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Chapter 9: Diseases of the Circulatory System (100-199) Anatomy of the Cardiovascular System

Introduction

The human vascular system comprises a series of tubes (which are known as vessels) that travel in almost all parts of the human body. It is categorized into the blood vascular system and the lymphatic vascular system.

1. Blood Vascular System

The blood vascular system (Figure 9.1) includes the heart and blood vessels required to facilitate the circulation of the colored fluid (blood) inside the body.



Figure 9.1 Blood Vascular System - Arteries and Veins

a) The Structure of Arteries

The arteries possess stronger and thicker walls than the corresponding veins and are based on the following components:

- i) Tunica Intima
- ii) Tunica Media
- iii) Tunica Externa
- b) The Structure of Veins

The veins have a similar structure as that of the arteries. The components of a typical vein are described below:

- i) Tunica Intima
- ii) Tunica Media
- iii) Tunica Externa
- c) The Blood

The blood is considered a uniquely specialized connective tissue that is composed of the formed elements (or the blood cells) and the fluid portion (or plasma). The formed elements of blood are based on the red blood cells (RBCs or erythrocytes), the white blood cells (WBCs or leukocytes) and the platelets (or thrombocytes). The blood contributes to about 8% of total body weight. The quantity of blood in an average human varies between 5 to 6 liters. The elements of blood are categorized below:

d) Erythrocytes or Red Blood Cells: The red blood cells are the most common type of blood cells that contribute to about 95% of the blood cell volume.

- e) Leukocytes or White Blood Cells: The white blood cells can be divided into the following subcategories:
- f) Granular Leukocytes: The granular leukocytes contain granules in their cytoplasm and can be further classified into the following three types:
 - i) neutrophils constitute about 60% to 70% of the white blood cells.
 - ii) eosinophils constitute about 2% to 4% of the white blood cells.
 - iii) basophils constitute about 0.5% to 1% of the white blood cells.
- g) Agranular Leukocytes: The agranular leukocytes do not contain granules in their cytoplasm and can be further classified into the following two types:
 - i) monocytes constitute about 3% to 8% of the white blood cells.
 - ii) lymphocytes constitute about 20% to 25% of the white blood cells.
- h) Thrombocytes or Platelets: The platelets are small cell fragments that do not contain nucleus in their cytoplasm.
- i) Blood Plasma

The plasma is the fluid component of blood in which the blood cells usually remain suspended. The blood plasma is composed of 91% water, 7% proteins, and 2% solutes.

2. Lymph Vascular System

The lymph vascular system includes the lymph glands and lymphatic vessels for circulating the colorless fluid (lymph) throughout the human body. Both of the blood vascular and the lymph vascular systems work in close association with each other for sustaining the human life cycle.

3. The Thoracic Cavity

The thoracic cavity is enclosed by the thoracic wall and primarily contains the structures of the cardiovascular and respiratory systems.

a) The Pericardium

The heart and the roots of the great vessels are contained within the conical and fibro-serous sac, which is known as the pericardium. It is composed of two closely connected sacs, which are known as the fibrous pericardium (or the outer sac) and the serous pericardium (the inner sac).

b) The Heart

The heart is a hollow muscular organ that remains enclosed in the fibro-serous sac (or the pericardium) and is regarded as the central organ of the cardiovascular system. It lies between the lungs in the middle mediastinum and receives blood from the veins.

4. The Chambers of the Heart

The human heart is based on the following four chambers (Figure 9.2):



Figure 9.2 Chambers of the Heart

- a) The Right Atrium: The right border of the human heart is formed by the right atrium. The superior vena cava, inferior vena cava and coronary sinus provide venous blood supply to the right atrium of the heart. The right atrium contains the following elements inside it:
 - i) Sinus Venarum
 - ii) Pectinate Muscles

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- iii) Opening of Superior Vena Cava
- iv) Opening of Inferior Vena Cava
- v) Opening of Coronary Sinus
- vi) The Right Atrioventricular Orifice
- vii) Interatrial Septum
- b) The Right Ventricle: The inferior border of the human heart is constituted by the right ventricle.
- c) The Left Atrium: The left atrium chiefly constitutes the base of the heart and utilizes the mitral valve to pump the oxygenated blood received from the pulmonary veins into the left ventricle of the heart. The interior of the left atrium is based on the following components:
 - Two superior and two inferior pulmonary veins that enter the posterior wall of the left atrium.
 - ii) A posteriorly directed interatrial septum that separates the right atrium from the left atrium of the heart.
 - iii) A smooth walled portion and a muscular auricle containing pectinate muscles.
 - iv) A comparatively thicker wall than the corresponding right atrium.
 - A left atrioventricular orifice that facilitates the discharge of oxygenated blood into the left ventricle.
- d) The Left Ventricle: The left ventricle pumps the oxygenated blood (through the aortic valve) to the whole body through the aorta. The interior of the left ventricle is based on the following elements:
 - a double-leaflet/dual-flap mitral (bicuspid or left atrioventricular) valve, which is located between the left atrium and ventricle for guarding the left atrioventricular orifice.
 - walls of the left ventricle, which are comparatively thicker than the corresponding right ventricle.
 - iii) conical cavity of the left ventricle that is comparatively longer than the corresponding right ventricle.
 - iv) anterior and posterior left ventricular papillary muscles that get attached to the cusps of the mitral valve through the tendinous cords (or the chordae tendineae).
 - aortic vestibule, which is a smooth-walled, nonmuscular, superoanterior outflow portion of the left ventricle that lies inferior to the aortic orifice and possesses fibrous walls.
 - vi) aortic orifice (or opening) is an opening of the left ventricle into the aorta. This valve is usually tricuspid (with three leaflets) and located posterior to the left side of the sternum at the level of the third intercostal space.
 - vii) inner surface of the left ventricle gives rise to the irregular, rounded and thick muscular ridges that are termed as the trabeculae carneae.

5. The Cardiac Cycle:

The cardiac cycle is based on the synchronous pumping of the right and left chambers of the heart.

- a) The Arterial Supply of the Heart
 - The heart is supplied by the following arteries:
 - i) right coronary artery (RCA)
 - ii) sino-atrial nodal artery
 - iii) right marginal artery
 - iv) posterior interventricular artery
 - v) atrioventricular nodal artery
 - vi) left coronary artery
 - vii) anterior interventricular artery (or Left Anterior Descending Artery)
 - viii) circumflex artery
 - ix) left marginal artery
 - x) posterior interventricular artery
- b) The Arteries
 - The major types of arteries are described below:
 - i) pulmonary arteries- pulmonary arteries carry the oxygen deficient blood from the heart to the lungs for attaining oxygen.
 - systemic arteries- systemic arteries transport the oxygenated blood to the rest of the body.
- c) The Aorta
 - The aorta is divided into the following components:
 - i) ascending aorta
 - ii) arch of aorta
 - iii) descending aorta

- d) Thoracic Aorta
 - i) aortic intercostal arteries (nine pairs)
 - ii) left bronchial arteries (two in number)
 - iii) posterior mediastinal arteries
 - iv) pericardial arteries
 - v) superior phrenic arteries
 - The Abdominal Aorta

e)

6. The Arteries of the Head and Neck

The major arteries that supply blood to the head and neck regions are the two common carotid arteries. These arteries travel through the neck and each one of them gets divided into the following branches:

- a) External Carotid Arteries
- b) Ascending Pharyngeal Artery
- c) Occipital Artery
 - i) muscular branches
 - ii) sternocleidomastoid branch/sternocleidomastoid artery
 - iii) auricular branch
 - iv) meningeal or dural branch
 - v) descending branch
- d) Posterior Auricular Artery
 - i) stylomastoid branch/stylomastoid artery
 - ii) auricular branch
 - iii) occipital branch
- e) Superior Thyroid Artery
 - i) hyoid branch
 - ii) sternocleidomastoid branch/sternocleidomastoid artery
 - iii) superior laryngeal branch/superior laryngeal artery
 - iv) cricothyroid branch
 - Lingual Artery

f)

- i) hyoid branch
- ii) dorsal lingual branches
- iii) sublingual branch/sublingual artery
- iv) deep lingual branch/deep lingual artery
- g) Facial (or External Maxillary) Artery

	Cervical Branches		Facial Branches
i)	ascending palatine artery	i)	inferior labial artery
ii)	tonsillar branch	ii)	superior labial artery
iii)	glandular branches	iii)	lateral nasal branch
iv)	submental artery	iv)	angular artery
v)	muscular branches	v)	muscular branches

- 7. The Internal Carotid Arteries: The internal carotid arteries are the direct continuation of the common carotid arteries. However, the other portions of these arteries extend into the following arterial branches:
 - The petrous portion of the internal carotid arteries gives rise to the following branches:
 - i) caroticotympanic artery
 - ii) artery of the pterygoid canal (or vidian artery)
 - b) The cavernous portion of the internal carotid arteries gives rise to the following branches:
 - i) cavernous artery
 - ii) hypophyseal artery
 - iii) semilunar arterial branches
 - iv) anterior meningeal artery
 - v) ophthalmic artery
 - c) Anterior Cerebral Artery
 - i) anteromedial ganglionic branches
 - ii) inferior branches
 - iii) anterior branches
 - iv) middle branches
 - v) posterior branches

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- d) The Middle Cerebral Artery
 - i) anterolateral ganglionic branches
 - ii) inferior lateral frontal branch
 - iii) ascending frontal branch
 - iv) ascending parietal branch
 - v) parietotemporal branch
 - vi) temporal branches
- e) Posterior Communicating Artery
- f) Anterior Choroidal Artery (or Choroid Artery)

8. The Arteries of the Upper Extremity: The Subclavian Artery divides into the following branches:

 a) Vertebral Artery: The vertebral artery is divided into the following branches:

	Cervical Branches		Cranial Branches
i)	spinal branches	i)	posterior meningeal branch
ii)	muscular branches	ii)	posterior/dorsal spinal artery
		iii)	anterior/ventral spinal artery
			posterior inferior cerebellar artery
		v)	medullary arteries

b) Internal Thoracic (or Internal Mammary) Artery

- i) pericardiacophrenic artery
- ii) anterior mediastinal arteries
- iii) pericardial branches
- iv) sternal branches
- v) anterior intercostal arteries
- vi) perforating branches
- vii) musculophrenic artery
- viii) superior epigastric artery
- c) Thyrocervical Trunk (or Thyroid Axis)
 - i) inferior thyroid artery
 - ii) inferior laryngeal artery
 - iii) esophageal branches
 - iv) tracheal artery
 - v) ascending cervical artery
 - vi) muscular branches
- d) Suprascapular (or Transverse Scapular) Artery
 - i) suprasternal branch
 - ii) acromial branch
- e) Transverse Cervical Artery (or Transverse Artery of Neck)
 - i) ascending branch
 - ii) descending branch
- f) The costocervical trunk is the highest intercostal artery (superior intercostal), and it includes:
 - i) first posterior intercostal artery
 - ii) second posterior intercostal artery
 - iii) deep cervical artery
 - iv) third arterial part
- g) Axillary Artery
 - i) first part
 - ii) second part
 - iii) third part
- h) Brachial Artery
 - i) muscular branches
 - ii) human nutrient artery
 - iii) profunda brachii artery (deep artery of the arm/superior profunda artery)
 - iv) superior ulnar collateral artery (or inferior profunda artery)
 - v) inferior ulnar collateral artery (or anastomotica magna artery)

i) Radial Artery

Branches of the Radial Artery in Forearm	Branches of the Radial Artery in Wrist	Branches of the Radial Artery in Hand
The Radial Recurrent Artery	The Posterior Radial Carpal Artery (The Dorsal Carpal Branch)	The Princeps Pollicis Artery
The Muscular (Arterial) Branches	The First Dorsal Metacarpal Artery	The Radialis Indicis Artery
The Anterior Radial Carpal Artery (The Volar Carpal Branch)		The Deep Palmar/ Volar Arch
The Superficial Volar Artery (The Superficial Palmar Branch of Radial Artery)		The Palmar Interosseous (or Volar Metacarpal) Arteries
		The Perforating (Arterial) Branches The Recurrent (Arterial) Branches

j) Ulnar Artery- The ulnar artery originates from the brachial artery and runs along the medial aspect (or ulnar side) of the forearm. A tabular representation of the arterial branches of ulnar artery is provided below:

Branches of the Ulnar Artery in Forearm	Branches of the Ulnar Artery in Wrist	Branches of the Ulnar Artery in Hand
The Anterior Ulnar Recurrent Artery	The Volar Carpal Branch (or Anterior Ulnar Carpal Artery)	The Deep Volar Branch (or Profunda Branch)
The Posterior Ulnar Recurrent Artery	The Dorsal Carpal Branch (or Posterior Ulnar Carpal Artery)	The Superficial Volar Arch (or Superficial Palmar Arch)
The Common Interosseous Artery (divides into the following two branches)		
i) The Volar Interosseous Artery (or Anterior Interosseous Artery)		
ii) The Dorsal Interosseous Artery (or Posterior Interosseous Artery)		
The Muscular (Arterial) Branches		

9. Arteries of the Trunk

- Arteries of the trunk are based on the following arteries:
- a) The Descending Aorta
 - i) thoracic aorta
 - ii) abdominal aorta
- b) The Common Iliac Arteries
- c) Internal Iliac (or Hypogastric) Artery

The Anterior Trunk	The Posterior Trunk
The Superior Vesical Artery	The Iliolumbar Artery-with
The Middle Vesical Artery	the following branches:
The Inferior Vesical Artery	i) The Lumbar (Arterial) Branch ii) The Iliac (Arterial) Branch
The Middle Hemorrhoidal Artery	The Superior and Inferior
The Uterine Artery (In Female)	Lateral Sacral Arteries
The Vaginal Artery (In Female)	The Superior Gluteal Artery
The Obturator Artery	(or Gluteal Artery)-with the following branches:
	i) The Superficial (Arterial) Branch ii) The Deep (Arterial) Branch

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11. The Veins

The veins are the blood vessels that carry deoxygenated blood (Figure 9.3) from the body tissues towards the heart via capillaries. The veins can be categorized into the following classes:

- Pulmonary Veins: The pulmonary veins carry oxygenated blood from the lungs to the left atrium of the heart. The pulmonary veins are of the following types:
 - i) right inferior pulmonary vein
 - ii) right superior pulmonary vein
 - iii) left inferior pulmonary vein
 - iv) left superior pulmonary vein
- b) Systemic Veins: The systemic veins deliver deoxygenated blood from the body tissues to the right atrium of the human heart.
- c) Superficial (or Cutaneous) Veins: The superficial veins are found immediately beneath the skin between the layers of the superficial fascia.
- d) Deep Veins: The deep veins are located under the deep fascia with their corresponding arteries.
- e) Systemic Veins
 - The systemic veins are divided into the following groups:
 - i) veins of the heart
 - ii) veins of the head and neck
 - iii) veins of the upper extremity and thorax
 - iv) veins of the lower extremity, abdomen, and pelvis
- f) Veins of the Heart
 - i) great cardiac vein
 - ii) small cardiac vein
 - iii) middle cardiac vein
 - iv) posterior vein of the left ventricle
 - v) oblique vein of the left atrium
- g) Veins of the Head and Neck
 - i) frontal vein (or supratrochlear vein)
 - ii) supraorbital vein
 - iii) angular vein
 - iv) anterior facial vein (or facial vein)
 - v) superficial temporal vein
 - vi) parotid veins
 - vii) articular veins (from temporomandibular joint)
 - viii) anterior auricular veins
 - ix) transverse facial veins
 - x) internal maxillary vein
 - xi) posterior facial vein (or temporomaxillary vein)
 - xii) posterior auricular vein
 - xiii) occipital vein
- h) Veins of the Neck
 - i) external jugular vein
 - ii) posterior external jugular vein
 - iii) anterior jugular vein
 - iv) internal jugular vein
 - v) vertebral vein
 - vi) diploic veins
 - (a) frontal diploic vein
 - (b) anterior temporal diploic vein
 - (c) posterior temporal diploic vein
 - (d) occipital diploic vein
- 12. Veins of the Brain
 - a) External Cerebral Veins
 - i) superior cerebral veins
 - ii) middle cerebral vein (or superficial sylvian vein)
 - iii) inferior cerebral veins
 - b) Internal Cerebral Veins (or Deep Cerebral Veins)
 - c) Terminal Vein
 - d) Great Cerebral Veins (or Great Vein of Galen)

- e) Cerebellar Veins
 - i) superior cerebellar veins
 - ii) inferior cerebellar veins
- f) Ophthalmic and Emissary Veins
 - Ophthalmic veins are the veins that serve to perform the venous drainage of the orbit and pass through the superior orbital fissure to enter into the cavernous sinus.
 - ii) superior ophthalmic veins
 - iii) inferior ophthalmic veins
 - iv) Emissary veins are those valveless veins that connect the dural venous sinuses with veins outside the cranium.
- g) Sinuses of the Dura Mater
 - i) posterosuperior sinuses
 - ii) superior sagittal sinus (or superior longitudinal sinus)
 - iii) inferior sagittal sinus (or inferior sagittal sinus)
 - iv) straight sinus (or tentorial sinus)
 - v) transverse sinuses (or lateral sinuses)
- h) Occipital Sinuses
 - i) anteroinferior sinuses
 - ii) cavernous sinuses
 - iii) intercavernous sinuses
 - iv) superior petrosal sinuses
 - v) inferior petrosal sinuses
 - vi) basilar plexus (or transverse/basilar sinus)



Capillary region of the lower body (trunk and legs)

Figure 9.3 Path of Oxygenated and De-oxygenated Blood Throughout the Circulatory System

- 13. Veins of the Upper Extremity, Thorax and Vertebral Column The veins of the upper extremity are divided into the superficial and the deep veins.
 - a) Superficial Veins of the Upper Extremity
 - i) cephalic vein (or antecubital vein)
 - ii) accessory cephalic vein
 - iii) median cubital vein (or median basilic vein/antecubital vein)
 - iv) basilic vein
 - v) median antebrachial vein
 - vi) dorsal venous network of the hand

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- vii) intercapitular veins iii) viii) dorsal metacarpal veins iv) left gastro-omental vein ix) dorsal digital veins right gastro-omental vein V) b) Deep Veins of the Upper Extremity vi) left hepatic vein i) radial veins vii) middle hepatic vein ulnar veins ii) viii) right hepatic vein iii) brachial veins ix) superior mesenteric vein iv) axillary veins x) inferior phrenic veins V) subclavian veins xj) inferior vena cava deep palmar venous arch xii) left renal vein vi) Veins of the Thorax xiii) right renal vein c) innominate veins (or brachiocephalic veins) splenic vein i) xiv) internal mammary veins (or internal thoracic veins) suprarenal veins ii) xv) deep dorsal vein of clitoris iii) inferior thyroid veins xvi) highest intercostal vein (or superior intercostal vein) iv) xvii) deep dorsal vein of penis right superior intercostal vein external pudendal veins v) xviii) left superior intercostal vein internal pudendal vein vi) xix) vii) superior vena cava xx) ovarian vein pampiniform venous plexus viii) azygos vein xxi) prostatic venous plexus ix) hemiazygos vein xxii) x) accessory hemiazygos vein (or vena azygos minor superior) xxiii) rectal venous plexus xi) bronchial veins xxiv) uterine venous plexus d) Veins of the Vertebral Column xxv) vaginal venous plexus external vertebral venous plexuses (or extraspinal veins) xxvi) common iliac veins i) anterior external vertebral plexuses xxvii) middle sacral veins ii) iii) posterior external vertebral plexuses xxviii) vesical venous plexus
 - internal vertebral venous plexus (or intraspinal veins)
 - basivertebral veins V)

iv)

- vi) intervertebral veins
- veins of the medulla spinalis (or veins of spinal cord) vii)

14. Veins of the Lower Extremity, Abdomen, and Pelvis

- The veins of the lower extremity are arranged into the following groups:
- a) Superficial Veins of the Lower Extremity
 - i) great saphenous vein
 - ii) small saphenous vein (or lesser saphenous vein)
- b) Deep Veins of the Lower Extremity
 - i) posterior tibial veins
 - ii) peroneal veins
 - iii) tibioperoneal trunk
 - anterior tibial veins iv)
 - popliteal vein V)
 - femoral vein vi)
 - vii) deep femoral vein (or profunda femoris vein)
 - viii) common femoral vein
 - external iliac vein ix)
- Major Veins of Abdomen and Pelvis c)
 - ascending lumbar vein i)
 - left gastric vein ii)

right gastric vein

15. The Portal System of Veins

The hepatic portal system of the veins is responsible for the portal circulation, which denotes the passage of blood from the gastrointestinal tract and spleen through the portal vein to the liver.

The tributaries and sub-tributaries of the portal vein are presented below:

The Tributaries and Subtributaries of the Portal Vein									
The Lienal Vein									
The Tributaries of Lienal Vein	The Short Gastric Veins								
	The Left Gastroepiplo	ic Vein							
	The Pancreatic Veins								
	The Inferior Mesenteri	ic Vein							
	The Tributaries of Inferior Mesenteric	The Sigmoid Veins							
	Vein	The Left Colic Vein							
The Superior Mesenteric Vein	The Superior Mesenteric Vein								
The Tributaries of Superior	The Right Gastroepiploic Vein								
Mesenteric Vein	The Pancreaticoduodenal Veins								
The Coronary Vein									
The Pyloric Vein									
The Cystic Vein									
The Paraumbilical Veins									

Common Pathologies

Angina pectoris

Commonly known as angina, angina pectoris chest pain is due to ischemia of the heart muscle, generally due to obstruction or spasm of the coronary arteries. The main cause of angina pectoris is coronary artery disease, due to atherosclerosis of the arteries feeding the heart.

Cardiomyopathy

Cardiomyopathy is a chronic disease of the heart muscle, in which the muscle is abnormally enlarged, thickened, and/or stiffened. The weakened heart muscle loses the ability to pump blood effectively, resulting in irregular heartbeats (arrhythmias) and possibly even heart failure.

Rheumatic Heart Disease

Rheumatic heart disease is a condition in which permanent damage to heart valves is caused by rheumatic fever. The heart valve is damaged by a disease process that generally begins with a strep throat caused by bacteria called Streptococcus, and may eventually cause rheumatic fever.

Arrhythmia

An arrhythmia is an abnormal rate or rhythm of the heartbeat. It can beat too fast, too slow, or with an irregular rhythm. If the heartbeat is fast it is called tachycardia and if is too slow, it is referred to as bradycardia.

Congenital Heart Defects

Congenital heart defects are abnormalities in the morphological or physiological functioning of the heart that are present at the time of birth. The primary cause is the incomplete or abnormal development of the fetal heart during the early weeks of pregnancy.

Hypertension

Hypertension or high blood pressure is a condition that exists when the force of blood pressing against the blood vessel walls is too high. Over time, hypertension can cause a myriad of complications within the body (Figure 9.4).



Figure 9.4 Main Complications of Hypertension

Aortic Aneurysm

An aneurysm is an abnormal bulging or swelling of a portion of a blood vessel. The aorta, which can develop these abnormal bulges, is the large blood vessel that carries oxygen-rich blood away from the heart to the rest of the body.

Atherosclerosis

Atherosclerosis (Figure 9.5) is a disease of the arterial blood vessels (arteries), in which the walls of the blood vessels become thickened and hardened by "plaques." The plaques are composed of cholesterol and other lipids, inflammatory cells, and calcium deposits.



Figure 9.5 Healthy Artery and Artery with Atherosclerosis

Deep Vein Thrombosis

Deep vein thrombosis (DVT) is a blood clot in a major vein that usually develops in the legs and/or pelvis.

Coronary Artery Disease

Coronary artery disease (CAD) is one of the common vascular diseases marked by accumulation of atherosclerotic plaque in the coronary blood vessels. As the plaque thickens, secondary changes may take place like enlargement of size and calcification that may lead to complete occlusion of the lumen of the coronary artery, resulting in inadequate supply of oxygen to the heart muscle.

Peripheral Vascular Disease

Peripheral vascular disease is a narrowing of blood vessels that restricts blood flow. It mostly occurs in the legs, but is sometimes seen in the arms.

Hypercholesterolemia

Hypercholesterolemia is the presence of high levels of cholesterol in the blood. It is a form of "hyperlipidemia" (elevated levels of lipids in the blood) and "hyperlipoproteinemia" (elevated levels of lipoproteins in the blood).

Lymphedema

A condition in which excess fluid collects in tissue and causes swelling. Lymphedema may occur in the arm or leg after lymph vessels or lymph nodes in the underarm or groin are removed.

Hodgkin's Lymphoma

This is a type of cancer of the lymphatic system. It can start almost anywhere in the body. It's believed to be caused by HIV, Epstein-Barr Syndrome, age, and family history.

