Chapter Three

Prefixes

Chapter Contents

Learning Outcomes

At the end of this chapter, students are expected to be able to:

1. define a prefix
2. identify the functions of prefixes in medical terms
3. pronounce medical terms containing prefixes
4. use prefixes in medical terms
5. analyze medical terms into their components
6. write definitions of medical terms, diseases and medical procedures.

Prefixes

1 Medical Terms

A prefix is a letter or a group of letters attached to the beginning of a word to modify or change its meaning. Pre- in the word 'prefix' means before. Prefixes are common components of medical terms. They may indicate location, number, time, color and opposite meanings, etc. Prefixes are never used independently. They have to be added to the beginning of words with a hyphen. However, medical dictionaries nowadays drop the hyphen after many frequent prefixes. They can be added before verbs, nouns and adjectives to modify their meanings. Learning prefixes is essential to healthcare students because they are frequently used in building up medical terminology. Furthermore, they are necessary for understanding the meanings of medical terms. Most of the medical prefixes come from Latin or Greek origins and that is why they are commonly used in the international language of science and medicine.

Consider the following examples and note the different meaning that results when a new prefix is added to the same root.

prefix	medical term	meaning
hypo- (beneath or below)	hypothyroidism	abnormally low activity of the thyroid gland
hyper- (over)	hyperthyroidism	over activity of the thyroid gland
a- (lack of)	apnea	cessation of breathing
dys- (difficulty)	dyspnea	difficulty in breathing
bi- (two)	bilateral	pertaining to two sides
uni- (one)	unilateral	pertaining to one side

Combining forms

The following is a list of some combining forms to which a prefix can be added:

Combining form	Meaning	example
an/o	anus	perianal
carp/o	wrist bone	metacarpal
cis/o	cutting	incision
cost/o	ribs	subcostal
crani/o	skull	extracranial
crin/o	secretion	endocrine
dactyl/o	fingers or toes	polydactyly
dur/o	dura mater	subdural hematoma
gen/o	produce	congenital
ign/o	fire	malignant

later/o	side	bilateral
lingu/o	tongue	sublingual
nat/i	birth	postnatal
norm/o	rule/order	abnormal
peritone/o	peritoneum	retroperitoneal
phag/o	appetite	polyphagia
phas/o	speech	aphasia
plas/o	formation	dysplasia
pleg/o	paralysis	quadriplegia
scapul/o	shoulder blades	subscapular
sect/o	cutting	resection
thyroid/o	thyroid hormone	hyperthyroidism
top/o	to put/place	ectopic
troph/o	development	atrophy
urethr/o	urethra	transurethral
uter/o	uterus	intrauterine
ven/o	vein	intravenous
vertebr/o	backbone	intervertebral

2 Prefixes

The following tables display the different types of prefixes and their meanings with examples.

Table 3.1 **Prefixes for Direction:**

prefix	meaning	example	meaning
ab-	away from	abduct	to move away from the midline
ad-	toward	adjacent	being near or close
dia-	through	diameter	through measurement
trans-	through	transdermal	pertaining to through the skin
per-	through	percutaneous	cable of being penetrated by liquids or gases

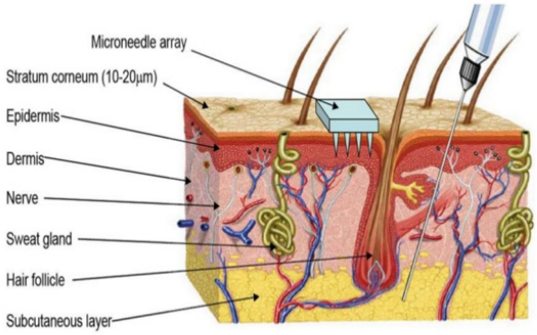

Figure 3.1: **transdermal: pertaining to through the skin**

Practice 3.1: Identify the prefix in each of the following words and write its meaning.

	prefix	meaning
1 adduct	ad-	toward
2. percolate	per-	through
3. dialysis	dia-	through
4. adhere	ad-	toward
5. transurethral	trans-	through
6. abnormal	ab-	away from

Table 3.2 **Prefixes for Numbers**

prefix	meaning	example	meaning
prim/i-	first	primitive primary	occurring first in time or sequence
mon/o-	one	monocular	a microscope with one lens
uni-	one	unilateral	one side
hemi-	half	hemiplegia	one side paralysis
semi-	half	semilunar	shaped like a half moon
bi-	two	bipolar	having two poles
di-	two	diatomic	having two atoms
dipl/o-	double	diplopic	pertaining to double vision
tri-	three	tripod	having three legs
quadri-	four	quadriplegia	paralysis of four limbs
tetra-	four	tetrad	four components
multi-	many	multicellular	consisting of many cells
poly-	many	polyphagia	excessive appetite

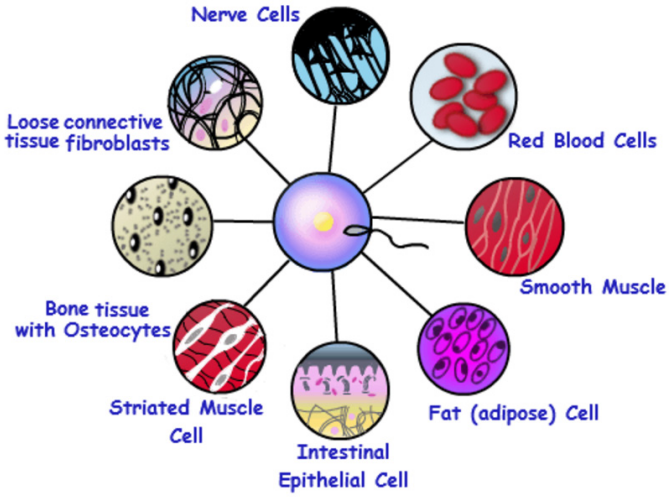

Figure 3.2: **multicellular: consisting of many cells**

Practice 3.2: Match each term in column A with its meaning in column B.

	A	B
1	diploid E	a. an element that has one atom
2	polyneuropathy C	b. half solid
3	monoatomic A	c. disease of many nerves
4	unify D	d. make two or more in one parts
5	semisolid B	e. an organism that has two sets of chromosome

Table 3.3 **Prefixes for Colors**

prefix	meaning	example	meaning
leuk/o-	white	leukoplakia	having white patches in the mouth
cyan/o-	blue	cyanosis	bluish discoloration of the skin
erythr/o-	red	erythrocyte	red blood cell
melan/o-	Black, dark	melanin	the dark pigment that colors the hair and skin
poli/o-	grey	poliomyelitis	inflammation of the gray matter of the brain
xanth/o-	yellow	xanthoderma	yellow coloration of the skin
cirrh/o-	orange	cirrhosis	a disease of the liver
chlor/o-	green	chlorophyll	the grean coloring matter of leaves and plants

Figure 3.3: **cyanosis: bluish discoloration of the skin**

Practice 3.3: Define the following terms.

1. leukemia increase in malignant white blood cells in blood and bone marrow
2. xanthoma yellow growth on the skin
3. melanocyte a mature melanin forming cell in the skin
4. erythrocytosis abnormal condition of having an increase in the total red blood cell mass

Table 3.4 **Prefixes for Time or Position**

prefix	meaning	example	meaning
ante-	before	antepartum	before birth
pre-	before, in front of	premenstrual	period before menstruation
pro-	before, in front of	prophase	first stage of cell division
Pros-	before, forward	prosthesis	artificial limb added to the body
post-	after, behind	postmortem	after death

It is worth noting that certain prefixes have two meanings. For example, the prefix *ante-* may refer to time and position as in *antepartum* (time), and *antecubital* (position). Similarly, *pro-* refers to time as in *prophase* and position as in *prognathic.* This explains why we place prefixes for time and position together in one list. This will also be noticed in some of the following tables.

