lower portion of the large intestine (sigmoid colon) makes an S curve toward the center and rear of the abdomen and ends in the rectum. The primary function of the large intestine is the absorption of water from undigested food and waste it receives from the small intestine. As this mass passes through the large intestine, water is absorbed from it and into the circulatory system. What remains

critical to life. In addition, the liver secretes a digestive juice called bile. Bile is stored in the gall bladder under the liver and enters the duodenum through the bile duct. The pancreas lies just to the left of the duodenum, under the stomach. Like the liver, the pancreas also secretes digestive juices which enter the duodenum through a duct (pancreatic duct). The pancreas also produces insulin which passes into the blood and controls the sugar in the body.

15–2. Useful Descriptive Terms

a. Anorexia. Loss of appetite.

b. Diarrhea. Frequent and watery fecal discharges; the opposite of constipation.

c. Enzyme. A protein or other organic compound which speeds changes in the digestion of foods.

d. Feces. The excrement discharged from the intestines.

e. Gastric. Pertaining to the stomach.

f. Hematemesis. Vomiting of blood.

g. Ingestion. The act of taking in food for digestion.

h. Jaundice. Yellow; yellowness of the skin and eyes.

i. Melena. Black tarry bowel movement.

or the physical and chemical changes in [illegible] *j. Metabolism.* The sum

he function of nutrition is effected after
ovided for the vital activities and new

ng in the stomach.

Abdominal Pain, Nausea, Vomiting)

condition in which an excess of hydro-
an effort to digest an abnormal amount
s are expelled with gas from the stomach
roducing a burning sensation. Since the
heart, the patient complains of heart-
hing to do with the heart. It is treated
lusil.

n is used when the stomach has difficulty
ving food. Indigestion may be caused by
ough and swallowed in large chunks, by
out enough liquid, or by dry food eaten
ted. Better eating habits and intake of
only treatment needed for indigestion.
Indigestion associated with acticity may
sease.

soned food, some infections, excessive
nicals and medicines may irritate the
ulting in nausea, loss of appetite, burn-

the living cells by which t
absorption; energy is pro
material for repair.

k. Nausea. A sick feelin

15–3. Gastric Conditions (A

a. Heartburn. This is a
chloric acid is produced in
or kind of food. Acid fume
through the esophagus, pr
esophagus is close to the
burn. Actually, it has noth
with an antacid such as Ge

b. Indigestion. This term
breaking down and liquefy
food that is not chewed en
bulky dry food eaten with
while the body is dehydra
more liquids may be the
Antacids may be helpful. I
be a symptom of cardiac di

c. Gastritis. Highly sea
alcohol, and certain chem
lining of the stomach, resu

ing, pain, belching, vomiting, and hematemesis. Antacids may be helpful, but mainly the patient needs to be advised about his dietary habits. If the symptoms persist, especially with fever, infection is likely and the patient should be seen by a medical officer.

d. Peptic Ulcer. This is an open lesion (sore) in the lining of the stomach or duodenum. The lesions may be simple ulcers without severe inflammation or pain. They may produce intense pain, bleed, obstruct the stomach or duodenum, or they may perforate into the abdominal cavity. Peptic ulcers are related to stomach acid and to stressful situations such as worry, frustrations, and inability to adapt to changing situations. In the management of the peptic ulcer patient, consultations with the chaplain and psychiatrist are often a part of the treatment. Usual symptoms of peptic ulcer are pain and burning, which are more intense before eating, nausea, vomiting, hematemesis, loss of appetite, and frequent indigestion. Frequent small meals, administration of an antacid, and management of mental state are the main considerations in treating peptic ulcer. If you suspect peptic ulcer, refer the patient to a medical officer.

e. Food Poisoning. This is a term applied to a condition resulting from ingestion of foods containing certain microorganisms

worsens or does not improve in 2 to 3 days, refer the patient to a medical officer. If a fever accompanies the diarrhea, or if there is pus or blood in the stool, evacuate the patient. These circumstances may indicate a bacterial or parasitic infection of the intestines, which is much more serious than viral enteritis. Typhoid fever, cholera, and amebiasis are among diseases in this category. It is important to remember that most cases of diarrhea result from eating or drinking unclean foods or liquids or using unclean utensils. If you emphasize to soldiers the importance of using water purification tablets, eating only approved foods, and using clean eating utensils, you can do much to reduce the problem of diarrhea.