Non-Hodgkin's Lymphoma

Non-Hodgkin's lymphoma is a cancer of the lymphoid system. It is divided into three types: high-grade, intermediate-grade and low-grade.

Lymphangitis

Lymphangitis is an inflammation of the lymphatics (lymph channels) due to an infection by a microbe or some chemical irritant. It occurs when an infection or inflammation occurs somewhere else and the microbe or the irritant is transported along with lymph fluid through the lymphatics.

Splenomegaly

Splenomegaly is a condition in which the spleen becomes enlarged, tender and painful. It can occur due to a number of reasons, ranging from certain infections to cancers.

Anatomy of the Lymphatic System

1. Introduction

The human lymphatic system (Figure 9.6) is closely linked with the blood and the vascular system. Both of these systems work in an intimate association with each other and transport vital fluids throughout the body via a system of vessels. The lymph capillaries and lymphatics are the special vessels that serve to transport a fluid (called lymph). The human lymphatic system consists of the below mentioned components:

- a) The Lymph
- b) The Lymph Vessels
- c) The Lymph Nodes
- d) The Tonsils, Spleen, Thymus Gland and Peyer's Patches

The most important function of the lymphatic system is to drain the protein containing fluid from the tissue spaces. The entire lymphatics of the body converge into one of the following major channels:

- i) thoracic duct (or the main collecting channel)
- ii) right lymphatic duct
- e) The lymph nodes (or lymph glands) are oval structures that are found along the length of lymphatics at various intervals. The lymph trunk is a specific lymph vessel containing lymph. The various types of lymph trunks are documented below:
 - i) jugular lymph trunk
 - ii) subclavian lymph trunk
 - iii) bronchomediastinal lymph trunk
 - iv) lumbar lymph trunk
 - v) intestinal lymph trunk



Figure 9.6 Lymphatic System Anatomy

2. Thoracic Duct

The thoracic duct is the largest lymphatic vessel in the body and constitutes an essential part of the lymphatic system. It is also called the alimentary duct, chyliferous duct, left lymphatic duct or Van Hoorne's canal.

3. Lymphatics of the Head, Face and Neck The entire lymph glands of the head are mostly extra-cranial, and arranged in the following groups:

- a) Occipital Lymph Glands: The occipital lymph glands are two or three in number and located on the back of the head.
- b) Posterior Auricular Lymph Glands (or Mastoid Glands): The posterior auricular lymph glands are two in number and exist on the upper part of the sternomastoid muscle and mastoid portion of the temporal bone.
- c) Anterior Auricular Lymph Glands (or Superficial Parotid/Preauricular Glands): The superficial parotid glands are present on the lateral surface of the parotid gland.
- d) Parotid Lymph Glands (or Deep Parotid Glands): The parotid lymph glands remain embedded in the deeper portions of the parotid gland.

- Superficial Facial Lymph Glands: The superficial facial lymph glands are based on several lymph glands in the region of face. However, the major ones are described below:
 - Infraorbital Lymph Glands (or Maxillary Glands): The infraorbital lymph glands remain scattered along the angle between the nose and cheek, and below the margin of the orbit.
 - Buccinator Lymph Glands: The buccinator lymph glands are found on the superficial surface of the anterior part of buccinator muscle, opposite to the angle of the mouth.
 - Supramandibular Lymph Glands: The supramandibular lymph glands lie on the outer surface of the mandible at the anterior border of the masseter muscle, between the external maxillary artery and the anterior facial vein.
- f) The Deep Facial Lymph Glands (or Internal Maxillary Glands): The deep facial lymph glands are found in association with the internal maxillary artery, on the outer surface of the external pterygoid muscle.
- g) The Lingual Lymph Glands: The lingual lymph glands are based on two or three small nodules that exist on the lateral surfaces of the hypoglossal and genioglossus muscles.
- h) The Retropharyngeal Glands: The retropharyngeal glands are located in the buccopharyngeal fascia behind the upper part of the pharynx.
- 4. The Lymph Glands of the Neck: The lymph glands of the neck are divided into the following major groups:
 - a) The Submaxillary Glands: The submaxillary glands are a pair of salivary glands located on each side under the body of the mandible.
 - b) The Submental (or Suprahyoid Glands): The submental glands are located beneath the chin, and between the anterior bellies of the two digastric muscles.
 - c) The Superficial Cervical Glands: The superficial cervical glands remain embedded in the deep fascia along the course of the external jugular vein, and superficial to the sternomastoid muscle.
- 5. The Anterior Cervical Glands: The lymph glands of the anterior neck region are divisible into the following two groups:
 - a) Superficial Anterior Cervical Lymph Glands- The superficial anterior cervical lymph glands exist in association with the anterior jugular veins.
 - b) Deep Anterior Cervical Lymph Glands: The deep anterior cervical lymph glands are divisible into the following groups/types:
 - i) infrahyoid glands obtain lymph fluid from the region of epiglottis and transport it to the deep cervical glands.
 - ii) prelaryngeal gland obtains lymph from the anterior portion of the larynx, the isthmus, and the portions of the right and left lobes of the thyroid gland.
 - iii) pretracheal lymph glands are the numerous small nodules that follow the course of the inferior thyroid veins.
 - iv) paratracheal lymph glands lie in association with the branches of the superior and inferior thyroid arteries and the recurrent nerves.
 - c) Deep Cervical Glands: The deep cervical glands are the intercommunicating lymph vessels that remain positioned in the anterior and posterior triangles of the neck, and under the cover of the sternomastoid muscle. These glands are divisible into the following groups:
 - superior deep cervical glands are located under the cover of the sternomastoid muscle, and lie in close association with the accessory nerve and internal jugular vein.
 - ii) inferior deep cervical glands are located below the level of the omohyoid muscle.
 - Lymphatic vessels of the scalp are distributed in the soft tissue envelope of the frontal, temporoparietal and the occipital regions of the cranium.
 - e) Lymphatic Vessels of the Ear divide into upper and lateral portions of the auricle and terminate into the anterior auricular glands.
 - f) Lymphatic vessels of the face are more widely distributed than the scalp vessels, and can be divided into the following groups:

Chapter 9: Diseases of the Circulator ያናያናኛምሽ (ነዕው ዓምም) is permitted during the examination.

- 6. Lymphatic Vessels of the Eyelids and Conjunctiva: The lymphatic vessels of the eyelids and conjunctiva form the following two groups:
 - a) Medial Lymph Vessels: The medial lymph vessels travel from the medial portions of the superior and inferior eyelids, and terminate to the submaxillary lymph glands.
 - b) Lateral Lymph Vessels: The lateral lymph vessels arise from the lateral parts of the eyelids, and terminate into the anterior auricular and the parotid lymph glands.
 - c) Lymphatic Vessels of the Cheeks: The superficial and deep lymphatic vessels of the cheeks usually communicate with the submaxillary glands.
 - d) Lymphatic Vessels of the Lips: The lymphatic vessels of the lips drain lymph fluid to the submental and submaxillary glands.
 - Lymphatic Vessels of the Nose: The lymphatic vessels from the external part of the nose drain lymph fluid to the anterior auricular and submaxillary glands.
 - f) Lymphatic Vessels of the Nasal Cavities: The lymphatic vessels from the anterior and posterior portions of the nasal cavities drain lymph fluid to the submaxillary, the retropharyngeal, and the superior deep cervical glands.
 - g) Lymphatic Vessels of the Mouth: The lymphatic vessels of the mouth can be divided into the following groups:
 - h) Lymphatic Vessels of the Palatine Tonsil: The lymphatic vessels of the palatine tonsil arise from the buccopharyngeal fascia and constrictor pharyngis superior and meet with the superior deep cervical glands.
 - i) Lymphatic Vessels of the Tongue: The lymphatic vessels of the tongue are divided into the following three groups:
 - i) anterior lymph vessels of the tongue drain lymph fluid from the tip and lower surface of the tongue to the submental glands.
 - iii) middle lymph vessels of the tongue drain lymph fluid from the anterior two third portion of the tongue to the submaxillary and medial superior deep cervical glands.
 - iii) posterior lymph vessels of the tongue drain lymph fluid from the portion of the tongue, which lies in the anterior wall of pharynx.
 - j) Lymphatic Vessels of the Gums: The lymph vessels of the anterior portion of mandibular gum drain lymph fluid to the submandibular gland. The lymph vessels from the inner portion of the mandibular gum also drain lymph fluid to the submaxillary glands.
 - k) Lymphatic Vessels of the Teeth: The lymph vessels of the teeth and mandible transport lymph fluid to the sub maxillary or the superior deep cervical glands.
- The Lymphatics of the Upper Extremity: The lymph glands of the upper extremity are divisible into the following two groups:
 - a) The Superficial Lymph Glands- The superficial lymph glands of the upper extremity are of the following types:
 - supratrochlear lymph glands are situated above the medial epicondyle of humerus, and drain lymph fluid from the middle, ring and little fingers, and the portions of the hand and forearm.
 - ii) deltoideopectoral lymph glands are located in the groove between the pectoralis major and deltoid muscles.
 - b) The Deep Lymph Glands: The deep lymph glands are chiefly found in the axillary region, where they constitute several constant as well as variable groups.
 - lateral group of axillary lymph glands lies along the line of the great axillary vessels. These glands drain lymph fluid from the greater part of the upper extremity to the central and inferior deep cervical glands.
 - ii) anterior group of axillary lymph glands travels from third to sixth intercostal space, along the line of the lateral thoracic artery.
 - iii) posterior group of axillary lymph glands lies along the posterior wall of axilla, and follow the course of the subscapular vessels.
 - iv) central group of axillary lymph glands are located in the central part of the axilla, and along the line of the intercostobrachial nerve.
 - v) infra-clavicular group of axillary lymph glands is found between the upper border of the pectoralis minor muscle and the clavicle, along the medial side of the axillary artery.
 - c) The Lymphatic Vessels of the Upper Extremity: The lymphatic vessels of the upper extremity are divisible into the following two groups:
 - superficial lymph vessels of the upper extremity are located in the skin and subcutaneous tissues, and commence in the cutaneous plexuses on the volar aspects of the fingers and hand.
 - ii) deep lymph vessels of the upper extremity follow the course of the deeper blood vessels in the regions of the forearm and hand.

- 8. Lymphatics of the Lower Extremity: The lymph glands of the lower extremity are divisible into the following groups:
 - a) The Superficial Lymph Glands- superficial lymph glands are found in the superficial fascia in subinguinal and inguinal regions. These glands are separable into the following groups:
 - inguinal lymph glands are located above the level of the inguinal ligament.
 - superficial sublingual lymph glands are divisible into the proximal and distal groups.
 - b) Deep Lymph Glands: The deep lymph glands of the inferior extremity are divided into the following two groups:
 - i) popliteal lymph glands are located in the popliteal fossa.
 - ii) deep sublingual lymph glands are located in the femoral trigone.
 - c) Lymphatic Vessels of the Lower Extremity: The lymphatic vessels of the lower extremity are based on the following two groups:
 - superficial lymphatic vessels are located in the superficial fascia and divided into vessels of the medial group arises on the tibial side and dorsum of the foot, and terminates in the distal group of superficial subinguinal glands and vessels of the lateral group commences from the fibular side of the foot.
 - deep lymphatic vessels of the lower extremity follow the course of the deep blood vessels, and terminate into the deep subinguinal and hypogastric glands.
- 9. The Lymphatics of the Abdomen and Pelvis: The lymph glands of the abdomen and pelvis are divisible into parietal lymph glands and visceral lymph glands.
 - a) External Iliac Glands: The external iliac group of glands pertains to the pelvic region, located along the course of the external iliac vessels, and constitutes the lateral, intermediate and medial chains.
 - b) Common Iliac Glands: The common iliac glands of the pelvis are located on the sides of the common iliac artery and below the bifurcation of aorta.
 - c) Epigastric Glands: The epigastric glands of the anterior abdominal wall are divisible into the following types:
 - superior epigastric gland is located in the superficial fascia of the median part of the epigastric region.
 - iii) inferior epigastric glands are located along the course of the inferior epigastric artery.
 - Circumflex Iliac Glands: The circumflex iliac glands of the anterior abdominal wall follow the course of the deep circumflex iliac artery in the lateral aspect of groin.
 - e) Hypogastric Glands: The hypogastric glands of the pelvis are located along the course of the hypogastric vessels.
 - i) gluteal lymph glands
 - ii) pubo-gluteal lymph glands
 - iii) middle hemorrhoidal gland
 - iv) inter-iliac glands

i)

- v) obturator gland
- f) Sacral Glands: The sacral lymph glands of the pelvis are located along the anterior aspect of sacrum, between the anterior sacral foramina.
- g) Lumbar Glands: The lumbar lymph glands are located behind the peritoneum of the posterior wall of the abdomen. The lumbar lymph glands are further separable into the following groups:
 - i) right lateral aortic glands
 - ii) left lateral aortic glands
 - iii) preaortic glands
 - iv) retroaortic glands
- h) Superior Gastric Glands: The superior gastric glands exist in association with the left gastric artery and constitute the following subdivisions:
 - i) anterior left gastric glands (or lower coronary glands)
 - ii) right paracardial glands
 - iii) left paracardial glands
 - iv) posterior paracardial glands
 - v) posterior left gastric glands (or upper coronary glands)
 - vi) right gastric gland (or pyloric gland)
 - vii) left suprapancreatic glands
 - viii) right suprapancreatic glands
 - ix) subpyloric glands
 - x) biliary lymph glands

Chapter 9: Diseases of the Circulatory System (අභ - Top) errata is permitted during the examination.