Figure 3.4: prosthesis: a device added to the upper limb after amputation

Practice 3.4: Define the following terms:

1. projectile throwing or extending toward
2. antefebrile before a fever (the time preceding the development of fever)
3. postmenopause after menopause, which is the cessation or stoppage of menstruation in women
4. premature occurring before the proper time

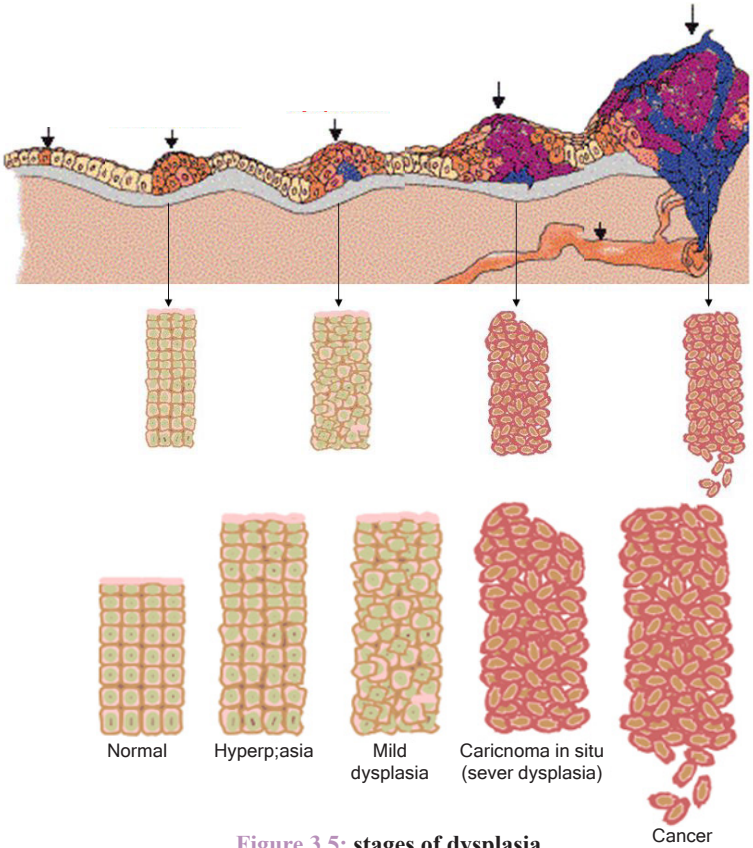

Figure 3.5: stages of dysplasia

Table 3.5 Prefixes for Disease

prefix	meaning	example	meaning
brady-	slow	bradygastria	decreased rate of electrical pacemaker activity in the stomach
tachy-	fast	tachycardia	rapid heart rhythm
pachy-	thick	pachydactyly	abnormal thickness of the fingers
mal-	bad, poor	malignant	cancerous tumor that spreads like fire
dys-	abnormal, difficult painful, bad/poor	dysplasia, dyspnea dysuria dystrophy	-abnormal development in numbers -difficulty in breathing - painful sensation upon urination - poor development
xero-	dry	xeroma	excessive dryness of the cornea and conjunctiva

Practice 3.5: The prefix *tachy-* means rapid. Use this prefix in a word that means each of the following:

1. rapid heart rate tachycardia
2. rapid breathing tachypnea
3. extreme rapidity of speech tachylalia
4. abnormally rapid mental activity tachyphrenia

Table 3.6 Prefixes for Infectious Diseases

prefix	meaning	example	meaning
staphyl/o-	grapelike cluster	staphylococcus	round bacteria that form clusters
strept/o-	twisted chain	streptobacillus	a rod-shaped bacterium that forms chains

Table 3.7 Prefixes for Position and Direction

prefix	meaning	example	meaning
circum-	around	circumcision	circular cut
peri-	around	peritoneal	peritoneum
intra-	within	intravenous	within the vein
extra-	outside	extrahepatic	outside the liver
epi-	above	epidermis	above the skin
supra-	above	supraabdominal	above the abdomen
infra-	below	infrascapular	below the shoulder blades
sub-	below	subpatellar	below the kneecap
juxta-	near	juxtaposition	a location near another structure
para-	near	parathyroid gland	near the thyroid glands
inter-	between	interstitial	relating to or situated in the small, narrow spaces between tissues or parts of an organ
retro-	behind	retrogastric	behind the stomach

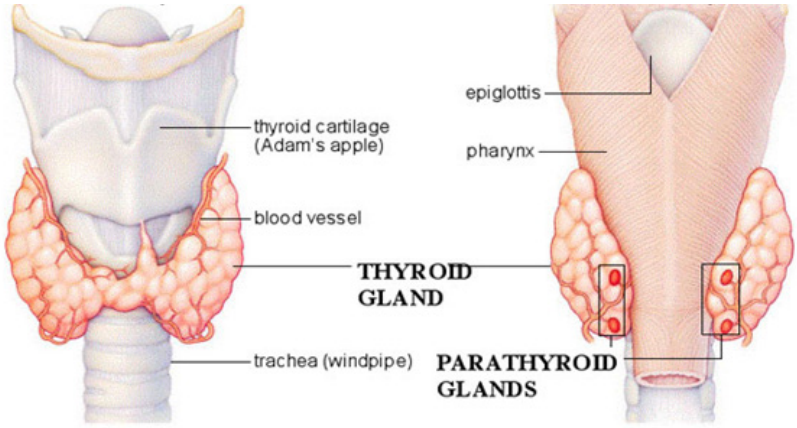

Figure 3.6: **Parathyroid glands. four endocrine glands on the posterior of the thyroid gland**

Practice 3.6: Replace the prefix in each of the following terms with another one having the same meaning.

1. circumoral perioral
2. subcostal infracostal
3. periorbital circumorbital
4. infrascapular subscapular

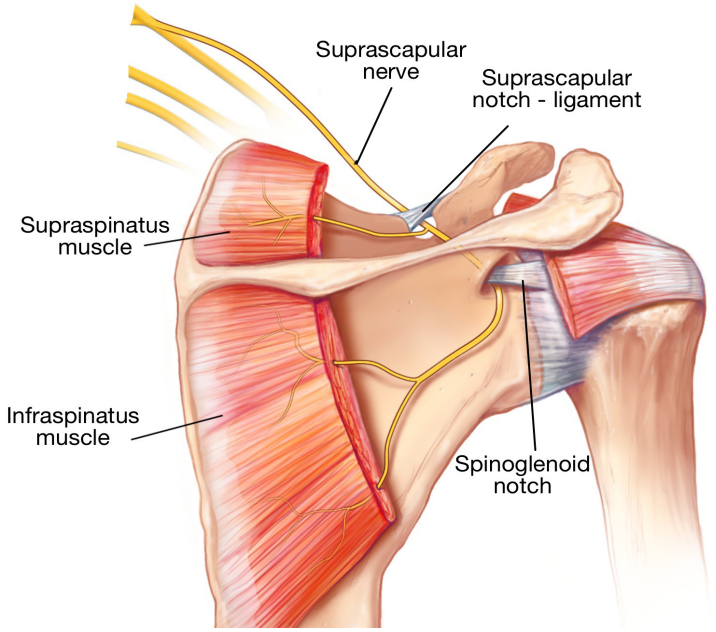

Figure 3.7: **infrascapular: pertaining to below the shoulder blades**

Practice 3.7: Write a word that means the opposite of each of the following terms:

1. suprapatellar subpatellar/infrapatellar
2. intracellular extracellular
3. suprascapular subscapular/infrascapular
4. hypogastric epigastric

Table 3.8 Prefixes for Negative

prefix	meaning	example	meaning
in-, im-	not	Insignificant impermeable	having no importance not allowing fluid to pass through
un-	not	unconscious	not aware of one's surroundings
non-	not	nonhuman	not appropriate to human being
a-,an-	not, lack, without	apnea anemia	cessation of breathing, no blood
anti-	against	antigen	a substance that when introduced into the body stimulates the production of an antibody
contra-	against	contraindicated	against recommendation
de-	down, without, removal	decongestant	a medication or treatment that decreases congestion, as of the sinuses
dis-	removal, separation	disinfect	to cleanse so as to destroy or prevent the growth of disease-carrying microorganisms

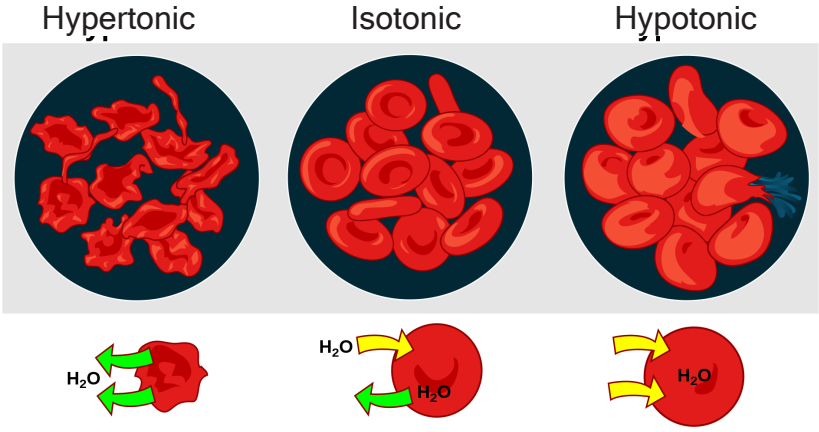

Figure 3.8: **antigen. a foreign substance such as a bacterium or virus**

Practice 3.8: Add a prefix to form the negative of the following words:

1. contributory noncontributory
2. coordinated uncoordinated
3. calcify decalcify
4. compatible incompatible
5. dote antidote
6. sect dissect

7. ception contraception
8. hydrous anhydrous
9. mnesia amnesia
10. moral immoral

Table 3.9 Prefixes for Position

prefix	meaning	example	meaning
ecto-	outside	ectopic	out of normal position
ex/o-	outside	exophthalmos	(Graves' disease) protrusion of the eyeball to the outside
dextr/o-	right	dextrogastria	displacement of the stomach to the right
sinistr/o-	left	sinistromanual	left handed
end/o-	inside	endometrial	within the uterus
mes/o-	middle	mesoderm	middle layer of a developing embryo
tel/o- tel/e	end	telophase telencephalon	last stage of cell division endbrain
syn-, sym- con-	together	syndrome symbiosis congenital	-group of signs and symptoms that occur together, - two dissimilar organisms living together - present at birth

Table 3.10 Differences between Endocrine and Exocrine Glands

Exocrine Glands	Endocrine Glands
They are enzyme secreting glands.	They are hormone secreting glands.
The activity of the enzymes is short term	The action of released hormones is prolonged.
The secreted substances are directly released over the target site or tissue.	The secretions are released into blood stream.
Some of the examples include sweat glands, gastric glands, etc.	Some examples include adrenal gland, pituitary gland, thyroid gland, etc.

The major glands that make up the human endocrine system include the:

- hypothalamus
- pituitary gland
- thyroid
- parathyroid
- adrenal glands
- pineal body
- reproductive glands (which include the ovaries and testes)
- pancreas

Examples of exocrine glands are:

- salivary glands that secrete saliva into the mouth
- bile-producing glands of the liver
- prostate gland
- the portion of the pancreas that secretes pancreatic fluid into the duodenum
- gastric glands
- sweat glands

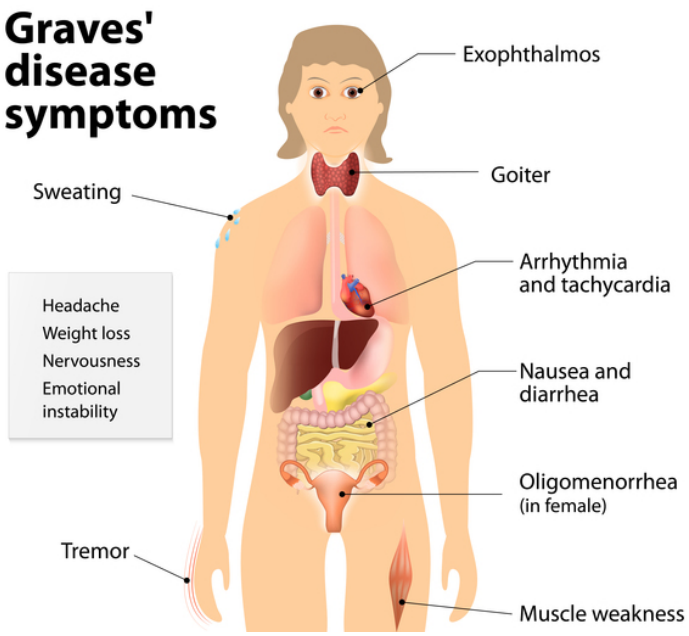

Figure 3.9: **exophthaloms: bulging of the eyes**

Practice 3.9: Define the following words:

1. endotoxin a toxin produced by certain bacteria and released upon destruction of the bacterial cell
2. exogenous a disease that is attributable to an agent or organism outside the body
3. sympathetic relating to the division of the autonomic nervous system that acts in opposition to the parasympathetic system accelerating the heartbeat
4. synapse junction between two nerve cells

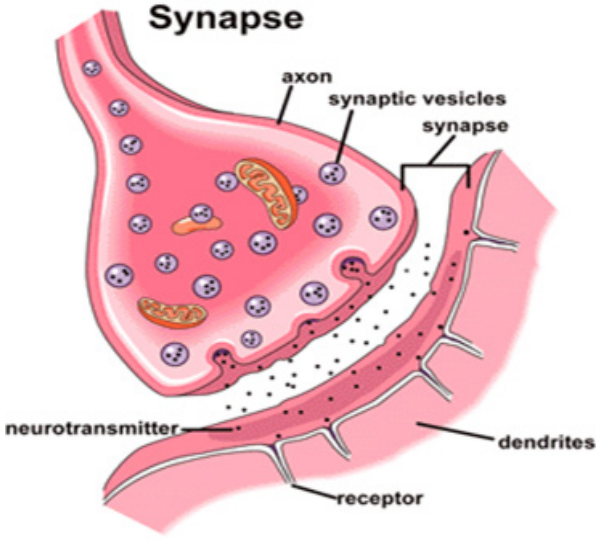

Figure 3.10: **synapse: junction between two nerve cells**

Table 3.11 **Prefixes for Degree**

prefix	meaning	example	meaning
oligo-	few	oligodontia	less than the normal number of teeth
pan-	all	panplegia	total paralysis
super-	above excess	supernumerary superscript	in excess number something written above
hyper-	abnormally high	hypertension	high blood pressure
hypo-	abnormally low	hypoglycemia	low blood sugar

Figure 3.11: **Oligodontia: having less than the normal number of teeth**

Practice 3.10: The prefix *hyper-* means excessive. Use this prefix to produce a word that means each of the following:

1. overproduction of a hormone hypersecretion
2. abnormally deep respiration hyperventilation
3. high increase of cells in size hypertrophy
4. high increase of cells in numbers hyperplasia

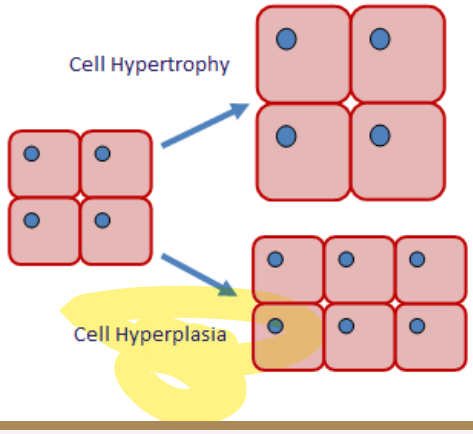

Figure 3.12: **hypertrophy and hyperplasia: cells increase in size and increase in number**

Table 3.12 **Prefixes for Size and Comparison:**

prefix	meaning	example	meaning
equi-	equal, same	equicaloric	equal in terms of calories
iso-	equal, same	isochromatic	having the same color
homo- homeo	same, unchanging	homosexual, homeostasis	- having a sexual orientation to persons of the same sex. - a property of cells, tissues, and organisms that allows the maintenance and regulation of the stability
hetero-	different, unequal	heterosexual	a person whose sexual orientation is toward people of the opposite sex.
macro-	abnormally large	macrodactyly	a condition of abnormally large fingers or toes
mega-, megalo-	abnormally large	megacephaly megalomania	- the condition of having an unusually large head or cranial capacity - a psychopathological condition characterized by delusional fantasies of wealth, power, or omnipotence
micro-	small	microbiology	the branch of biology that deals with microorganisms
eu-	true, good, easy	eupnea	normal breathing
normo-	normal	normothermic	having normal body temperature
ortho-	straight, correct	orthognathism	the condition of having straight jaws
poikilo-	irregular	poikilothermic	having different body temperature
pseudo-	false	pseudogene	a segment of DNA that resembles a gene but is not functional and usually not transcribed
re-	again, back	resection	cutting back and forth in a sense of removal
neo-	new	neocortex	the dorsal region of the cerebral cortex, especially large in primates, thought to have evolved more recently than other parts of the brain.

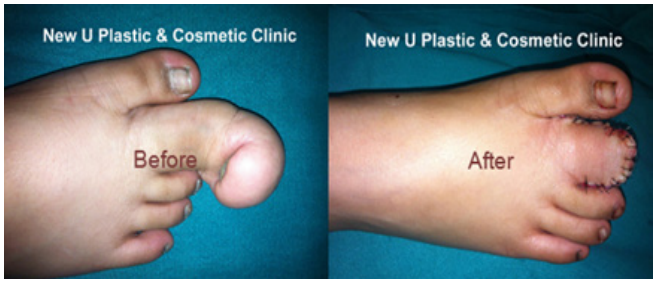

Figure 3.13: **macrodactyly: abnormally large fingers or toes**

Practice 3.11: Match each of the following terms in column A with its definition in column B.

	A	B
1	isocellular____B____	a. composed of different materials
2	homograft____I____	b. composed of identical cells
3	normovolemia____J____	c. false response
4	heterogeneous____A____	d. correcting deformity

5	equilibrium F	e. return of partly digested food from the stomach to the mouth/backward flow
6	pseudoreaction C	f. a state of balance
7	euthyroidism G	g. normal production of thyroid hormone
8	regurgitation E	h. large enough to be seen without a microscope
9	poikiloderma K	i. tissue transplanted to another of the same species
10	macroscopic H	j. normal blood volume
11	orthotic D	k. irregular condition of the skin

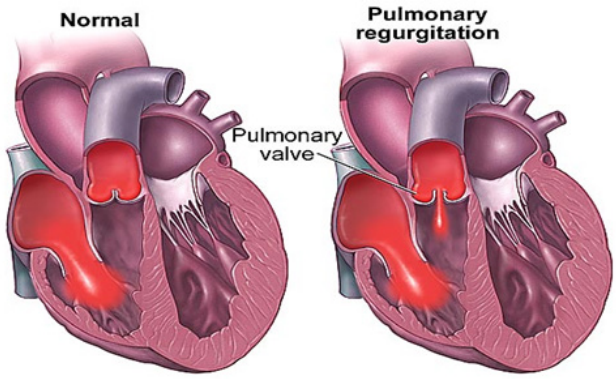

Figure 3.14: **regurgitation: to cause to pour back**

Table 3.13 Terms using different prefixes with the combining forms for fingers (dactyl/o)

medical term	meaning
syndactyly	a congenital anomaly in humans marked by webbing or fusion of the fingers or toes
polydactyly	a person or animal having more than the normal number of digits
oligodactyly	congenital condition in which some fingers or toes are missing
tetradactyly	having four digits on each extremity
monodactyly	an animal having only one digit on each extremity
pachydactyly	enlargement of the fingers or toes, especially extremities
microdactyly	a condition of abnormal smallness of fingers or toes.

3 Focus on Reading

Read the following text and answer the questions following it.

Nuclear Concepts Used in Medicine

1. Our bodies are made up of cells in which chemical processes of one form or another constantly occur. Whenever we suffer from injury or disease, the affected part of our body cannot properly carry out its chemical functions. In such instances, the diagnostician can introduce a radioactively labeled chemical called a radiopharmaceutical into the affected area, where it will take part in some of these chemical activities.

By detecting the gamma emissions from the radiopharmaceutical employed, we are able to produce useful information about the function and health of the organs that we are studying.

2. While most of the studies done in clinical nuclear medicine require the radiopharmaceutical to be injected into a vein (normally in the antecubital region), it may on occasion be inhaled, ingested, or injected through a catheter or other implanted device. Once the radiopharmaceutical has been administered to the patient, it travels through the body as though it were normally present. Since our bodies cannot distinguish a radiopharmaceutical from a normally present chemical, they handle it in the same way as it would a nonradioactive chemical. The only difference and advantage offered by the radiopharmaceutical is that the administered chemical can be detected externally.

3. A scintillation camera, which is able to map the distribution of the radiopharmaceutical within the patient's body, provides the images. These images, called scintigraphs or scintiscans, are produced when the gamma rays spontaneously emitted from the radiopharmaceutical escape from the patient's body. Each scintiscan is made up of hundreds of thousands of individual gamma ray interactions with the camera, and these many interactions are displayed as individual dots of light which are added together to form a single image.

4. Typically, images are recorded every 2 seconds immediately following the injection of the radiopharmaceutical. These initial images provide information on the arterial supply, capillary transit, and venous drainage of the organ or tissue of interest. After a period of time sufficient to permit the tissues to extract the radiopharmaceutical from the circulation, more images are recorded. These first images are called dynamic images, and the latter ones are called statics or delayed images.

5. The radiopharmaceutical used in the study of a particular organ must be chosen for its ability to accumulate in that particular organ. The choice also depends on the isolation of a chemical pathway or function that is peculiar to the organ that is to **be imaged**. For the most part, the label (the radioactive part of the pharmaceutical) used as a tag within the pharmaceutical doesn't affect its localization, and so materials are often labeled with gamma emitters that have the best combination of availability, energy, and half-life. A radionuclide called technetium-99m is frequently used because it can be produced onsite from a system called a generator.