15–5. Abdominal Pain

Disease of almost any organ in the abdomen can produce abdominal pain. Pain in the upper part of the abdomen is common with simple indigestion or gastritis. Cramping pain in the lower part of the abdomen is common with viral enteritis and diarrhea. Yet, abdominal pain may be an important indication of a serious condition such as appendicitis. For this reason, never treat abdominal pain with analgesics such as aspirin or morphine unless the cause of the pain is obvious, as with a bullet wound, for example. Where the cause of the pain is not clear, observe the patient for several hours. If the pain lessens and disappears and the patient feels well, no further treatment is needed. If the pain remains the same or worsens, refer the patient to a medical officer. A helpful physical finding is *rebound tenderness.* This is tenderness evoked when the wall of the abdomen is *slowly* and *gently* compressed inward and then released suddenly. Sharp pain on the rebound indicates irritation of the lining of the abdominal cavity (peritoneum) and requires referral to a medical officer. Do not let the patient eat or drink anything. Rebound tenderness is present in fully developed appendicitis and in any severe abdominal infection. If a laboratory is available, a blood count can be done to help diagnose appendicitis. Usually the white blood cell count is elevated. However, a medical officer must make the evaluation in suspected appendicitis. If an infected appendix ruptures, the peritoneum becomes infected and death may result. Peritonitis, as this is called, is manifested by intense diffuse abdominal pain and boardlike rigidity of the abdominal wall. The patient will tend to keep his knees drawn up to lessen the tension on the abdominal wall.

15–6. Intestinal Parasitic Infestation (Worms)

Worms from various origins may infect the intestinal tract. They are the roundworm, giant roundworm, hookworm, whipworm, pinworm, tapeworm, dwarf tapeworm, and beef, pork, and fish worm.

All may be ingested by eating contaminated foods or drinking contaminated water. Hookworms get into the body through the skin, usually the skin of the feet or lower legs.

a. Signs and symptoms are related to the type of worm infestation. Most symptoms include abdominal distress. Blood in the stool, anemia, and bowel obstruction are found in some cases. The most common presenting complaint is that the patient has seen worms in his stool.

b. Treatment depends on the identification of the specific worm involved. For that reason, the patient must be evacuated to an area where the stool can be examined by trained laboratory personnel. Drugs are available for treating specific types of worm infections.

c. Worms are spread through the intestinal discharges of the infected person. Food, water, and the hands are the most common vehicles for transmission of worms. Usually an entire family is infected. If one member of a family is infected with pinworm, the whole family should be treated. Reinfection or autoinfection is common, especially with pinworm.

15–7. Viral Hepatitis

a. Viral hepatitis is inflammation of the liver resulting from a specific viral infection. The virus may be transmitted by contaminated food, water, hands, needles, syringes, blood, or plasma. Signs and symptoms include jaundice, malaise, fever, nausea, vomiting, diarrhea, and clay-colored stool. A person may have the disease and show no signs or symptoms. He may recover from it and still have the virus in his blood. Hepatitis damages the liver cells so that the patient's liver cannot function adequately. Bile components, normally excreted into the intestine by the liver, instead "back up" into the bloodstream in hepatitis, coloring the skin and eyes yellow (jaundice).

b. There is no specific treatment for hepatitis. When it is diagnosed, the patient should be evacuated for rest, plenty of fluids, and a diet high in proteins and carbohydrates and low in fats. Preventive measures include using sterile or disposable syringes and needles. In addition, drinking water must be potable and food prepared under sanitary conditions. Good personal hygiene and sanitary discipline must be maintained. No vaccine for viral hepatitis is known.

15–8. Hemorrhoids (Piles)

Hemorrhoids are dilated veins in the wall of the rectum, or anal canal. If the veins are located at the junction of the skin and mucous membrane at the anus, the swelling protrudes from the anus and the hemorrhoids are external. If the veins are located in

CHAPTER 16
DISEASES OF THE GENITOURINARY SYSTEM

16–1. Genitourinary System

The genitourinary system consists of the urinary organs for the production and discharge of urine and the genital organs, which are used in reproduction.