- Inferior Gastric Glands (or Right Gastroepiploic Glands): The inferior gastric glands are associated with the greater curvature of the stomach and follow the course of the right gastroepiploic artery.
- j) Hepatic Glands: The hepatic lymph glands exist in the region of porta hepatis (or transverse fissure of the liver), between the layers of the lesser omentum.
- Pancreaticolienal Glands (or Splenic Glands): The pancreaticolienal glands are positioned in relation to the posterior surface and upper border of pancreas, and follow the course of the lienal (or splenic) artery.
- Mesenteric Glands: The mesenteric lymph glands are located between the layers of the mesentery.
- m) Ileocolic glands: The ileocolic glands are located around the ileocolic artery and form the following major groups:
 - i) ileal glands
 - ii) anterior ileocolic glands
 - iii) posterior ileocolic glands
 - iv) right colic glands
- Mesocolic Glands: The mesocolic glands exist in close association with the transverse colon.
- o) Inferior Mesenteric Glands- The inferior mesenteric glands are located on the branches of the left colic and sigmoid arteries, the superior hemorrhoidal artery, and the muscular coat of the rectum.

10. The Lymphatic Vessels of the Abdominal Viscera and the Superior and Posterior Walls of the Abdomen

- a) Lymphatic Vessels of the Abdominal Part of the Alimentary Canal
- b) Lymphatic Vessels of the Stomach
- c) Lymphatic Vessels of the Duodenum
- d) Lymphatic Vessels of the Jejunum and Ileum (or the Lacteals)
- e) Lymphatic Vessels of the Cecum, Vermiform Process, and the Ascending Colon
- f) Lymphatic Vessels of the Right Colic Flexure and the Transverse Colon
- g) Lymphatic Vessels of the Left Colic Flexure, Descending Colon, Iliac Colon, and Pelvic Colon
- h) Lymphatic Vessels of the Liver
- i) Lymphatic Vessels of the Gall Bladder
- j) Lymphatic Vessels of the Pancreas
- k) Lymphatic Vessels of the Spleen
- I) Lymphatic Vessels of the Kidneys
- m) Lymphatic Vessels of the Ureters
- n) Lymphatic Vessels of the Suprarenal Glands
- o) Lymphatic Vessels of the Diaphragm

11. The Lymphatic Vessels of the Pelvic Viscera

- a) lymphatic Vessels of the Male Urethra
- b) Lymphatic Vessels of the Prostate

- c) Lymphatic Vessels of the Female Urethra
- d) Lymphatic Vessels of the Seminal Vesicle
- e) Lymphatic Vessels of the Ductus Deferens
- f) Lymphatic Vessels of the Urinary Bladder
- g) Lymphatic Vessels of the Ureter
- h) Lymphatic Vessels of the Vagina
- i) Lymphatic Vessels of the Uterus
- j) Lymphatic Vessels of the Uterine Tube
- k) Lymphatic Vessels of the Ovaries
- I) Lymphatic Vessels of the Testis and Epididymis
- m) Lymphatic Vessels of the Anus, Anal Canal and Rectum

12. The Lymphatics of the Thorax

- The Lymph Glands of the thorax are separable into the following groups:
- a) Sternal Lymph Glands- The sternal lymph glands are located at the margins of the sternum along the side of the internal mammary artery.
- b) Intercostal Lymph Glands- The intercostal lymph glands are situated in the posterior portions of the intercostal spaces (in relation to the intercostal vessels), and in front of the heads of the ribs.
- c) Anterior Mediastinal Lymph Glands- The anterior mediastinal lymph glands are located in the lower portion of the anterior mediastinum, and the anterior part of the superior mediastinal cavity.
- d) Posterior Mediastinal Lymph Glands- The posterior mediastinal lymph glands exist along the thoracic part of the esophagus and the descending thoracic aorta.
- e) Bronchial Lymph Glands- The bronchial lymph glands lie along the walls of the intrathoracic of the trachea, the bronchi and their intrapulmonary branches. These glands are further categorized into the following groups:
 - i) tracheobronchial lymph glands
 - lymph glands of the bifurcation (or intertracheobronchial lymph glands)
 - iii) bronchopulmonary lymph glands
 - iv) pulmonary lymph glands

13. The Lymphatic Vessels of the Thorax

These vessels are divisible into the following groups:

- a) Intercostal Lymph Vessels
- b) Lymph Vessels of the Diaphragm
- c) Lymphatic Vessels of the Contents of the Thorax: The lymphatic vessels of the contents of the thorax are divisible into the following groups:
 - i) lymph vessels of the heart
 - ii) lymph vessels of the pericardium
 - iii) lymph vessels of the thymus
 - iv) lymph vessels of the thoracic part of esophagus
 - v) lymph vessels of the pleura
 - vi) lymph vessels of the lungs

Proctors: This errata is permitted during the examination.

- EXCLUDES2 certain conditions originating in the perinatal period (P04-P96)
 - certain infectious and parasitic diseases (A00-B99) complications of pregnancy, childbirth and the puerperium
 - (O00-O9A) congenital malformations, deformations, and chromosomal abnormalities (Q00-Q99)
 - endocrine, nutritional and metabolic diseases (E00-E88)
 - injury, poisoning and certain other consequences of external
 - causes (S00-T88)
 - neoplasms (C00-D49)
 - symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified (R00-R94)
 - systemic connective tissue disorders (M30-M36)
 - transient cerebral ischemic attacks and related syndromes (G45.-)

This chapter contains the following blocks:

- I00-I02 Acute rheumatic fever
- I05-I09 Chronic rheumatic heart diseases
- I10-I16 Hypertensive diseases
- I20-I25 Ischemic heart diseases
- 126-128 Pulmonary heart disease and diseases of pulmonary circulation
- I30-I52 Other forms of heart disease
- I60-I69 Cerebrovascular diseases
- **I70-I79** Diseases of arteries, arterioles and capillaries
- 180-189 Diseases of veins, lymphatic vessels and lymph nodes, not elsewhere classified
- 195-199 Other and unspecified disorders of the circulatory system

Acute rheumatic fever (I00-I02)

	100	Rheun	natic fever without heart involvement		107		Rifeumatio
		AHA:	24 2016	49	107	Rneun	natic tricus
		INCLUI	DES arthritis, rheumatic, acute or subacute			INCLUE	DES rheun
		EXCLU	DES1 rheumatic fever with heart involvement (I01.0 -I01.9)			<u> </u>	uns
4 th	101	Rheun	natic fever with heart involvement			EXCLUI	DES1 tricus
		EXCLU	DES1 chronic diseases of rheumatic origin (105-109) unless				tricus
			rheumatic fever is also present or there is evidence of				invo
			reactivation or activity of the rheumatic process.			107.0	Rheumati
		l01.0	Acute rheumatic pericarditis			107.1	Iricuspid (
			Any condition in I00 with pericarditis			107.1	Kneumati
			Rheumatic pericarditis (acute)			107.2	Phoumati
			EXCLUDES1 acute pericarditis not specified as rheumatic (130)			107.2	Othor rho
		101.1	Acute rheumatic endocarditis			107.0	Dhoumati
			Any condition in 100 with endocarditis or valvulitis			107.9	Phoumatic
		101.0	Acute rheumatic valvulitis	40	108	Multin	le valve di
		101.2	Acute rheumatic myocarditis			INCLU	DES multi
		101.0	Any condition in 100 with myocarditis			EVCIII	DECI ondo
		101.0	Any condition in 100 with other or multiple types of heart			EXCLU	
			involvement				muitij 126
			Acute rheumatic pancarditis				150.
		101.9	Acute rheumatic heart disease, unspecified			100.0	rneun Dhaumati
			Any condition in I00 with unspecified type of heart involvement			100.0	Involuence
			Rheumatic carditis, acute				rheumat
~			Rheumatic heart disease, active or acute			108.1	Rheumati
4"	102	Rheun	natic chorea			108.2	Rheumati
		DEFINII	10N: Chorea is an abnormal involuntary movement resembling			108.3	Combined
		MICLU	nageung of dancing.				tricuspid v
		INCLUI	DES Sydennam's chorea			108.8	Other rhe
		EXCLU	DEST chorea NOS (G25.5)			108.9	Rheumati
			Huntington's chorea (G10)	4 th	109	Other	rheumatic
		102.0	Rheumatic chorea with heart involvement			109.0	Rheumati
			Chorea NOS with heart involvement				EXCLUDES
			classifiable upder 101			109.1	Rheumati
		102.9	Rheumatic chorea without heart involvement				Rheumatio
			Rheumatic chorea NOS				Rheumatio
							EXCLUDES

04-P96) OS Rheumatic mitral valve diseases

Chronic rheumatic heart diseases (105-109)

INCLUDES conditions classifiable to both 105.0 and 105.2-105.9, whether specified as rheumatic or not EXCLUDES1 mitral valve disease specified as nonrheumatic (134.-)

mitral valve disease with aortic and/or tricuspid valve involvement (I08.-) 105.0 Rheumatic mitral stenosis

- Mitral (valve) obstruction (rheumatic) I05.1 Rheumatic mitral insufficiency Rheumatic mitral incompetence Rheumatic mitral regurgitation
 - EXCLUDES1 mitral insufficiency not specified as rheumatic (134.0)
- I05.2
 Rheumatic mitral stenosis with insufficiency Rheumatic mitral stenosis with incompetence or regurgitation

 I05.8
 Other rheumatic mitral value diseases
- **I05.8 Other rheumatic mitral valve diseases** Rheumatic mitral (valve) failure
- 105.9 Rheumatic mitral valve disease, unspecified Rheumatic mitral (valve) disorder (chronic) NOS

IO6 Rheumatic aortic valve diseases

- EXCLUDES1 aortic valve disease not specified as rheumatic (135.-) aortic valve disease with mitral and/or tricuspid valve
- involvement (108.-) 106.0 Rheumatic aortic stenosis Rheumatic aortic (valve) obstruction 106.1 Rheumatic aortic insufficiency
- Rheumatic aortic incompetence Rheumatic aortic regurgitation 106.2 Rheumatic aortic stenosis with insufficiency
- Rheumatic aortic stenosis with incompetence or regurgitation
- I06.8
 Other rheumatic aortic valve diseases

 I06.9
 Rheumatic aortic valve disease, unspecified
- Rheumatic aortic (valve) disease NOS 7 Rheumatic tricuspid valve diseases
- INCLUDES rheumatic tricuspid valve diseases specified as rheumatic or unspecified
 - EXCLUDES1 tricuspid valve disease specified as nonrheumatic (136.-) tricuspid valve disease with aortic and/or mitral valve involvement (108.-)
 - 107.0 Rheumatic tricuspid stenosis Tricuspid (valve) stenosis (rheumatic)
 107.1 Rheumatic tricuspid insufficiency
 - Tricuspid (valve) insufficiency (rheumatic)
 - 107.2 Rheumatic tricuspid stenosis and insufficiency
 - I07.8
 Other rheumatic tricuspid valve diseases

 I07.9
 Rheumatic tricuspid valve disease, unspecified
 - Rheumatic tricuspid valve disorder NOS Multiple valve diseases
 - ICLUDES multiple valve diseases specified as rheumatic or unspecified **<u>XCLUDES1</u>** endocarditis, valve unspecified (I38)
 - multiple valve disease specified a nonrheumatic (134.-, 135.-, 136.-, 137.-, 138.-, Q22.-, Q23.-, Q24.8-) rheumatic valve disease NOS (109.1)
 - 108.0 Rheumatic disorders of both mitral and aortic valves Involvement of both mitral and aortic valves specified as rheumatic or unspecified
 - 108.1 Rheumatic disorders of both mitral and tricuspid valves
 - 108.2Rheumatic disorders of both aortic and tricuspid valves108.3Combined rheumatic disorders of mitral, aortic and
- tricuspid valves 108.8 Other rheumatic multiple valve diseases 108.9 Rheumatic multiple valve disease, unspecified O Other rheumatic heart diseases
- 109.0
 Rheumatic myocarditis