6. The process of generation of Technetium-99m is a simple one: molybdenum-99 (99Mo) decays to form Technetium-99m. Since technetium-99m is chemically different from molybdenum, it is easy to separate the two. A small amount of molybdenum can produce enough technetium each day to meet the needs of a typical nuclear medicine department. Also, technetium-99m emits gamma radiation at an acceptable energy level of 140 Ke V. Although this level is higher than most X-rays, human tissue can **tolerate *it*** since gamma rays escape the body while x-rays tend to irradiate body tissues. The final reason for the popularity of this radionuclide is that it has a 6-hour half-life long enough to allow the radiopharmaceuticals to accumulate in the tissues of interest and short enough to permit repeat studies within a day or so. The combination of the low energy (by gamma ray standards) and short half-life also gives the patient an acceptably low radiation dose.

7. The radioactivity principle can also be used to detect and measure substances in blood or urine, substances that may be present in such small concentrations that conventional methods cannot detect them. This technique, termed radioimmunoassay (RIA), involves the production of antibodies specific to the substance being

measured, the isolation of a pure extract of this substance (termed the antigen), and the radioactive labeling of the antigen. By mixing known amounts of these substances with the patient sample and allowing the whole to come to equilibrium in a test tube, one can separate the unreacted antigen (both from the patient and the labeled antigen) from that which has bound to the antibody provided for that purpose. The ratio of free-to-bound antigens permits a calculation of the amount of material present in the patient's original sample. Tests performed on blood or urine samples requiring that the radioactive chemical be added to the sample but not the patient are termed **in vitro** tests. Those procedures requiring a radioactive chemical to be administered to the patient are called **in vivo** tests. **In vitro** techniques are commonly used to measure various hormone levels, drug levels, and concentrations of other compounds of medical interest.

A. Answer the following questions:

1. What does the italicized pronoun 'it' in **paragraph 6** refer to?

.....

2. What do the rays emitted from the radiopharmaceutical enable us to do?

.....

3. What is the main difference between the radiopharmaceutical and the normal chemical in the body?

.....

4. Define delayed images or 'statics'.

.....

5. Summarize **paragraph 5** in one sentence.

.....

6. What is the difference between **in vitro** tests and **in vivo** tests?

.....

7. Scan the text and find prefixes that mean
   a. Against: _____
   b. before: _____
   c. between: _____
   d. complete: _____

8. Circle the word that is closest in meaning to the highlighted word in **paragraph 6**?

   a. reject b. accept c. accumulate d. radiate

9. Find a word that means "expose to radiation" in **paragraph 6**.

10. What is the meaning of the bold-faced word in **paragraph 5?**

B. Find words in the text that mean:_

1. A noun meaning " a person who determines the cause of a disease". (Para.1)

.....

2. An adjective meaning "A radioactive compound used in diagnosis or therapy". (Para.1)

.....

3. An verb meaning "To take into the body by the mouth for absorption". (Para.2)

.....

4. A noun meaning "Movement in a circle or circuit, especially the movement of blood through bodily vessels as a result of the heart's pumping action". (Para. 4)

.....

5. An adjective meaning "Not ordinary or usual; odd or strange". (Para. 5)

.....

6. A verb meaning "To gather or cause to increase". (Para. 6)

.....

7. A noun meaning "the condition existing when a chemical reaction and its reverse reaction proceed at equal rates". (Para. 7)

.....

4 Vocabulary Development

Medical Collocations

Practice 3.12: Match the word in column A with its complement in column B. Write the letter of the correct answer on the line provided.

(A)	(B)
1. inoperable _____	a. habits
2.tender _____	b. genes
3.subjective_____	c. tumor
4.premature_____	d. pain
5. genetic _____	e. neck
6. hygienic _____	f. voice
7. hoarse_____	g. report
8.stiff_____	h. infant
9. intermittent _____	i. skin
10. defective _____	j. trait

Practice 3.13: Complete the following sentences using collocations from Exercise 3.12.

a. She suffered from _____after exposing herself to the sun.

b. The doctor provided a _____ on the patient history of his brain tumor.

c. He felt an _____ that kept recurring over and over again.

d. The _____ died due to early birth.

e. The young man died because of an _____.

f. All doctors have _____ like using disposable tissues.

g. The flu left him with a _____.

h. He awoke with a painful _____.

i. Fixing _____ should be welcome news to those who carry them.

j. The father had a _____ that predisposed him to the development of cancer.

Practice 3.14: Match the words in column A with their collocates in column B. Write the correct answer on the line provided.

A		B
1	enhance _____	a. the onset
2	maintain _____	b. a drug
3	ease _____	c. anxiety
4	identify _____	d. physical fitness
5	Induce _____	e. the appetite
6	go into _____	f. infections
7	eradicate _____	g. vomiting
8	tolerate _____	h. antibodies
9	speed up _____	i. nausea
10	relieve _____	j. shock

Practice 3.15: What can the following words collocate with?

1. trigger _____
2. enhance _____
3. cleanse _____
4. tolerate _____
5. strain _____

Academic Words

Study the following academic lists.

Academic List 1

	Words	*Definitions*
1	Alternative	A choice or course of action that is mutually exclusive with another
2	Philosophy	the attitude or set of ideas that guides the behavior of a person or organization
3	justify	to give an acceptable explanation for something that other people think is unreasonable
4	publish	to make official information such as a report available for everyone to read
5	fund	an amount of money that is collected and kept for a particular purpose
6	react	to behave in a particular way or show a particular emotion because of something that has happened or been said
7	techniques	Non-prescriptive ways or methods used to perform missions, functions, or tasks
8	minor	small and not very important or serious, especially when compared with other things
9	outcome	the final result of a meeting, discussion, etc – used especially when no one knows what it will be until it actually happens
10	sequence	the order that something happens or exists in, or the order it is supposed to happen or exist in

Academic List 2

	Words	*Definitions*
1	emphasize	to stress, single out as important
2	coordinate	to organize an activity so that the people involved in it work well together and achieve a good result
3	ensure	to make certain that something will happen properly
4	physical	related to someone's body rather than their mind or emotions
5	compensate	to pay someone money because they have suffered injury, loss, or damage
6	link	to make a connection between two or more things or people
7	sufficient	as much as is needed for a particular purpose
8	criteria	a standard that you use to judge something or make a decision about something
9	demonstrate	to show or prove something clearly
10	contribute	to give money, help, ideas etc to something that a lot of other people are also involved in

Practice 3.16: Match the words in column A with their definitions in column B.

A	B
1. link_____	a. to give an acceptable explanation for something that other people think is unreasonable
2. criterion_____	b. the attitude or set of ideas that guides the behavior of a person or organization
3. publish_____	c. to stress, single out as important
4. justify_____	d. a standard that you use to judge something or make a decision about something

5. philosophy_____	e. the order that something happens or exists in, or the order it is supposed to happen or exist in
6. techniques_____	f. to make a connection between two or more things or people
7. outcome_____	g. to make official information such as a report available for everyone to read
8. emphasize _____	h. to organize an activity so that the people involved in it work well together and achieve a good result
9. sequence _____	i. Non-prescriptive ways or methods used to perform missions, functions, or tasks
10. coordinate_____	j. the final result of a meeting, discussion, etc – used especially when no one knows what it will be until it actually happens

Practice 3.17: Complete each of the following sentences using the correct word from the box.

funded	outcomes	sequential	philosophical	justified
alternative	published	react	techniques	minor

1. His injuries were relatively _____, so he was released from the hospital within a couple of hours of being admitted.

2. Faced with worsening health, and a doctor that didn't seem able to help him, Ali decided to try _____ medicine.

3. Before we had a publicly-_____ universal health care system in Canada, many people could not afford medical care, or faced bankruptcy with a serious illness.

4. Operations on animals helped to develop organ transplant and open-heart surgery _____..

5. Studies have shown that babies in the womb will _____ to sudden loud noises or bright lights that are flashed on the mother's belly.