16–2. Urinary System

The urinary system is composed of organs for filtering and excreting wastes from blood. The urinary organs are two kidneys, two ureters, one urinary bladder, and one urethra. This system helps to control the water balance of the body. During formation of urine, wastes are removed from circulating blood for elimination.

a. Kidneys. The kidneys are bean-shaped organs about 4 inches long, 2 inches wide, and 1 inch thick. They lie on each side of the spinal column, against the muscles of the back, beneath the diaphragm and behind the peritoneum. The renal artery and renal vein enter each kidney at its central notch, the hilus. The kidneys filter the blood, remove liquid wastes (urine content), and retain in the circulation the usable portion to maintain the body's fluid balance.

(1) Acute pyelonephritis is an acute inflammation of the kidneys caused by bacterial infection. Bacteria may reach the kidneys through the bloodstream or a ureter. Infection is likely to occur if the free outflow of urine is blocked and urine stagnates.

(2) Symptoms of acute pyelonephritis include the sudden onset of chills, fever, pain, and tenderness in the upper back just below the ribs. Laboratory study of the urine may show pus cells (white blood cells). Pain during urination is a common symptom of kidney infection. Treatment includes a high fluid intake and specific antibiotics.

b. Ureter. The pelvis of each kidney is drained by the ureter, a muscular tube extending from the hilus to the urinary bladder. Some stones formed in the kidneys pass through the ureters to the bladder. Often, the passage of stones causes pain and lacerates ureter walls causing blood in the urine. A stone in the ureter may block the flow of urine and lead to an infection of the urinary tract

above the blockage because of stagnation. These symptoms may be confused with symptoms of other urinary inflammations. The ureters may also be infected by organisms invading either the kidneys or the bladder.

c. Urinary Bladder. The urinary bladder is a muscular sac which stores urine. It is located in the lowest part of the abdomen just behind the pubis, which is under the pubic hair. The bladder's size varies with the amount of urine it contains. The average bladder holds about 500 cc. When 200 to 300 cc. of urine collects in the bladder, sensory nerves carry a sensation of fullness to the brain, causing a desire to urinate. Urination involves relaxation of the bladder's sphincters and contraction of its walls which force urine out through the urethra.

(1) Cystitis, or inflammation of the bladder, may result from microorganisms traveling up the urethra into the bladder, traveling down the ureters into the bladder, or being introduced into the bladder during catherization.

(2) The symptoms of cystitis are a burning pain in the region of the urinary bladder, burning pain with urination, frequency, urgency, and sometimes pus or blood in the urine. Cystitis will usually respond to antibiotics and a high fluid intake. The causative organism should be determined in the laboratory if possible so that the proper antibiotic can be chosen.

d. Urethra. The urethra is the tube that carries urine from the bladder to the outside. It is about 6 to 8 inches long in the male and about 1½ inches long in the female. The male urethra is divided into three parts: the prostatic, which passes through the prostate gland; the membranous, between the prostate and penis; and the anterior, the part in the penis. The only important urethral disease is urethritis (para 16–3).

16–3. Nonspecific Urethritis

Nonspecific or nongonococcal urethritis is not classed as a specific disease until the causative organism is identified. It may be traced to any of a number of causative organisms. Frequently, its cause is impossible to determine. Nongonococcal urethritis may be associated with syphilis, lymphogranuloma venereum, chancroid, protozoan infection, and certain fungus infections. Although not generally classed as a venereal disease, nonspecific urethritis may be venereal in origin.

a. Symptoms of nonspecific urethritis include a discharge or pain in the urethra, glans, testicles, perineum, and inguinal regions. The common types of urethral discharges are purulent, mucopurulent, and serous.

b. Smears from about one-fifth of the patients with urethritis show pus and epithelial cells, but often no organisms can be

demonstrated on culture. Nonspecific urethritis is differentiated from gonococcal urethritis by the absence of the gonococcal bacteria on smears of the discharge examined under the microscope and on culture of the discharge.

c. Treatment is directed toward the causative organism if it can be determined. The wrong antibiotic, especially in inadequate dosage, may mask the causative organism and make a positive diagnosis very difficult. If a specific organism cannot be found, a broad spectrum antibiotic such as tetracycline is often used. Antibiotics should be prescribed only by a medical officer after careful laboratory studies.