 EXCLUDES1
 myocarditis not specified as rheumatic (I51.4)

 109.1
 Rheumatic diseases of endocardium, valve unspecified Rheumatic endocarditis (chronic)
 - Rheumatic valvulitis (chronic) **EXCLUDES1** endocarditis, valve unspecified (138)

 Unspecified Code
 Other Specified Code
 Manifestation Code
 Newborn
 Pediatric
 Maternity
 Adult
 Image: Adult
 <t

100 - 109.1

	100.2	Character			11		
	109.2	Adhere	nt pericardium, rheumatic	W 113	Hyper	DES any	eart and chronic kloney disease
		Chronic	rheumatic mediastinopericarditis		INCLU	CON	diorenal disease
		Chronic	rheumatic myopericarditis			cari	diovascular renal disease
	100.0	EXCLUD	ES1 chronic pericarditis not specified as rheumatic (131)		l13.0	Hyperte	nsive heart and chronic kidney disease with heart
5	109.8	Other s	pecified rheumatic heart diseases			failure a	nd stage 1 through stage 4 chronic kidney disease,
		109.81	Use additional code to identify type of heart failure (150 -)]		or unsp	ecified chronic kidney disease
		109.89	Other specified rheumatic heart diseases			Use add	itional code to identify type of heart failure (ISU)
			Rheumatic disease of pulmonary valve			(N18.1	-N18.4. N18.9)
	109.9	Rheum	atic heart disease, unspecified	5	113.1	Hyperte	nsive heart and chronic kidney disease without
		Rheuma	atic carditis			heart fa	ilure
		EXCLUD	rneumatola caraltis (NIUS.31)			113.10	Hypertensive heart and chronic kidney disease
Hypor	tonciv	o disos	asos (110-116)				4 chronic kidney disease, or unspecified chronic
пурег	CENSIV	e uisea	1323 (110-110)				kidney disease
Use	additio	nal code	to identify:				Hypertensive heart disease and hypertensive chronic
ex	posure tory of	to enviro	dependence (787 891)				Use additional code to identify the stage of chronic
00	cupatic	nal expo	uspendence (207.097)				kidney disease (N18.1-N18.4, N18.9)
to	bacco d	lepender	nce (F17)			113.11	Hypertensive heart and chronic kidney disease
to	bacco u	ise (Z72.0))				disease or and stage repaidings on a life areas
EXC	LUDES1	neonata	l hypertension (P29.2)				Use additional code to identify the stage of chronic
		primary	pulmonary hypertension (127.0)				kidney disease (N18.5, N18.6)
EXC	LUDES2	hyperter	nsive disease complicating pregnancy, childbirth and the		l13.2	Hyperte	nsive heart and chronic kidney disease with heart
110	Eccont	puerpe	erium (010-011, 013-016)			failure a	nd with stage 5 chronic kidney disease, or end stage
110	AHA:	.iai (priii) 04 2016.	04 2013			Use add	itional code to identify type of heart failure (150)
	INCLU	DES hig	h blood pressure			Use add	itional code to identify the stage of chronic kidney
		hy	pertension (arterial) (benign) (essential) (malignant) primary) (systemic)			diseas	e (N18.5, N18.6)
	EXCLU	DES1 hyp	pertensive disease complicating pregnancy, childbirth and he puerperium (010-011, 013-016)				Brain stroke
	EXCLU	DES2 ess (1	ential (primary) hypertension involving vessels of brain 160-169)		0		
		ess (ential (primary) hypertension involving vessels of eye H35.0-)		hypert	Vision loss ensive retinop	athy
🐠 l11	Hyper	tensive b	neart disease (Figure 9.1)				
	INCLUI	DES an	y condition in 150, 151.4-151.9 due to hypertension				
	111.0	Hyperte	ensive heart disease with heart failure				
		Hyperte	ensive heart failure				
		Use add	ditional code to identify type of heart failure (I50)				Heart attack
	111.9	Hyperte	ensive heart disease without heart failure				
a i12	Hyper	Hyperte tensive (ensive heart disease NOS	Blood ves athero	sel damage sclerosis		
•	INCLUI	DES an	v condition in N18 and N26 - due to hypertension				
		art	eriosclerosis of kidney				
		art	eriosclerotic nephritis (chronic) (interstitial)				Kidney failure
		hy	pertensive nephropathy				
		nej	ohrosclerosis				
	EXCLU	DES1 hy	pertension due to kidney disease (115.0, 115.1)				101
		ren	ovascular hypertension (l15.0)			Figure	9 1 Complications of Hypertension
		sec	rondary hypertension (115)			Figure	2.1 complications of hypertension
	EXCLU	DES2 act	ite kidney failure (N17)	🎱 l15	Secon	dary hyp	ertension
	112.0	Hyperte	ensive chronic kidney disease with stage 5 chronic disease or end stage renal disease		Code	also unde	riying condition
		AHA: Q	3 2016		EXCLU	DES2 soci	iprocedulul hypertension (197.3) andary hypertension involving vessels of brain (160.160)
		Use add	ditional code to identify the stage of chronic kidney		EXCLU	Seco	naary hypertension involving vessels of otalli (100-109) andary hypertension involving vessels of eve (H25 0-)
	112.0	diseas	se (N18.5, N18.6)		l15.0	Renovas	scular hypertension
	112.9	stage 4	chronic kidney disease, or unspecified chronic		115.1	Hyperte	nsion secondary to other renal disorders
		kidney	disease HCC MA			AHA: Q3	3 2016
		Hyperte	ensive chronic kidney disease NOS		115.2	Hyperte	ension secondary to endocrine disorders
		Hyperte	ensive renal disease NOS		115.8	Second:	ary hypertension unspecified
		diseas	se (N18.1-N18.4, N18.9)		113.9	Seconda	a y nypertension, unspecified

Proctors: This errata is permitted during the examination.

Code exempt from diagnosis present on admission requirement
 Questionable admission Complication or comorbidity
 Principal diagnosis as its own CC
 Principal diagnosis as its own MCC
 Principal diagnosis as its own CC
 Principal diagnosis as its own MCC
 Principal diagnosis own

109.2 - 115.9

Tabul	ar Lis	t Proctors: This errata is permitte	ed during the exa	amination.	l16 - l21.9
49 116	Hyper	tensive crisis	5 121.0	ST elevation (STEMI) myocardial infa	arction of anterior wall
	Code	also any identified hypertensive disease (I10-I15)		Type 1 ST elevation myocardial infarc	tion of anterior wall
	116.0	Hypertensive urgency AHA: Q4 2016		I21.01 ST elevation (STEMI) myoca left main coronary artery	
	116.1	Hypertensive emergency		AHA: Q4 2017 I21.02 ST elevation (STEMI) myoca	rdial infarction
	116.9	Hypertensive crisis, unspecified		involving left anterior desc	ending coronary
		AHA: Q4 2016		artery	
				ST elevation (STEMI) myocar	dial infarction involving
Ischen	nic he	art diseases (120-125)		diagonal coronary artery	
Use	additic Angin	onal code to identify presence of hypertension (I10-I16) a pectoris		other coronary artery of ant	
	Use ad	dditional code to identify:		Acute transmural myocardia	l infarction of anterior wall
	expo histo	osure to environmental tobacco smoke (277.22)		Anteroapical transmural (Q	vave) infarction (acute)
	OCCL	upational exposure to environmental tobacco smoke (Z57.31)		Anteroseptal transmural (Q Anteroseptal transmural (Q	wave) infarction (acute) wave) infarction (acute)
	toba	acco dependence (F17)		Transmural (Q wave) infarcti	on (acute) (of) anterior
	toba	acco use (Z72.0)		(wall) NOS	viction of inforior wall
	EXCLU	DES1 angina pectoris with atherosclerotic heart disease of native	121.1	Type 1 ST elevation (STEWI) myocardial infarc	tion of inferior wall
		atherosclerosis of coronary artery bypass araft(s) and		I21.11 ST elevation (STEMI) myoca	rdial infarction involving
		coronary artery of transplanted heart with angina pectoris		right coronary artery	
		(125.7-)		Inferoposterior transmural (wave) infarction (acute)
	120.0	postinfarction angina (123.7)		I21.19 ST elevation (STEMI) myoca	rdial infarction involving
	120.0	Accelerated angina		other coronary artery of inf	
		Crescendo angina		Acute transmural myocardia	l infarction of inferior wall
		De novo effort angina Intermediate coronary syndrome		Inferolateral transmural (Q w	vave) infarction (acute)
		Preinfarction syndrome		diaphragmatic wall	on (acute) (or)
	120.1	Worsening effort angina		Transmural (Q wave) infarcti	on (acute) (of) inferior
	120.1	Angiospastic angina		(wall) NOS	MI) muccardial infanction
		Prinzmetal angina		involvina left c	ircumflex coronary artery
		Spasm-induced angina		(121.21)	
	120.8	Other forms of angina pectoris	5 I21.2	ST elevation (STEMI) myocardial infa	arction of other sites
		Angina equivalent		121.21 ST elevation myocardial infarc	rdial infarction involving
		Angina of effort Coronary slow flow syndrome		left circumflex coronary art	ery НСС мсс кинсс ссмсс еже
		Stenocardia		AHA: Q4 2017 ST elevation (STEMI) myocar	dial infarction involving
		Stable angina Use additional code(s) for symptoms associated with angina	K	oblique marginal coronary	artery
		equivalent		121.29 ST elevation (STEMI) myoca	rdial infarction involving
	120.9	Angina pectoris, unspecified		AHA: Q4 2017	
		Angina NOS Anginal syndrome		Acute transmural myocardia	l infarction of other sites
		Cardiac angina		Apical-lateral transmural (Q Basal-lateral transmural (O w	wave) infarction (acute)
🚇 I21	Acute	Ischemic chest pain		High lateral transmural (Q w	ave) infarction (acute)
121	INCLU	DES cardiac infarction		Lateral (wall) NOS transmural	(Q wave) infarction (acute)
		coronary (artery) embolism		Posterobasal transmural (Q	vave) infarction (acute)
		coronary (artery) occlusion		Posterolateral transmural (Q	wave) infarction (acute)
		coronary (artery) rupture		Septal transmural (Q wave) i	nfarction (acute) NOS
		infarction of heart, myocardium, or ventricle	I21.3	ST elevation (STEMI) myocardial infa	arction of unspecified
		myocardial infarction specified as acute or with a stated			
	Lico ar	duration of 4 weeks (28 days) or less from onset		Acute transmural myocardial infarction	on of unspecified site
	expo	osure to environmental tobacco smoke (Z77.22)		Transmural (Q wave) myocardial infar	ction NOS
	histo	pry of tobacco dependence (Z87.891)	121.4	Non-ST elevation (NSTEMI) myocard	lial
	οςςι	upational exposure to environmental tobacco smoke (Z57.31)		infarction	
	stati th	us post administration of tPA (rtPA) in a different facility within e last 24 hours prior to admission to current facility (792.82)		AHA: Q1 2017, Q4 2017, Q2 2015 Acute subendocardial myocardial inf	arction
	toba	acco dependence (F17)		Non-Q wave myocardial infarction N	DS
	toba	acco use (Z72.0)		Nontransmural myocardial infarction	NOS
	EXCLU	DES2 old myocardial infarction (I25.2)	121 9	Acute myocardial infarction upspect	
		postmyocardial infarction syndrome (I24.1)		AHA: Q4 2017	
		subsequent type 1 myocardial infarction (122)		Myocardial infarction (acute) NOS	
			1		

 Unspecified Code
 Other Specified Code
 Manifestation Code
 Newborn
 Pediatric
 Maternity
 Adult
 ✓
 Male
 ♀
 Female

 ● New Code
 ▲ Revised Code Title
 ►
 Revised Text
 Notes
 INCLUDES
 INCLUDES
 INCLUDES
 Not coded here
 INCLUDES
 Not included here

 ● 4th character required
 ● 5th character required
 ● 6th character required
 ● 7th character required
 ● Extension 'X' Alert

 IMC
 Hospital-acquired condition (HAC) alert
 AHA
 AHA Coding Clinic^o
 Imc
 Code first alert
 TIP
 Coding guidance

I21.A - I23.3

Proctors: This errata is permitted during the examination.