6. Medical doctors usually take credit for actions which produce favorable _____, but blame the situation when their actions are questionable or lead to failure.

7. My grandfather is very _____ about his illness; he certainly doesn't want to die, but he says he has lived a long life, and isn't afraid to go.

8. We feel that animal testing should be reduced to a minimum and carefully _____ in each case.

9. Protein synthesis is a _____ process in which DNA is transformed into protein.

10. She has _____ a number of important papers in a leading medical journal.

Practice 3.18: Complete each of the following sentences using the correct word from the box.

Criteria	compensation	coordinate	demonstrated	emphasize
contributes	physical	sufficiently	ensure	link

1. He _____ a lot of time and money to helping people with Parkinson disease.
2. Students in our medical program will be graded according to the _____ described in the course outline.
3. Eating plenty of fruits, vegetables, protein and dairy products will _____ your body gets the minerals it needs.
4 . He received almost half a million dollars in _____ after his surgical malfunction.
5. Detectives were able to _____ the murderer to the crime using DNA evidence.
6. The Red Cross is trying to _____ relief efforts aimed at aiding the victims of Sunday's earthquake.
7. The best way to lose weight is to do regular _____ activity.
8. Recent studies have _____ that drinking green tea may help to prevent breast cancer.
9. Forgetting material which is stored in long-term memory cannot be _____ explained by the simple passage of time.
10. Doctors usually _____ the need for regular exercise to maintain good health.

5 Focus on Grammar

Asking questions

Healthcare students and practitioners always need to extend their repertoire of medical terminology in order to avoid communication breakdowns with others. They also need more focus on certain grammatical issues such as asking and answering questions and comparing and contrasting drugs and their effects on human body. In this section, students will be reminded of how to ask questions of different types about several medical issues.

Practice 3.19: Study the following questions and learn how to use each highlighted question word. Decide what it is used for and when we can use it.

Who is that man?
Who is the patient?
Who is his next of kin (closest relative)?

When did you hurt your arm?
When do you take your pills?
When did the pain start?

What do you do for a living?
What did you eat yesterday?
What did you do to your leg?
What makes the pain better?
What is the pain like?

How are you ?
How are you feeling?

How did you cut yourself?
How strong is the pain?

How long have you been having fever?
How long have you had the pain?

How many tablets do you take a day?
How many cigarettes do you smoke?
How much sleep do you get?
How often do you get regular exercise?
How often do you eat vegetables?

Why didn't you follow your doctor's instructions?
Whose medication is this?

Where do you live?
Where does it hurt you most?

Practice 3.20: Use each of the above highlighted question words or phrases in a question of your own on healthcare issues.

Practice 3.21: Ask questions to which the bold-faced words are answers.

1. The top of a person's **scalp** is covered with **hair. (What)**

.....

2. At the top and front of the upper body, just below the neck is the **collar bone**. (Where)

.....

3. The patient takes the medication **three times a day**. (How often)

.....

4. Jane has been pregnant **for five months**. (How long)

.....

5. The front of the lower leg is the **shin** and the back of the lower leg is the **calf**. (what)

.....

6. In many cases **specialists** require a **referal** from a family doctor before they will see a patient. (who), (what)

.....

.....

7. The newborn baby sleeps **four times** every day. (How often)

.....

8. **Tylenol 3** is one of the painkillers available without prescription. (which)

.....

9. **Women giving birth** usually find that the epidural is the most effective pain relief. (Who)

.....

10. He looks **much worse** today because **the medicines he is taking don't seem to work**. (how), (why)

.....

.....

6 Oral Communication Skills

Practice 3.22: Study the following dialogue between a doctor and a patient and answer the questions following it orally.

Doctor: Hi Janet. How are you feeling today?

Patient: A bit better.

Doctor: That's good to hear. Are you still feeling nauseous?

Patient: No, I haven't felt sick since you switched my medication. My stomach is fine.

Doctor: Great. Say, your test results came in this morning.

Patient: It's about time. Is it good news or bad?

Doctor: I guess it's a bit of both. Which do you want first?

Patient: Let's get the bad news over with.

Doctor: Okay. It looks like you're going to need surgery to remove the tumor from your leg. After the operation you're going to have to stay off your feet for at least three weeks. That means no soccer.

Patient: I was afraid you were going to say that.

Doctor: Now for the good news. The biopsy shows that the tumor is benign, which means it's not cancerous. We're going to take it out anyway just to be on the safe side.

Patient: Wow, that's a load off my mind. Thanks Doctor.

Doctor: Don't get too excited. We still need to get to the bottom of all of this weight loss.

Patient: I've probably just been so worried about this stupid lump.

Doctor: These things often are stress related, but we're still going to do a few blood tests just to rule a few things out.

Patient: Things like what? Cancer?

Doctor: Actually, I'm thinking more along the lines of a food allergy.

A. Answer the following questions.

1. What was the woman suffering from?
2. Why did she have to switch medication?
3. What bad news did the doctor tell her?
4. What medical procedure has the woman already undergone?
5. Define the term *biopsy*?

6. Give the opposite of:

- *benign*:_____
- *to lose weight*:_____

B. Act out the dialogue with a classmate.

7 Focus on Writing

Definition

Definitions may be brief or extended. A brief definition reflects the essence or primary characteristic of a term. The essence of an adjective, for instance, is that it is a part of speech that modifies a noun. On the other hand, an extended definition includes information beyond the essence or primary characteristic of a term. An extended definition of an adjective could include categories like size, shape, or color, etc., and an explanation of the various forms it takes such as comparative and superlative.

An extended definition essay should classify a term with relevant criteria, and use examples that focus on distinguishing the term from other closely related terms or concepts. The writer must decide what categories of information best distinguish the item or concept under scrutiny.

An appropriate range of examples can be the most direct way to identify and clarify a term.

Examples

stances and systems which include herbal preparations, mega-dose vitamins, homeopathy, naturopathy, osteopathy, aromatherapy, electromagnetic fields, acupuncture, chiropractic, hypnosis, bio-feedback, spiritual devotions, therapeutic touch, chelation therapy, and many more.

This extra information may include the properties of the defined item, an analysis of its parts, a physical description or its location. Furthermore, extra information may focus on the mode of operation of the item to be defined as in defining a diagnostic instrument: *Sonography* operates by the energy from sound waves being reflected off internal organs and transformed into an image on a TV-type monitor.

An object can also be clarified by indicating its functions or what it is particularly useful for, or by comparing and contrasting it to other members of the class:

> The lung disease 'emphysema', which limits a patient's ability to breathe, could be contrasted with 'pneumoconiosis', a disease which also results in breathing difficulty, but due to different causes and through a different process.

A definition may also include the causes of the defined item, or its results, or both:

> Atherosclerosis is the condition where fatty deposits, called plaque, within the lining of an artery gradually build up and harden, causing a narrowing of the vessel, thereby reducing the blood flow to tissues. (Result) A primary factor in its development is the presence of cholesterol-containing lippoproteins.

> Other risk factors include high blood pressure, smoking, inactivity and family history. (Causes)

Defining a term may involve a description of its process or procedures:

> Angioplasty is the procedure commonly used in cases of atherosclerosis. This involves surgically removing the plaque to reopen a narrowed vessel and restore blood flow. The vessel is then kept open by the installation of a stent. This hinged metal or plastic device is inserted into the vessel with a deflated balloon inside it. Once in place, the balloon is inflated and the stent is forced open to a size which will keep the vessel wide. The balloon can then be deflated and removed, while the stent remains open and in place.