16–4. Useful Descriptive Terms

a. Dys. Prefix denoting painful or difficult urination, as in dysuria.

b. Gonad. Testicle or ovary.

c. Hematuria. Discharge of urine containing blood.

d. Incontinence. Inability to control voiding of urine.

e. Purulent. Containing, consisting of, or forming pus.

f. Pyuria. Pus in the urine.

g. Renal. Referring to the kidney.

h. Scrotum. Pouch containing the testicles.

16–5. Venereal Diseases

Venereal diseases are those diseases transmitted primarily by sexual intercourse or other close physical contact. Because of the lack of information and education and because of misinformation and fear about these diseases, many infected persons fail to seek adequate medical treatment. Education and information aimed at prevention, early detection, and adequate treatment are mandatory to control venereal diseases.

16–6. Gonorrhea

Gonorrhea is an infectious disease involving chiefly the mucous membranes of the genitourinary tract, rectum, and cervix. It occasionally spreads through the blood to serous and synovial membranes to other parts of the body.

a. The cause of gonorrhea is the gonococcus (GC) organism. It damages the epithelial tissue lining the urethra and produces pus. If a smear of the pus is made on a slide, stained properly, and placed under the microscope, the gonococcus is usually seen.

b. Typically, gonococcal disease in the male is dysuria, with or without pyuria. Frequently, dysuria with itching occurs 1 or 2 days before the pyuria. Patients refer to the pyuria as a "drip." The incubation period (interval between infection and onset of symptoms) is 2 to 14 days. Some male gonococcal disease is [illegible] first sym

asymptomatic. Untreated gonococcal disease may spread through the bloodstream. Late effects of untreated gonorrhea in the male include stricture and sterility.

c. In the female, primary infection of the urethra, cervix, and rectum is usual. Gonorrhea in the female can be very difficult to diagnose due to early mild symptoms and inaccessible infected sites. The infection may go unnoticed in many cases. As the infection progresses, there is a purulent discharge which may also be unnoticed. Late effects may be pain and discomfort. If not treated, the infection may involve the uterus and fallopian tubes. If the gonococcus destroys the lining of the fallopian tubes, adhesions of the walls of the tubes may occur which could obstruct them permanently. This obstruction can result in sterility.

d. The drug of choice for treating gonorrhea in men or women is penicillin. The recommended dose for males in continental United States is 2.4 million units of aqueous procaine penicillin given intramuscularly. It is recommended that women receive 4.8 million units as initial treatment. All these patients should have a followup examination to insure adequacy of treatment. For infections resistant to penicillin and for individuals allergic to penicillin, tetracycline may be used. In all cases, treatment should be determined and supervised by a medical officer. Benzathine penicillin (long-acting Bicillin) causes the gonococci to develop resistance, and it must not be used in treating gonococcal diseases.

16–7. Syphilis

Syphilis is an acute and chronic venereal disease which may involve any organ or tissue. It may exist without symptoms for years.

a. Syphilis is caused by bacteria called spirochetes. It is usually transmitted directly from an infected person, or by transfusions of infected blood or plasma, or by passage from mother to fetus. The spirochete is fragile and will not live outside the human body, although it may survive in blood for transfusion. It is easily killed by sunlight, drying, antiseptics, and antibiotics, especially penicillin.

b. The spirochete usually passes from one person to another during sexual intercourse. Within 3 to 10 days a lesion may appear at the site of infection. This lesion, called "primary chancre," heals in about 7 to 10 days even if untreated. It is during the primary chancre phase that the individual is most likely to infect others. The lesion will usually be indented, or saucer shaped, and filled with a pus-like exudate. If the lesion is touched or probed, it produces little pain to the infected person. The lesion is said to be "painless." In fact, it may be small and never noticed by the patient. At this point, the patient should be directed to the labora-

tory, where a sample of the lesion will be placed under the microscope. The diagnosis then can be made by microscopic observation of the spirochete.

c. The lesion will disappear in a short time, with or without treatment, but the disease remains active in the body. The organisms enter the lymphatics and blood and go on to lodge in other tissue. Those which lodge in the skin and mucous membrane produce visible lesions and rashes, a condition called secondary syphilis. The organisms found in lesions of the skin and mucous membrane may infect other people. The organisms which lodge in the other organs such as the heart, brain, or liver destroy tissue. When these organs become involved, as long as 10 or 20 years later, the disease is called tertiary syphilis.