Solution Solution	I21.A Ot I21.A Ot I2 I2 I2 I2 I2 I2 I2 I2 I2 I2 I2 I2 I2	her type of myocardial infarction I.A1 Myocardial infarction type 2 AHA: Q4 2017 Myocardial infarction due to demand ischemia Myocardial infarction secondary to ischemic imbalance Code also the underlying cause, if known and applicable, such as: anemia (D50.0-D64.9) chronic obstructive pulmonary disease (J44) heart failure (I50) paroxysmal tachycardia (I47.0-I47.9) renal failure (I17.0-N19) shock (R57.0-R57.9) 1.A9 Other myocardial infarction type AHA: Q4 2017 Myocardial infarction associated with revascularization procedure Myocardial infarction type 4a Myocardial infarction type 4b Myocardial infarction type 4b Myocardial infarction type 5 Code first , if applicable, postprocedural myocardial infarction type 45 Myocardial infarction, if known and applicable, surgery (197.790) Code also complication, if known and applicable, such as: (acute) stent scenosis (T82.897-) (acute) stent stenosis (T82.897-) (acute) stent thrombosis (T82.897-) (acute) stent thrombosis (T82.887-) (acute) stent thrombosis (T82.897-) (acute) stent thrombosis infarction of percutaneous coronary intervention (PCI) (197.89) occlusion of coronary artery bypass graft (T82.218-) Int ST elevation (STEMI) and non-ST elevation (NSTEMI) al infarction of heart, myocardial infarction reinfarction of tPA (rtPA) in	I22.0 I22.1 I22.2 I22.8 I22.8 I22.8 I22.9 I22.9 I22.9 I22.9 I22.9 I22.9 I22.9 I22.9 I22.9 I22.1 I22.1	Subsequent ST elevation (STEMI) myocardial infarction of anterior wall Subsequent acute transmural myocardial infarction of anterior wall Subsequent anteroapical transmural (Q wave) infarction (acute) Subsequent anteroapical transmural (Q wave) infarction (acute) Subsequent anteroseptal transmural (Q wave) infarction (acute) Subsequent anteroseptal transmural (Q wave) infarction (acute) Subsequent anteroseptal transmural (Q wave) infarction (acute) Subsequent ST elevation (STEMI) myocardial infarction of inferior wall AHA: Q4 2012 Subsequent transmural (Q wave) infarction of inferior wall Subsequent transmural (Q wave) infarction (acute) Subsequent transmural (Q wave) infarction (acute)(of) diaphragmatic wall Subsequent transmural (Q wave) infarction (acute) Subsequent inferolateral transmural (Q wave) infarction (acute) Subsequent inferolateral transmural (Q wave) infarction (acute) Subsequent non-ST elevation (NSTEMI) myocardial infarction Subsequent non-ST elevation (NSTEMI) myocardial infarction NOS Subsequent non-Q wave myocardial infarction NOS Subsequent subendocardial infarction NOS Subsequent acute subendocardial infarction NOS Subsequent acute transmural myocardial infarction of other sites Subsequent acute transmural myocardial infarction of other sites Subsequent acute transmural (Q wave) myocardial infarction (acute) Subsequent hasil-lateral transmural (Q wave) myocardial infarction (acute) Subsequent posterior (true) > transmural 4 (Q wave) myocardial infarction (acute) (of) lateral (wall) NOS Subsequent posteroolateral transmural (Q wave) myocardial infarction (acute) Subsequent posterolateral transmural (Q wave) myocardial infarction (acute) Subsequent posterolateral transmural (Q wave) myocardial infarction (acute) Subsequent posterolateral transmural (Q wave) myocard
	Use addit exposur history o occupat status p the la: tobacco tobacco	reinfarction of myocardium rupture of heart, myocardium, or ventricle subsequent type 1 myocardial infarction ional code, if applicable, to identify: e to environmental tobacco smoke (Z77.22) of tobacco dependence (Z87.891) ional exposure to environmental tobacco smoke (Z57.31) ost administration of tPA (rtPA) in a different facility within it 24 hours prior to admission to current facility (Z92.82) dependence (F17) use (Z72.0)	I23 Certain non-S ⁻ period I23.0	In current complications following ST elevation (STEMI) and T elevation (NSTEMI) myocardial infarction (within the 28 day I) Hemopericardium as current complication following acute myocardial infarction EXCLUDES1 hemopericardium not specified as current complication following acute myocardial infarction EXCLUDES1 hemopericardium not specified as current complication following acute myocardial infarction EXCLUDES1 acquired atrial septal defect not specified as current complication following acute myocardial inforction following acute myocardial information
	EXCLUDES	 subsequent myocardial infarction, type 2 (l21.A1) subsequent myocardial infarction of other type (type 3) (type 4) (type 5) (l21.A9) 	I23.2 I23.3	Intarction (151.0) Ventricular septal defect as current complication following acute myocardial infarction A complication following acute myocardial infarction (151.0) Rupture of cardiac wall without hemopericardium as current complication following acute myocardial infarction A complication following acute myocardial AHA: Q2 2017

Unacceptable principal diagnosis symbol per Medicare code edits
 Questionable admission
 Complication or comorbidity
 Principal diagnosis as its own CC
 Principal diagnosis as its own CC
 Principal diagnosis as its own CC
 Principal diagnosis
 Complication or comorbidity
 Principal diagnosis as its own CC
 Principal diagnosis as its own CC
 Principal diagnosis
 Complication or comorbidity
 Principal diagnosis as its own MCC
 Principal diagnosis as its own MCC
 Principal diagnosis
 Principal diag

Tabular List

123.4 - 125.701

123.4 - 125.701

	123.4	Rupture of chordae tendineae as current complication following acute myocardial infarction EXCLUDES1 rupture of chordae tendineae not specified as				125.110	Atherosclerotic heart of coronary artery with uppectoris	disease of native Instable angina A C III III III CARCER
	123.5	current complication following acute myocardial infarction (151.1) Rupture of papillary muscle as current complication					EXCLUDES1 unstable ar atherosc (120.0)	igina without lerotic heart disease
	120.0	following acute myocardial infarction				l25.111	Atherosclerotic heart of coronary artery with a documented spasm	disease of native ngina pectoris with A HCC MMC
	123.6	Interction (151.2) Thrombosis of atrium, auricular appendage, and ventricle as current complications following acute myocardial					EXCLUDES I angina pec spasm wi heart disc	toris with documented ithout atherosclerotic ease (120.1)
		infarction A (C) IIC IIC IIC IIC IIC IIC IIC IIC IIC I				125.118	Atherosclerotic heart of coronary artery with of angina pectoris	disease of native ther forms of A HCC RHCC
	123.7	Postinfarction angina ALA C2 2015					EXCLUDES1 other forms without of	s of angina pectoris atherosclerotic heart
	123.8	Other current complications following acute myocardial infarction				l25.119	disease (i Atherosclerotic heart	20.8) disease of native
	Other	acute ischemic heart diseases					coronary artery with u	Inspecified angina
	EXCLU	DES1 angina pectoris (I20)					Atherosclerotic heart dis	ease with angina NOS
	124.0	transient myocardial ischemia in newborn (P29.4) Acute coronary thrombosis not resulting in myocardial					Atherosclerotic heart d chest pain	isease with ischemic
		AHA: Q1 2013 Acute coronary (artery) (vein) embolism not resulting in					EXCLUDES I unspecified without of disease (angina pectoris atherosclerotic heart 120 9)
		myocardial infarction		125.2	Old my	ocardial in	nfarction	POA RXHCC
		Acute coronary (artery) (vein) occlusion not resulting in myocardial infarction			Healed	myocardia	al infarction	cc
		Acute coronary (artery) (vein) thromboembolism not resulting			Past my invest	ocardial ir	ntarction diagnosed by E ut currently presenting r	CG or other
		in myocardial infarction		I25.3	Aneury	sm of hea	int callenary presenting i	
	13/1 1	EXCLUDEST atherosclerotic heart disease (125.1-)			Mural a	neurysm		
	124.1	Postmyocardial infarction syndrome	5	125.4	Ventric	ular aneur rv arterv a	ysm aneurysm and dissectio	n
		EXCLUDES1 postinfarction angina (I23.7)			125.41	Coronar	y artery aneurysm	RxHCC
	124.8	Other forms of acute ischemic heart disease				Coronary	y arteriovenous fistula, ad	cquired
		AHA: Q4 2017 EXCLUDES1 myocardial infarction due to demand ischemia (I21.A1)				EXCLUDE	S1 congenital coronary ((Q24.5)	artery) aneurysm
	124.9	Acute ischemic heart disease, unspecified			125.42	Coronar	y artery dissection	
	-	EXCLUDES1 ischemic heart disease (chronic) NOS (125.9)		125.5	Ischem	ic cardion	nyopathy	RxHCC
I25	Chron	Ic ischemic heart disease		125.6	EXCLUE Silent r	<u>vesz</u> coron	lary atheroscierosis (125. 1-	-, 125.7-) RxHCC
	chro	nic total occlusion of coronary artery (125.82)	9	125.7	Athero	sclerosis o	of coronary artery bypas	s graft(s) and
	expo	osure to environmental tobacco smoke (Z77.22)			corona	ry artery o	of transplanted heart wi	th angina pectoris
	histo	ory of tobacco dependence (Z87.891)			Use ad	ditional co	ode, if applicable, to iden	tify:
	occu toba	pational exposure to environmental tobacco smoke (Z57.31) cco dependence (F17)			coror (125	hary athero 5.84)	osclerosis due to calcified	l coronary lesion
•	toba	cco use (Z72.0)			EVCLUE	DEC1 athor	oscierosis due to lipid rici	n plaque (125.83)
	125.1	Atherosclerotic heart disease of native coronary artery Atherosclerotic cardiovascular disease			LACLUL	hea	art without angina pector	is (125.812)
		Coronary (artery) atheroma				ather	osclerosis of coronary art	ery bypass graft(s)
		Coronary (artery) atherosclerosis				witi	hout angina pectoris (125.	810)
		Coronary (artery) usesse Coronary (artery) sclerosis Use additional code, if applicable, to identify:				ather trai (125	osclerosis of native coron nsplanted heart without a 5.811)	ary artery of Ingina pectoris
		coronary atherosclerosis due to calcified coronary lesion (125.84)		69	I25.70	Atheroso unspecif	clerosis of coronary arte fied, with angina pector	ry bypass graft(s), is
		coronary atherosclerosis due to lipid rich plaque (125.83)				125.700	Atherosclerosis of core	onary artery bypass
		EXCLUDES2 atheroembolism (175) atherosclerosis of coronary artery bypass graft(s) and					graft(s), unspecified, v pectoris	
		transplantea neart (125.7-) 125.10 Atherosclerotic heart disease of pative coronary					atherosc	lerosis of coronarv
		artery without angina pectoris					artery by	pass graft (I20.0)
		AHA: Q2 2015, Q4 2013				125.701	Atherosclerosis of core	onary artery bypass
		Atherosclerotic heart disease NOS					gratt(s), unspecified, v with documented spa	sm A HCC Refect
	69	artery with angina pectoris					EXCLUDES1 anaina per	toris with
							documer atherosc	nted spasm without lerosis of coronary
			I				uncery by	p ==== grant (120.17)

Proctors: This errata is permitted during the examination.