A medical term can also be defined by stating what it is not:

> Alternative medicine incorporates a very broad category of medical systems. However, though it is sometimes treated as synonymous with complementary medicine, they are not the same. Complementary medicine intends to be used as a supplement to conventional treatment. This could involve having vitamin supplements or a health food diet while undergoing conventional medical treatment. On the other hand, alternative systems or treatments function to replace a conventional treatment. Acupuncture could be used instead of anesthesia during an operation. In some countries, like the US and Britain, alternative medicine is not taught in medical schools, is generally not used in hospitals, and is not covered by insurance. Many conventional medical professionals reject their safety and efficacy. Despite this, there is some professional interest. There are surgeons in the countries mentioned who use acupuncture instead of anesthesia, for instance. In the UAE, there is a government department which deals with alternative medicine. It is fair to say that its status is not fixed.

Practice 3.23: Write an extended definition of one of the following:

a. Endocrine glands
b. Exocrine glands
c. Graves' disease
d. Colonoscopy

8 Pronunciation of Medical Terms

The following are the medical terms introduced in this chapter. You are supposed to read them aloud as many times as you need to master their pronunciation. These medical terms are recorded on a CD to help you learn the correct pronunciation. In this activity, you are also required to give the meaning of each term in order to retain them active in your memory.

Read the following medical terms and know their meanings.

abduct	antepartum	bradygastria
adduct	antigen	circumcision
adhere	aphasia	circumoral
adjacent	apnea	congenital
amenorrhea	atrophy	contraindicated
anemia	bilateral	cyanosis
antefebrile	bipolar	decongestant

dextrogastria
dialysis
diameter
diatomic
diploid
diplopic
disinfect
dysplasia
dyspnea
dysuria
ectocardia
ectopic
endocrine
endometrial
endotoxin
epidermis
equicaloric
equilibrium
erythrocyte
erythrocytosis
eupnea
euthyroidism
exogenous
exophthalmos
extracranial
extrahepatic
hemiplegia
heterogeneous
heterosexual
homeostasis
homograft
homosexual,
hypertension
hyperthyroidism
hypochondriac
hypogastric
hypoglycemia
hypothyroidism
incision
infrascapular
interstitial
intervertebral
intracellular
intrauterine
intravenous
isocellular
isochromatic
juxtaposition
leukemia
leukoplakia
macrodactyly
macroscopic
malignant
megacephaly
megalomania
melanin
melanocyte
mesoderm
metacarpal
microbiological
microdactyly
monoatomic
monocular
monodactyly
multicellular
neocortex
nonhuman
normothermic
normovolemia
oligodactyly
oligodontia
orthognathism
orthotic
pachydactyly
panplegia
parathyroid gland
percolate
perianal
periorbital
peritoneal
permeable
poikiloderma
poikilothermic
poliomyelitis
polydactyly
polyneuropathy
polyphagia
postmenopause
postmortem
postnatal
premature
premenstrual
primary
primitive
projectile
prophase
prosthesis
pseudogene
pseudoreaction
quadriplegia
regurgitation
resection
retrogastric
retroperitoneal
semilunar
semisolid
sinistromanual
staphylococcus
streptobacillus
subcostal
subcutaneous
subdural hematoma
sublingual
subpatellar
subscapular
supernumerary
supraabdominal
suprascapular
symbiosis
sympathetic
synapse
syndactyly
syndrome
tachycardia
telencephalon
telophase
tetrad
tetradactyly
transurethral
tripod
ultrasonography
unify
unilateral
unusual
xanthoderma
xanthoma
xeroma

Name: ..... ID: .....

9 Review Exercises

A. Circle the best answer.

1. A prefix that means the same as *di-* is
   a. tri b. uni c. bi d. mono
2. The prefixes *hemi-* and *semi-* mean
   a. whole b. first c. two d. half
3. The prefix in *binocular* means
   a. one b. three c. four d. two
4. The prefix in *nonexistent* means
   a. slow b. complex c. equal d. not
5. A *neonate* is a(n)
   a. teen b. adult c. preteen d. newborn
6. The prefixes *ante-*, *pre-*, and *pro-* all mean
   a. after b. within c. under d. before
7. The prefix *tel/o-* means
   a. together b. middle c. end d. apart
8. The prefixes *meta-* and *ultra-* mean
   a. whole b. outside c. inside d. beyond
9. The prefix in *analysis* means
   a. apart b. not c. separation d. breaking
10. The prefix in *pachycephaly* means
    a. slow b. fast c. equal d. thickness

B. Write true or false before each statement.

1. The prefix in *leukocyte* means "irregular." (F)
2. The prefix in *percutaneous* means "on the skin." (F)
3. The prefix in *synthesis* means "apart." (F)
4. The last stage of cell division is prophase. (F)
5. A prefix appears before a root and after a suffix. (F)
6. A polysaccharide is composed of more sugar than a monosaccharide. (T)
7. The prefix in *dissect* means "to separate." (T)
8. "Anti-" and "contra-" mean the same thing. (T)
9. Right-handed people are dextromanual. (T)
10. A telomere is found in the middle of a chromosome. (F)
11. The prefix in *erythrocyte* means "red." (T)
12. The prefix in *periosteum* means "on the bone." (F)

C. Fill in the blank with the correct medical term.

1. Hypoxia causes a bluish discoloration of the skin is termed cyanosis.
2. The prefix in *superciliary* means excess.
3. The prefix *poikilo-* means irregular.
4. The prefix in the word *pachycephaly* means thickness.
5. Total paralysis is panplegia.
6. Composed of similar cells is isocellular.
7. A group of four is tetralogy.
8. Describing a colony derived from one cell is monoclonal
9. To separate tissues for anatomical study is called dissect
10. A mass of blood above the membrane surrounding the brain is epidural hematoma
11. Surgical puncture to remove fluid from the membrane surrounding the fetus is amniocentesis.

D. Write the word that means the opposite of each of the following:

1. hyperthermia hypothermia
2. polyuria oliguria
3. incision excision
4. abduct adduct
5. chronic acute
6. benign malignant
7. hypopnea eupnea
8. epigastric hypogastric
9. postmortem antemortem
10. atrophy trophy
11. bradypnea tachypnea

E. Identify the prefix and provide its meaning:

	Prefix	meaning
1. normothermic	normo-	normal
2. quadruplet	quadric-	four
3. mesoderm	meso-	middle
4. euthyroidism	eu-	easy
5. poikilothermic	poikilo-	irregular
6. malabsorption	mal-	poor/bad
7. panplegia	pan-	total
8. symbioses	sym-	together

F. Write a word or a prefix that means the same as each of the following:

1. isolateral equilateral
2. megalocyte macrocyte
3. supersensitivity hypersensitivity
4. prenatal antenatal

5. para juxta-
6. circum peri-
7. subcostal infracostal
8. ecto ecto-

G. Identify the prefixes or the combining forms in the following words and figure out what they mean.

	Term	Prefix	Combining form	Meaning
1.	oliguria	oligo		
2.	cyanosis	cyano		
3.	erythropenia	erythro		
4.	leukorrhea	leuko		
5.	melanocyte	melano		
6.	endocrine	endo		
7.	fibroid			
8.	morphology			
9.	aphasia	a		
10.	dysplasia	dys		
11.	eupnea	eu		
12.	peritoneum	peri		
13.	endoscopy	endo		
14.	angioectasis			

H. Give the meaning of each of the following terms:

1. sublingual
2. retroperitoneal
3. aphasia
4. quadriplegia
5. intervertebral
6. hypochondriac
7. hypertension
8. congenital
9. dystrophy
10. transdermal
11. diplopia
12. polyphagia
13. postmortem
14. tachycardia
15. sinistromanual