d. During the secondary or later stages of syphilis, the disease can usually be detected by a serologic blood test. The blood test becomes positive 14 to 90 days after infection. This is called a "serology," because blood serum is used in most laboratory tests for syphilis.

e. Penicillin is the drug of choice for the treatment of syphilis. The usual treatment is two doses of 2.4 million units given a week apart. If the infected patient is allergic to penicillin, tetracycline is the next drug of choice. Treatment must be directed by a medical officer. A serology should be done 2 months after treatment and repeated each 6 months until at least two negative results are obtained. It is the responsibility of the treating physician or medic to get the patient to return for these repeat serologies. There is no immunization against syphilis.

16–8. Granuloma Inguinale

Granuloma inguinale is characterized by granular, purulent lesions of the skin in the region of the groin, often involving the genitalia. If granuloma inguinale is left untreated, the organisms will spread over a large area and produce a large, foul-smelling ulceration. This ulcer tends to bleed freely. The incubation period is 1 week to 12 weeks, but once established, the lesion may spread quickly. Positive diagnosis is made in the laboratory. The drug of choice for the treatment of granuloma inguinale is tetracycline. As a rule, the older and more extensive the lesion, the longer the duration of therapy.

16–9. Chancroid

Chancroid is a highly infectious venereal ulcer which infects the genitalia of both men and women. It is spread by sexual contact. The ulcer is caused by a bacterium called Hemophilus ducreyi. Positive identification of the causative organism must be made in the laboratory. The sore, or ulcer, usually appears in 3 to 5 days

after exposure and grows rapidly. It has abrupt edges and a rough floor, and usually is painful and inflamed. Initially, it resembles a syphilitic ulcer. A syphilitic ulcer is painless, while the chancroid ulcer is very painful. The syphilitic lesion is usually singular and

nsize. The chancroid ulcer may be multiple and enlarge
the lesion heals, scar tissue remains. Major portions o
or vulva may be destroyed by chancroid if it is not
romptly and adequately. Chancroid-like lesions must be
by a medical officer so that a specific diagnosis can be
ancroid is treated with a sulfonamide.

mphogranuloma Venereum

ranuloma venereum usually starts with a small papule,
y be so small it is not noticed by the patient. This vene-
ase is caused by a virus. Its symptoms which bring a
the dispensary are usually fever, headache, myalgia, and
Swollen tender inguinal lymph nodes develop as the dis-
resses. You should always suspect plague first when you
en inguinal nodes. Lymphogranuloma venereum responds
otics and frequently requires hospitalization for much of
nent.

ffferential Diagnosis

y .....Pyelonephritis, cystitis,

CHAPTER 17
DISEASES OF THE NERVOUS SYSTEM

17–1. Nervous System

The nervous system may be divided into three main areas according to functions. They are the central, peripheral, and involuntary (autonomic) nervous systems.

17–2. Central Nervous System

a. Brain. The central nervous system is composed of the brain and spinal cord. It receives information from the peripheral and autonomic nervous systems. It evaluates the information, stores some of it, and sen
nds appropriate responses. The main parts of the brain are the cer
ebrum, cerebellum, and medulla. The cerebrum receives, stores, i
nterprets information, sends messages, and re- cords general and
l special sensations. As the highest level of the nervous system, t
his is where thinking and memory take place. The cerebellum li
es below the cerebrum. It coordinates muscular activity, regulates
muscle tone, and serves as the center for reflex action and equilib
orium. The medulla is found at the base of the brain near the spi
inal cord. It contains the centers for the control of blood pressure,
, heart rate, and rate and depth of respiratory movements.

The spinal cord is a cord of nervous tissue about *b. Spinal Cord.* 18 to 20 inches lon
ng located in the spinal canal inside the vertebral column of the back
. The cord serves as a connecting cable of nerves between the brain
and the rest of the body. It also contains some centers for basic re
eflex actions.

ervous System

17–3. Peripheral N

rvous system receives and transmits information The peripheral ner
ng part of the body and the central nervous sys- between the outlyi
has two parts, sensory and motor. The sensory tem. The system h
ulses from the surface of the body to the brain. nerves carry impu
e brain to the muscles travel along the motor Impulses from th
ry and motor nerve fibers of the body make up nerves. The senso
vous system. the peripheral nerv

17–4. Autonomic Nervous System

Autonomic means self-controlling. For example, if the extremity muscles need more blood for an emergency, one part of the autonomic nervous system speeds the heart to pump more blood. Blood vessels in the muscles dilate so that more blood can get to them. Another part, meanwhile, will slow down parts of digestion and constrict their blood vessels, making this blood available for the muscles. When the emergency need no longer exists, the reverse action takes place. The autonomic nervous system also controls heart rate, breathing rate, intestinal motility, eye dilation, and many other functions.