SS ina MCC Exc out SS ris _{RxHCC} **CHAPTER 9: DISEASES OF THE CIRCULATORY SYSTEM (100-199)**

Unspecified Code Other Specified Code Manifestation Code 🛛 Newborn 🕑 Pediatric 🕅 Maternity 🚺 Adult 🝼 Male 🌻 Female ● New Code ▲ Revised Code Title ▶ ◄ Revised Text NOTES INCLUDES EXCLUDEST Not coded here EXCLUDESS Not included here 🕲 4th character required 🛛 5th character required 🗇 6th character required 🖗 7th character required 🐨 Extension 'X' Alert Hospital-acquired condition (HAC) alert AHA AHA Coding Clinic[®] For Code first alert TIP Coding guidance

Tabular List		rmitted during the exam	8 - 125.76	125.708 - 125.76	
therosclerosis of autologous artery pronary artery bypass graft(s) with other orms of angina pectoris A CO HCC MARK CONTROL XCLUDES1 other forms of angina pectoris without atherosclerosis of autologous artery coronary	125.728		Atherosclerosis of coronary artery bypass graft(s), unspecified, with other forms of angina pectoris EXCLUDES1 other forms of angina pectoris without atherosclerosis of coronary artery bypass and	125.708	
ectoris XCLUDES1 unspecified angina extoris without atherosclerosis of artery bypass graft(s) ith unspecified angina ith unspecified a	125.729		(120.8) Atherosclerosis of coronary artery bypass graft(s), unspecified, with unspecified angina pectoris EXCLUDEST unspecified angina pectoris without atherosclerosis of coronary artery bypass graft	125.709	
autologous artery coronary artery bypass araft(s) (120.9)			(120.9)	🚱 125 71 Atheros	@ 125.71
rosis of nonautologous biological tery bypass graft(s) with angina pectoris therosclerosis of nonautologous iological coronary artery bypass graft(s) ith unstable angina ectoris	Atherosc coronary I25.730	③ 125.73	raft(s) with angina pectoris Atherosclerosis of autologous vein coronary artery bypass graft(s) with unstable angina pectoris	bypass (125.710	
XCLUDES1 unstable angina without atherosclerosis of nonautologou: biological coronary artery bypas: graft(s) (120.0) therosclerosis of nonautologous	125.731		atherosclerosis of autologous vein coronary artery bypass graft(s) (120.0) EXCLUDES2 embolism or thrombus of coronary artery bypass graft(s)		
iological coronary artery bypass graft(s) ith angina pectoris with documented basm A C Hit Mark Company VCUNDESS anging pectoris with documented		0	(T82.8-) Atherosclerosis of autologous vein coronary artery bypass graft(s) with angina pectoris with documented	125.711	
spasm without atherosclerosis of nonautologous biological coronary artery bypass graft(s) (120.1)	125 729		spasm A C HC Mark Concerned EXCLUDES1 angina pectoris with documented spasm without atherosclerosis of autologous		
iological coronary artery bypass	123.730		graft(s) (I20.1)		
ectoris A cell BCC BCC BCC BCC BCC BCC BCC BCC BCC B			Atherosclerosis of autologous vein coronary artery bypass graft(s) with other forms of angina pectoris A control angina pectoris EXCLUDES other forms of angina pectoris without atherosclerosis of autologous vein coronary artery bypass araft(s) (100.8)	125.718	
therosclerosis of nonautologous iological coronary artery bypass raft(s) with unspecified angina ectoris A C III and C III and C III and C III <u>XCLUDES1</u> unspecified angina pectoris without atherosclerosis of nonautologous biological coronary artery bypass	125.739		Atherosclerosis of autologous vein coronary artery bypass graft(s) with unspecified angina pectoris I unspecified angina pectoris without atherosclerosis of without atherosclerosis of	125.719	
graft(s) (120.9)	A 41		artery bypass graft(s) (120.9)		
d heart with angina pectoris atherosclerosis of native coronary artery of transplanted heart without angina pectoris (125.811)	transplar EXCLUDE	125.75	lerosis of autologous artery coronary pass graft(s) with angina pectoris lerosis of internal mammary artery graft with pectoris Atherosclerosis of autologous artery	I25.72 Atheros artery b Atherose angina 125 720	☞ 125.72
therosclerosis of native coronary artery f transplanted heart with unstable ngina construction in the second secon	I25.750 I25.751		coronary artery bypass graft(s) with unstable angina pectoris A cc III III IIII IIIIIIIIIIIIIIIIIIII		
f transplanted heart with angina pectoris ith documented spasm			atherosclerosis of autologous artery coronary artery bypass		
therosclerosis of native coronary artery f transplanted heart with other forms of ngina pectoris construction of the second second second second seco	125.758		graft(s) (120.0) Atherosclerosis of autologous artery coronary artery bypass graft(s) with	125.721	
theroscierosis of native coronary artery f transplanted heart with unspecified ngina pectoris	125.759		angina pectoris with documented spasm A C HC MC CARCER EXCLUDES anging pectoris with		
osis of bypass graft of coronary artery of d heart with angina pectoris atherosclerosis of bypass graft of coronary	Atheroso transplar EXCLUDE	6 125.76	documented spasm without atherosclerosis of autologous artery coronary artery bypass artef(c) (/20.1)		

Onacceptable principal diagnosis symbol per Medicare code edits in Code exempt from diagnosis present on admission requirement in adm



 Unspecified Code
 Other Specified Code
 Manifestation Code
 Newborn
 Pediatric
 Maternity
 Adult
 Male
 Female

 New Code
 Revised Code Title
 Revised Text
 Net Code Site
 New Code
 Revised Text
 Net Code Site
 Net Code Area
 Net Area
 Net Area
 Net Code Area
 Net Area

CHAPTER 9: DISEASES OF THE CIRCULATORY SYSTEM (100-199)

125.760 - 127.0

662

CHAPTER 9: DISEASES OF THE CIRCULATORY SYSTEM (100-199)

 Unacceptable principal diagnosis symbol per Medicare code edits
 Questionable admission
 Complication or comorbidity
 Major complication or comorbidity 🐮 Principal diagnosis as its own CC 🛛 🚇 Principal diagnosis as its own MCC 🔢 HCC diagnosis code 🔤 RxHCC diagnosis code MACRA code Z Code as first-listed diagnosis **DEFINITION** Describes condition/terminology

2019 ICD-10-CM

 Juniorally Typertension (12.20) Izo Marked Science (12.20) Izo Marked Science (12.20) Izo Other secondary pulmonary hypertension (12.20) Izo			EXCLUD	ES1 persistent pulmonary hypertension of newborn (P29.30)	59	127.8	Other s	specified pulmonary heart diseases	
 Secondary pulmonary hypertension IZ 20 Units could pulmonary hypertension IZ 20 Units could pulmonary hypertension IZ 20 Units could pulmonary hypertension IZ 21 Secondary pulmonary sterial hypertension IZ 21 Secondary pulmonary sterial hypertension IZ 23 Evenenage's syndrome IZ 24 Units secondary pulmonary hypertension IZ 25 Units secondary pulmonary hypertension IZ 26 Units secondary pulmonary hypertension IZ 28 Secondary pulmonary hypertension IZ 29 Unitonary hypertension IZ 20 Unitonary hypertension IZ				pulmonary nypertension NOS (127.20)			127.81	Cor pulmonale (chronic)	HCC RANCE
 127.1 Nyphocollettic hard decase AMA (2) 2017 127.2 Other secondary pulmonary hypertension 127.3 Differences hypertension with registration (2) 12 and (2) 12 and				secondary pulmonary hypertension (127.29)				EXCLUDES1 acute cor pulmonale (126.0-)	
 AMA: 04: 2017 Use additional code, if splittable, for saccidated lange immediate of the saccidated underlying condition EXCOMPTINE Sectore of the saccidated conditions Excondary group and condition Excondary		127.1	Kyphos	coliotic heart disease			127.82	Chronic pulmonary embolism	
 VI.2.2 Other secondary pulmonary hypertension VI.2.2 Other secondary pulmonary hypertension VI.2.2 Dimension for the secondary pulmonary hypertension VI.2.3 Dimension for the secondary pulmonary hypertension <l< th=""><th>_</th><th></th><th>AHA: Q</th><th>4 2017</th><th></th><th></th><th></th><th>Use additional code, if applicable, for ass</th><th>ociated long-</th></l<>	_		AHA: Q	4 2017				Use additional code, if applicable, for ass	ociated long-
 (28.71) (28.71)	5	127.2	Other s	econdary pulmonary hypertension				EXCLUDES1 personal history of pulmonary	embolism
 12.2.0 Polinovary hypertension Nos 12.2.1 Secondary public environmental hypertension (25.2) 12.2.2 Secondary public det (25.2) 12.2.3 Secondary public det (25.2) 12.2.4 Secondary public det (25.2) 12.2.5 Secondary public det (25.2) 12.2.6 Advected effect of appetite depressants (150.5) 12.2.7 Secondary public det (25.2) 12.2.8 Other disease (20.2.6) 12.2.9 Public det (20.2.7) 12.2.9 Public det (FS1 Fisenmenger's syndrome (127.83)				(Z86.711)	cinoonsin
 Pulmonary hypertension NDS IZ2.31 Secondary pulmonary hypertension (CSC) Associated (drug induced) (toxin-induced) pulmonary hypertension (CSC) Accelerated (drug induced) (toxin-induced) pulmonary hypertension (CSC) Adverse effects of drugs or toxins, such as: activation activation of the secondary group pulmonary hypertension (CSC) pohymositis (M3.2-) pohymositis (M3.2-) systemic sclearcis (M3.4-) idease in the secondary group activation (CSC) pohymositis (M3.2-) systemic sclearcis (M3.4-) idease in the secondary induced in the secondary group activation (CSC) pohymositis (M3.2-) systemic sclearcis (M3.4-) idease in the secondary induced in the seconda			127.20	Pulmonary hypertension, unspecified			127.83	Eisenmenger's syndrome	HCC RxHCC
 27.21 Secondary pulmonary sterial hypertension (Calculated and compared and effect of shorther induced) pulmonary arterial hypertension (Calculated according and calculated according according and calculated according acco				Pulmonary hypertension NOS				Eisenmenger's complex	
 Proceeding (and produced) (and produce			127.21	Secondary pulmonary arterial hypertension				Pulmonary hypertension with right to left	t shunt
 (Associated (adup indiced) (toxin induced) (secondary (proper) Pulmonary hypertension Code also associated conditions if applicable, or adverse effect of appetite depressions (150.5/5) congenital heart disease (02-02) human immunodeficiency vius [HV] disease (820) potwystisk (033.2.) (27.2 Pulmonary hypertension (W35.0.) systemic sclerosis (M3-) systemic sclerosis (M3-) theumatic mitral valve disease (05.) theumatic mitral valve diseases (06.) (27.2 Pulmonary hypertension due to long disease (08.) plate of disease (07.3) code also associated pulmonary manifestations. (EX.0) tarter to disease (06.) (27.2 Chronic ktrong pulmonary manifestations. (EX.0) torset disease (07.3) (27.2 Chronic ktrong pulmonary hypertension Code also associated pulmonary hypertension code al				(Associated) (drug-induced) (toxin-induced) pulmonary arterial hypertension NOS				related to congenital heart disease	
 Gescondary) group 1 pulmonary hypertension of del also associated conditions if paplicable, or adverse effect of drugs or toxins, such as: adverse effect of appetit depression (SO26) polymyositis (M32.2) poltal hypertension (K76.6) theumatic antibuis (B05.7) Sjögen synchrone (M35.6) systemics (Ceression (M44.6) systemics (Ce				(Associated) (drug-induced) (toxin-induced)				Code also underlying heart defect, if kno	wn, such as:
 Cube allow asylcited (Childred in Application of address of the of dividual solutions (Color 10) (Col				(secondary) group 1 pulmonary hypertension				atrial septal defect (Q21.1) Fisenmenger's defect (Q21.8)	
 advesse effect of appetite depresents (TSD:S2) congenital herit disease (20:20-28) human immunodeficiency vitus [HV] disease (820) portal hypertension (KSD:) scheduse (KSD:) s				adverse effects of drugs or toxins, such as:				patent ductus arteriosus (Q25.0)	
 i. 2.7.39 Other specified pulmonary heart disease. (30) polymyosits (M32.2) (30) polymyosits (M32.2) (31) polymyosits (M32.2) (32) (32) (32) (32) (32) (32) (32) (3				adverse effect of appetite depressants (T50.5X5)				ventricular septal defect (Q21.0)	
 human immundeficiency virus (Hil/) disease (B20) polymyostik (M3.2-) portal hypertension (K76.6) theamaticid hypertension (K76.6) theamaticid activity wessis is schitosomiasi (B6.5-) systemic sclerost (M3.4-) iz 22.2 Pulmonary hypertension due to left heart disease (J3.4-) theoremic and any sin (225.72) is accelerated at the any disease (J0.5-) theumatic and valve diseases (J0.5-) theumatic mitral valve diseases (J0.5-) theumatic mitral valve diseases (J0.5-) theumatic and valve diseases (J0.5-) theumatic mitral valve disease (J1.5-) theumatic				congenital heart disease (Q20-Q28)			127.89	Other specified pulmonary heart diseas	es HCC RxHCC
 populyyositis VM3.2/ portal hypertension (t/5.6) theumatod arthritis (M05.2) systemic sciencis (M34.) IZ2.2 Pulmoary hypertension due to left heart disease Group 2 pulmoary hypertension due to left heart disease Group 2 pulmoary hypertension due to left heart disease Group 2 pulmoary hypertension due to left heart disease (106) theumatic mittal valve diseases (106) disease disease (107.2) (2122 Chonic thromboembelic pulmonary hypertension Code also associated pulmonary hypertension Pulmonary hypertension due to metabolic disorders Pulmonary hypertension due to hereatologic disorders Pulmonary hypertension due to hereatologic disorders Pulmonary hypertension due to hereato				human immunodeficiency virus [HIV] disease (B20)		127.9	Pulmo	nary heart disease, unspecified	НСС Вансс
 inclusted arthrits (MOSC) schistoomiasis (B5-) Sjögren syndrome (M3S-) systemic sclerosis (M3-2) systemic sclerosis (M3-2) (Coup 2 pulmonary hypertension Code also associated (B1 heart disease, If known, such as: berunatic antic valve diseases (IOS-) rheumatic antic valve diseases (IOS-) read disease (S43-2) roopit data functionary embolism. If applicable (IOS-) ray pretension due to hematologic disorders Pulmonary hypertension Code also asociated pulmonary hypertension Code also asociated pulmonary hypertension Group 3 pulmonary hypertension Group 4 pulmonary hypertension Group 4 pulmonary hypertension Group 5 pulmonary hypertension Group 4 pulmonary hypertension Group 5 pulmonary hypertension Group 5 pulmonary hypertension Group 5 pulmonary hypertension Group 4 pulmonary hypertension Group 4 pulmonary hypertension Group 5 pulmonary hype				polymyositis (M33.2-)	4 128	Other	disease	s of pulmonary vessels	
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19/22.2 Pulmonary hypertension due to left heart disease. (f known, such as: multiple valve diseases (06.) heumatic actit valve diseases (05.) heumatic actit valve diseases (06.) difference diseases (07.000 \$2.0000 \$2.0000 \$2.000 \$2.0000 \$2.0000 \$2.000 \$2.000 \$2.000				Sjögren syndrome (M35.0-)		128.1	Aneury	sm of pulmonary artery 🛛 🕵	
 12.2.2 Pulmonary hypertension due to let heart disease, if known, such as: multiple valve disease (108) rheumatic antita valve diseases (108) rheumatic antita valve diseases (108) rheumatic antita valve diseases (108) 122.23 Pulmonary hypertension due to lung diseases and hypoxia Group 3 pulmonary hypertension due to lung diseases and hypoxia Group 3 pulmonary hypertension due to lung disease, if known, such as: bronchicctasis (147) cystic fibrosis with pulmonary manifestations, (154.6) 127.29 Pulmonary hypertension Code also associated pulmonary manifestations, (154.7) 127.29 Chronic thromboembolic pulmonary (127.7) 127.29 Other scolard diffusion (120.7) 127.29 Other scolard diffusion Pulmonary hypertension Code also associated pulmonary pertension Group 3 pulmonary hypertension Code also associated pulmonary embolism, if applicable (126); 7.82) 127.29 Other scolard pulmonary hypertension Pulmonary hypertension Code also associated pulmonary embolism, if applicable (126); 7.82) 127.29 Other scolard pulmonary hypertension Pulmonary hypertension (127.1) rheumatic pericarditis Code also associated pulmonary embolism, if applicable (126); 7.82) 127.29 Other scolard diffication Pulmonary hypertension (127.1) Gaucher disease (127.2) (127.29 Acute necidentitis (127.1) rheumatic pericarditis Pulmonary hypertension Pulmonary hypertension (127.1) rheumatic pericarditis Pulmonary hypertension (127.1) Gaucher disease (126) hyperthyroidism (126) 130.4 Other forms of acute pericarditis Supplychoccial pericarditis (127.29 Other scolard disease (126) hyperthyroidism (126) 130.4 Other forms of acute pericarditis supplychoccial pericarditis supplychoccial pericarditis (128.10 Other forms of acute pericarditis (128.10 Other forms of pericarditis (129.10 Other disease of pericarditis (120.10 Acute pericarditis (120.10 Other disease of pericarditis (120.10 Other disease of pericarditis (120.10 Other disease o				systemic sclerosis (M34)			EXCLUE	DES1 congenital aneurysm (Q25.79)	
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 interview of pulmonary hypertension is applicable (126, 127.82) is			127.24	Chronic thromboembolic pulmonary	K .		rh	eumatic pericarditis (acute) (101.0)	
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renal disease (I12.0, ►I13.11, ◄ I13.2) hyperthyroidism (E05) hypothyroidism (E00-E03) polycythemia vera (D45) sarcoidosis (D86) I31.0 Chronic adhesive pericardium Adherent pericardium Adherent pericardium Adherent pericardium				hypertensive chronic kidney disease with end stage		130.8	Other f	forms of acute pericarditis	
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hypothyroidism (E00-E03) polycythemia vera (D45) sarcoidosis (D86)				hyperthyroidism (E05)	- 151	EXCL	DEST die	seases of pericardium specified as rheumatic	(109.2)
sarcoidosis (D86) I31.0 Chronic adhesive pericarditis Accretio cordis Adherent pericardium Adhesive mediastinopericarditis				hypothyroidism (E00-E03)		EACED	b0	ostcardiotomy syndrome (197.0)	
I31.0 Chronic adhesive pericarditis Accretio cordis Adherent pericardium Adhesive mediastinopericarditis				polycytnemia vera (נאט) sarcoidosis (D86 -)			tra	aumatic injury to pericardium (S26)	
Accretio cordis Adherent pericardium Adhesive mediastinopericarditis						I31.0	Chroni	c adhesive pericarditis	CC/MCC Exc
Adherent pericardium Adhesive mediastinopericarditis							Accreti	o cordis	
					1		Adhere	nt pericardium	