I. Give the meaning of each of the following prefixes and give a medical term in which it is used.

	Meaning	example
1. ab-	away	abnormal
2. ad-	toward	adrenal
3. meta-	beyond	metatarsal
4. para-	near	parathyroid
5. con-	together	congenital
6. anti-	against	antibiotic
7. ante-	before	antenatal
8. inter-	between	interscapular
9. brady-	slow	bradypnea
10. pre-	before	prenatal
11. sub-	under	sublingual
12. hyper-	excessive	hypertrophy
13. dys-	painful	dysuria
14. ec-	outside	ectopic
15. intra-	within	intravascular
16. syn-	together	syndrome
17. epi-	above	epigastric
18. extra-	outside	extrathoracic
19. trans-	through	transdermal
20. endo-	within	endometrium

J. Circle the correct answer.

1. A prefix is found
- A. at the beginning of a word
- B. after the root
- C. at the end of the word
- D. before a hyphen

2. The prefix multi- means
- A. single
- B. double
- C. twice
- D. many

3. Which of the following has four components?
- A. unicycle
- B. polysaccharide
- C. bicuspid
- D. tetralogy

4. Cyanosis refers to
- A. dark coloration
- B. blue coloration
- C. thickness
- D. shape

5. A xanthoma is
- A. green
- B. blue
- C. dark
- D. yellow

6. The prefix in disintegration means
   - A. movement
   - B. separation
   - C. few
   - D. decreased

7. To detoxify means to
   - A. poison
   - B. confine
   - C. remove toxins
   - D. manufacture toxins

8. The prefixes dia-, per-, and trans- all mean
   - A. under
   - B. near
   - C. through
   - D. equal

9. The prefix pan- means
   - A. ever
   - B. before
   - C. excess
   - D. all

10. Which of the following means the same as equi-?
   - A. pseudo
   - B. megalo
   - C. ecto
   - D. iso

11. The prefix pseudo- means
   - A. good
   - B. large
   - C. even
   - D. false

12. The opposite of dextro- is
   - A. telo
   - B. sym
   - C. megalo
   - D. sinistro

13. The opposite of ectoderm is
   - A. endoderm
   - B. proderm
   - C. mesoderm
   - D. metroderm

14. The mesencephalon is the
   - A. surface of the brain
   - B. underneath part of the brain
   - C. inner part of the brain
   - D. middle portion of the brain

15. A word that describes organisms living together is
   - A. symbiosis
   - B. antibiosis
   - C. metabiosis
   - D. endobiosis

16. Interstitial fluid is found
   - A. inside cells
   - B. between cells
   - C. on the surface of the skin
   - D. under the brain

17. Metastasis is
   - A. a wasting of tissue
   - B. a form of anemia
   - C. a form of infection
   - D. spreading of cancer

18. An antipyretic is used to
   - A. increase body temperature
   - B. harden bones
   - C. reduce pain
   - D. reduce fever

19. An endotoxin is a
A. poison found within a cell
B. spreading cancer cell
C. substance produced by the immune system
D. poison secreted from a cell

20. The opposite of bradycardia is
A. dyscardia
B. xerocardia
C. cardiocele
D. tachycardia

21. In pachyemia the blood is
A. thin
B. light
C. deficient
D. thick

22. The term hyperbaric refers to
A. increased temperature
B. increased pressure
C. treatment with chemicals
D. decreased pressure

23. When a drug is contraindicated it is
A. given in double dose
B. given at night
C. recommended for treatment
D. not recommended for treatment

24. Polyarteritis is
A. constriction of two arteries
B. inflammation of many arteries
C. formation of tissue around arteries
D. removal of tissue from an artery

25. The scientific name for a "heart attack" is
A. myocardial infarction
B. endocarditis
C. pericardial occlusion
D. cardioversion

26. The epiglottis is the
A. lower end of the trachea
B. throat
C. cartilage around the bronchioles
D. cartilage that covers the trachea during swallowing

27. Orthopnea is
A. a rapid rate of breathing
B. a shallow depth of breathing
C. irregular breathing
D. difficulty in breathing unless upright

28. A decreased rate and depth of breathing is termed
A. hyperpnea
B. hypocapnia
C. hyperventilation
D. hypopnea

29. A temporary stoppage of breathing is
A. apnea
B. dyspnea
C. dysventilation
D. eupnea

30. The term perioral means
A. above the nose
B. within the sinuses
C. around the mouth
D. around the jaw

31. The term hemiglossal refers to
A. the salivary glands in the cheek
B. the position of the jaw
C. one half of the tongue
D. the upper part of the palate

32. Oliguria is
A. excretion of a decreased amount of urine
B. discoloration of the urine
C. infection of the bladder
D. narrowing of the ureter

33. Painful or difficult urination is
A. nocturia
B. pyuria
C. uremia
D. dysuria

34. A retrouterine structure is located
A. under the uterus
B. behind the vagina
C. behind the uterus
D. within the uterus

35. A congenital disorder
A. is caused by viral infection
B. is present at birth
C. appears during childhood
D. appears in a mother

Case report

HIV Infection and Tuberculosis

T.H., a 48-year-old-man, was an admitted intravenous (IV) drug user and occasionally abused alcohol. Over 4 weeks, he had experienced fever, night sweats, malaise, a cough, and a 10-lb weight loss. He was also concerned about several discolored lesions that had erupted weeks before on his arms and legs.

T.H. made an appointment with a physician assistant (PA) at the neighborhood clinic. On examination, the PA noted bilateral anterior cervical and axillary lymphadenopathy and pyrexia. T.H.'s temperature was 39°C. the PA sent T.H. to the hospital for further studies.

T.H.'s chest radiograph (x-ray image) showed paratracheal adenopathy and bilateral interstitial infiltrates, suspicious of tuberculosis (TB). His blood study results were positive for human immunodeficiency virus (HIV) and showed a low lymphocyte count. Sputum and bronchobacillus (AFB); a PPD (purified protein derivative) skin test result was also positive. Based on these findings, T.H was diagnosed with HIV, TB, and Kaposi sarcoma related to past IV drug abuse.

A. Write the word or phrase from the text that has the same meaning as each of the following words or phrases:

1. within a vein _____
2. fever _____
3. Pertaining to both sides _____

4. Pertaining to the neck_____
5. Pertaining to the armpit _____
6. X-ray image _____
7. Near the trachea_____

B. Circle the letter of the most appropriate answer.

1. The term lymphadenopathy means:
   a a disease of the lymph
   b. An enlargement of the lymph nodes, usually associated with disease
   c. lymph nodes enlargement
   d. a disease of a gland

2. The term interstitial means:
   a. above the cells b. under the cells
   c. between the cells d. within the cells

3. The word 'discolored' has the prefix_____
   a. di b. dis c. ed d. color

4. Provide the meaning for the following words.
   a. immunodeficiency_____
   b. infiltrate_____
   c. sarcoma_____
   d. adenopathy_____

10 Self-assessment

Check (✓) what you learned. If you need more information or practice, refer to the relevant section in the chapter.

( ) I can define a prefix.
( ) I can identify prefixes in medical terms.
( ) I can differentiate between the prefixes that have similar meanings.
( ) I can analyze medical terms into their constituents.
( ) I can use prefixes in medical terms.
( ) I can use certain medical collocations and academic words properly.
( ) I can pronounce medical terms properly.
( ) I can skim and scan medical texts for main ideas and details.
( ) I can ask and answer questions pertaining to medical issues.
( ) I can write brief definitions of medical terms, procedures, disease, etc.
( ) I can spell and pronounce the new medical terms in the chapter.