17–5. Useful Descriptive Terms

a. Anesthesia. Loss of sensation; local anesthesia is a loss of sensation limited to a part of the body.

b. Anxiety. A feeling of apprehension, uncertainty, and fear, often accompanied by restlessness.

c. Ataxia. Loss of coordination.

d. Bilateral. Pertaining to or affecting both sides of the body.

e. Conversion Reaction. The unconscious conversion of an emotion into physical manifestations and *belief* by the patient that he is ill.

f. Emotional Instability. Inability to cope with a situation; given to easy rage, brooding, and widely fluctuating moods.

g. Encephalitis. Inflammation of the brain.

h. Hemiplegia. Paralysis of one-half of the body (arm and leg on one side).

i. Hypnotic. Drug which produces sleep.

j. Neuralgia. Pain which extends along the course of one or more nerves.

k. Neuritis. Inflammation of nerves.

l. Neuropsychiatric. Pertaining to mental or nervous disorders.

m. Neurotoxic. Poisonous to nerve tissue.

n. Paralysis. Loss of the power of motion.

o. Paraplegia. Paralysis of both legs.

p. Poliomyelitis. Acute viral infection involving the spinal cord.

q. Psychogenic. Originating in the mind.

17–6. Headache

One of the most common complaints of patients is headache. Most headaches are nonspecific and indicate no serious condition. However, frequent or very severe headaches may be a danger signal. Always check the blood pressure when headache is a complaint.

a. Tension Headache. Tension headache is the commonest type of headache. Tensing the neck and scalp muscles for long periods of time will tire the muscles and cause a headache. Tension head-

ache is often seen in men stationed on lookout or at a listening post. Continuous stress, like that placed on the "point-man" or scout, leads to tension headache. Drivers of tanks and trucks also complain of tension headache due to keeping their eyes fixed on the road for long periods of time. Continuous noise, or long periods of extreme quiet, will cause tension headache. Emotional stress also produces it. Tension headaches are relieved by rest, and the history essentially establishes the diagnosis. Aspirin is very helpful.

b. Other Headaches. If there is no history of physical or emotional stress and the headache is not relieved by rest or sleep, there is potential cause for concern. The patient should be seen by a medical officer, as he may have a serious or even life-threatening condition.

17–7. Unconsciousness

Unconsciousness means the patient is completely unaware of what is going on around him and is unable to make purposeful movements. Sleep is the only normal unconsciousness. Fainting is a brief unconsciousness. Coma is prolonged unconsciousness. Stupor is partial, transient unconsciousness. The commonest causes of abnormal unconsciousness are cerebral vascular accident (stroke), head injury, heat stroke, poisoning, alcoholism, hypoxia, and epilepsy. Acute alcoholic intoxication can suppress respiration and cause death. Often the cause of unconsciousness is not apparent. Until specific treatment can be started, do these things.

a. Examine the patient carefully. Be certain that his airway is not obstructed. Look for head injury, signs of bleeding, heat stroke, and poisoning.

b. Do not move him needlessly. Generally, it is best to let him lie in place.

c. Do not give him anything by mouth.

d. Do not give him morphine.

e. Refer the case to a medical officer.