Proctors: This errata is permitted during the examination.

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127.1 - 131.0

Tabular List Proctors: This errata is permitted					ng the examination. I31.1 - I40.1
	121.1		I		135.0 Nonrheumatic aortic (valve) stenosis
	151.1	Concretio cordis			135.1 Nonrheumatic aortic (valve) insufficiency
		Pericardial calcification			Nonrheumatic aortic (valve) incompetence NOS
	131.2	Hemopericardium, not elsewhere classified			Nonrheumatic aortic (valve) regurgitation NOS
		EXCLUDES1 hemopericardium as current complication following			135.2 Nonrheumatic aortic (valve) stenosis with insufficiency
		acute myocardial infarction (123.0)			135.8 Other nonrheumatic aortic valve disorders
	131.3	Pericardial effusion (noninflammatory)			I35.9 Nonrheumatic aortic valve disorder, unspecified
		Chylopericardium	49	136	36 Nonrheumatic tricuspid valve disorders
		EXCLUDES1 acute pericardial effusion (130.9)			EXCLUDES1 tricuspid valve disorders of unspecified cause (107)
	131.4				tricuspid valve disorders specified as congenital (Q22.4,
	121.0	Other specified diseases of pericardium			Q22.8, Q22.9)
	131.0	Enicardial plaques			tricuspia valve alsoraers specified as rheumatic (107)
		Focal pericardial adhesions			tricuspia vaive aisoraers with aortic ana/or mitrai vaive
	I31.9	Disease of pericardium, unspecified			136.0 Nonrheumatic tricusnid (valve) stenosis
		Pericarditis (chronic) NOS			136.1 Nonrheumatic tricuspid (valve) insufficiency
132	Perica	rditis in diseases classified elsewhere			Nonrheumatic tricuspid (valve) incompetence
	Code	hrst underlying disease			Nonrheumatic tricuspid (valve) regurgitation
	EXCLU	DEST pericarditis (in):			I36.2 Nonrheumatic tricuspid (valve) stenosis with insufficiency
		COXSACKIE (VIPUS) (B33.23)			136.8 Other nonrheumatic tricuspid valve disorders
		gonococcal (A34.os) meninaococcal (A39.53)		127	136.9 Nonrheumatic tricuspia valve disorder, unspecified
		rheumatoid (arthritis) (M05 31)		157	57 Nonineumatic pulmonary valve disorders
		svphilitic (A52.06)			EXCLUDEST pulmonary valve alsorder specified as congenital (Q22.1, $Q22.2, Q22.3$)
		systemic lupus erythematosus (M32.12)			nulmonary valve disorder specified as rheumatic (109 89)
		tuberculosis (A18.84)			137.0 Nonrheumatic pulmonary valve stenosis
4 I33 🐠	Acute	and subacute endocarditis			137.1 Nonrheumatic pulmonary valve insufficiency
	EXCLU	DES1 acute rheumatic endocarditis (I01.1)			Nonrheumatic pulmonary valve incompetence
		endocarditis NOS (138)			Nonrheumatic pulmonary valve regurgitation
	133.0	Acute and subacute infective endocarditis			137.2 Nonrheumatic pulmonary valve stenosis with insufficiency
		Bacterial endocarditis (acute) (subacute)			137.8 Other nonrneumatic pulmonary valve disorders
		Endocarditis lenta (acute) (subacute) NOS		138	38 Endocarditis valve unspecified
		Malignant endocarditis (acute) (subacute)		150	INCLUDES endocarditis (chronic) NOS
		Purulent endocarditis (acute) (subacute)			valvular incompetence NOS
		Septic endocarditis (acute) (subacute)			valvular insufficiency NOS
		Vicerative endocarditis (acute) (subacute)			valvular reguraitation NOS
		Use additional code (B95-B97) to identify infectious agent			valvular steposis NOS
	133.9	Acute and subacute endocarditis, unspecified			valvulitis (chronic) NOS
		Acute endocarditis NOS			EXCLUDES1 congenital insufficiency of cardiac valve NOS (O24.8)
		Acute myoendocarditis NOS			congenital stenosis of cardiac valve NOS (Q2 8)
		Acute periendocarditis NOS			endocardial fibroelastosis (142.4)
		Subacute endocarditis NOS			endocarditis specified as rheumatic (109.1)
_		Subacute periendocarditis NOS	ľ	139	39 Endocarditis and heart valve disorders in diseases classified
🎱 I34	Nonrh	eumatic mitral valve disorders			elsewhere 🔊 🖉 «смссей
	EXCLU	DEST mitral valve disease (105.9)		ß	Code first underlying disease, such as:
		mitral valve stenosis (105.0)			Q fever (A78)
		mitral valve disorder of unspecified cause with diseases of			EXCLUDES1 endocardial involvement in:
		aortic and/or tricuspid valve(s) (108)			candidiasis (B37.6)
		mitral valve disorder of unspecified cause with mitral			gonococcal infection (A54.83)
		stenosis of obstruction (105.0) mitral value disorder specified as conceptual (023.2, 023.9)			Libman-Sacks disease (M32.11)
		mitral valve disorder specified as rheumatic (105 -)			listerosis (A32.82)
	134.0	Nonrheumatic mitral (valve) insufficiency			meningococcal infection (A39.51)
		Nonrheumatic mitral (valve) incompetence NOS			rheumatoid arthritis (M05.31)
		Nonrheumatic mitral (valve) regurgitation NOS			syphilis (A52.03)
	134.1	Nonrheumatic mitral (valve) prolapse			tuberculosis (A18.84)
		Fioppy nonrneumatic mitral valve syndrome			typhoid fever (A01.02)
	134 2	Nonrheumatic mitral (value) stenosis	49	140	40 Acute myocarditis (Figure 9.2)
	134.8	Other nonrheumatic mitral valve disorders			INCLUDES subacute myocarditis
	134.9	Nonrheumatic mitral valve disorder, unspecified			EXCLUDEST acute rheumatic myocarditis (101.2)
4 I35	Nonrh	eumatic aortic valve disorders			140.0 Infective myocarditis
	EXCLU	DES1 aortic valve disorder of unspecified cause but with diseases			Septic myocarditis
		of mitral and/or tricuspid valve(s) (108)			I40.1 Isolated myocarditis
		aortic valve disorder specified as congenital (Q23.0, Q23.1)			Fiedler's myocarditis
		aortic valve disorder specified as rheumatic (106)			Giant cell myocarditis
		hypertrophic subaortic stenosis (142.1)	l		Idiopathic myocarditis

Unspecified Code Other Specified Code Manifestation Code 🛛 Newborn 🕑 Pediatric M Maternity 🖾 Adult 🔿 Male ♀ Female New Code A Revised Code Title A Revised Text NOTES INCLUDES EXCLUDES Not coded here EXCLUDES2 Not included here 4th character required 4th character required 5th character re

When symbols appear on a code that requires a 7th character extension, refer to Appendix B to identify applicable 7th character codes.

131.1 - 140.1