17–8. Diseases of the Central Nervous System

a. Meningitis. This is an inflammation of t
are protective membranes surrounding the br
tion may be caused by a virus or one of many
symptoms include headache, stiffness of the ne
times coma. In some cases, the signs and symp
extremely rapidly. Meningitis may be a life-
which can kill within hours of onset. Therefor
to this possibility in any patient with fever and
ment depends on the type of organism found
The patient must be evacuated to a medical tre

he meninges, which
rain. The inflamma-
bacteria. Signs and
ck, fever, and some-
ptoms may progress
-threatening disease
e, you must be alert
d a stiff neck. Treat-
in the spinal fluid.
atment facility with

adequate laboratory facilities as soon as possible. For bacterial meningitis, large doses of specific antibiotics will be given by the medical officer after performing a lumbar puncture and examining the spinal fluid under a microscope to determine the type of bacteria present.

b. Poliomyelitis. Poliomyelitis, or polio, is a viral infection of the central nervous system involving motor nerve cells in the spinal cord and brain stem. Some or all of these motor nerves may be damaged or destroyed, resulting in paralysis of the voluntary muscles. The disease is prevented by administration of the polio vaccine.

CHAPTER 18
COMMON DRUGS AND THEIR USAGE

18–1. Medications Carried By the Aidman

The medications you use in the field should be based upon your knowledge and skill, the amount of weight you can carry on a mission, and the evacuation lag time. Of these, knowledge and skill are most important. The mission usually dictates how much and what kinds of drugs you carry. As an example, the average aidman on an ordinary 3-day mission may carry the following items:

a. ASA (Aspirin). Aspirin is the best drug you will carry. It is useful for fever and as an anti-inflammatory drug. It can be given to patients with painful minor injuries, bruises, and fever. The adult dose is two tablets every 4 hours. Carry about 50 tablets and try to keep them fresh.

b. Antihistamines. These are used as nasal and sinus decongestants in cold and allergies. A number of antihistamines are available. The one used most is Benadryl. (One tablet every 6 hours is usually given.) Carry about 24 capsules. Since antihistamines produce drowsiness, they should be used with extreme caution in individuals who must remain alert.

c. Anesthetic Ointment. This deadens the itching of insect bites and other skin rashes. Tetracaine, dibucaine, nupercaine, and other "caine" ointments are equally effective. Tetracaine is used most. Two tubes are enough to carry.

d. Antimalaria Tablets. In malaria-infested areas, soldiers generally take these tablets daily or weekly, depending on the type. Carry enough to supply the men for the duration of the mission.

e. Cough Medication. A coughing soldier may give away a position, so carry some cough lozenges. They are convenient to carry and easy to administer.

f. Indigestion Medication. Antacid tablets are commonly packaged in waterproof plastic. One or two tablets may be chewed or dissolved in water to relieve indigestion.

g. Salt Tablets. When operating in hot weather, many aidmen carry salt tablets. When troops are sweating a lot, losing body water and salt, they are subject to heat exhaustion. One or two salt tablets dissolved in a canteen of water will help prevent heat

exhaustion. A pint of this solution every half hour may be needed under strenuous conditions in a very hot climate.

h. Tablets for Nausea and Vomiting. Nausea frequently accompanies many minor viral infections. It is also a sign of heat exhaustion. For nausea, an antiemetic such as Compazine or Tigan may be given. Because of undesirable side effects which may occur, discuss the use of these drugs with a medical officer before taking them with you.

i. Morphine. Morphine is the best drug for severe pain such as that produced by most battle injuries. It should never be given to any patient with a head injury, breathing difficulty, unconsciousness, or abdominal pain of uncertain cause. Because it is a narcotic, a medical officer will determine how much morphine you will carry and the dose to give.

j. Water Purification Tablets. It is the individual soldier's responsibility to carry water purification tablets. For those who fail to do so, you should carry an extra bottle of the tablets.

k. Anti-diarrheal Drugs. Kaopectate-type liquids are the most readily available (in powdered form). Carrying one bottle of this may be very helpful. The dose is three or four capfuls every 2 to 3 hours until the diarrhea subsides.

18–2. Misuse of Antibiotics

The use of certain drugs, notably antibiotics, in the field is contraindicated. Antibiotics are the drugs most often misused by aidmen. Many times, it may do more harm than good to give antibiotics in the field. Adverse conditions likely to develop from field use of antibiotics include the following:

a. Serious drug reactions may occur which you cannot handle, especially when penicillin is administered.

b. Inadequate dosage may make organisms resistant to an antibiotic and seriously hamper further treatment with it.

c. Giving the wrong antibiotic or an inadequate dose may mask the causative organism and make it difficult, or impossible, for the laboratory to identify it.

d. Giving the wrong antibiotic or an inadequate dose may also mask the signs and symptoms of the disease, making diagnosis difficult for the medical officer.

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