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Chapter 9: Diseases of the Circulatory System (I00-I99)

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.

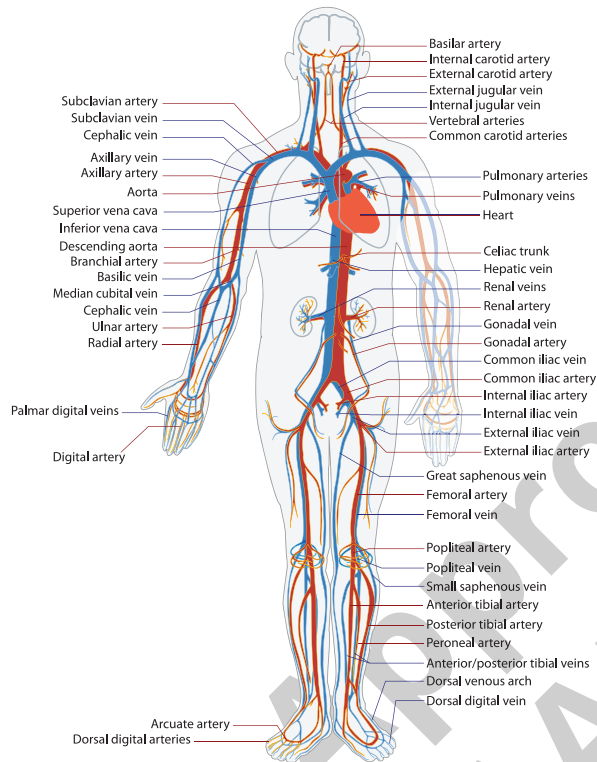


Figure 9.1 Blood Vascular System - Arteries and Veins

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):

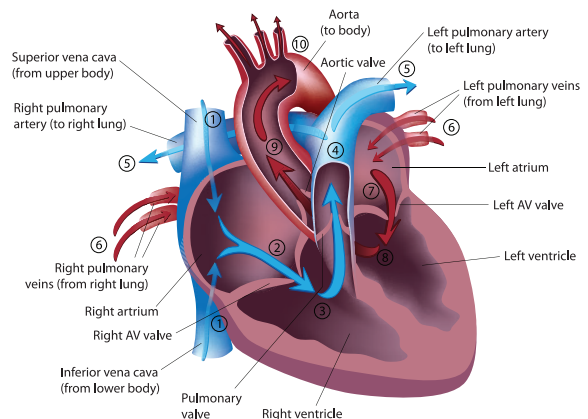


Figure 9.2 Chambers of the Heart

- 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

- 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:
- i) 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.
 - v) 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:
- i) 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.
 - ii) 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).
 - v) 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.
- ii) 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
- e) The Abdominal Aorta

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
- f) Lingual Artery
 - 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:

- a) 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

- 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
	iv) posterior inferior cerebellar artery
	v) medullary arteries

- b) Internal Thoracic (or Internal Mammary) Artery
 - i) pericardiophrenic 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) <ul style="list-style-type: none"> 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 following branches:
The Middle Vesical Artery	
The Inferior Vesical Artery	
The Middle Hemorrhoidal Artery	i) The Lumbar (Arterial) Branch
The Uterine Artery (In Female)	ii) The Iliac (Arterial) Branch
The Vaginal Artery (In Female)	The Superior and Inferior Lateral Sacral Arteries
The Obturator Artery	The Superior Gluteal Artery (or Gluteal Artery)-with the following branches:
	i) The Superficial (Arterial) Branch
	ii) The Deep (Arterial) Branch

The Anterior Trunk	The Posterior Trunk
The Internal Pudendal Artery (Internal Pubic Artery)-with the following branches: The Muscular (Arterial) Branches The Inferior Hemorrhoidal Artery The Perineal (or Superficial Perineal) Artery The Artery of the Urethral Bulb The Urethral Artery The Deep Artery of the Penis (or Artery to the Corpus Cavernosum) The Dorsal Artery of the Penis	
The Inferior Gluteal Artery (Sciatic Artery)-with the following branches: The Muscular (Arterial) Branches The Coccygeal (Arterial) Branches The Arteria Comitans Nervi Ischiadici The Anastomotic (Arterial) Branch The Articular (Arterial) Branch The Cutaneous (Arterial) Branches	

- d) The External Iliac Artery divides into the inferior epigastric artery, which includes:
- i) muscular branches
 - ii) cutaneous branches
 - iii) external spermatic branch (in males) and artery of round ligament of uterus (in females)
 - iv) pubic branch
- e) Deep Iliac Circumflex Artery
- i) muscular branch
 - ii) cutaneous branch

10. The Arteries of the Lower Extremity

- a) Femoral Artery- The branches of the femoral artery are presented below in a tabular format:

The Branches of the Femoral Artery	
The Superficial Epigastric Artery	
The Superficial Iliac Circumflex Artery	
The Superficial External Pudendal Artery (or Superficial External Pubic Artery)	
The Deep External Pudendal Artery (or Deep External Pubic Artery)	
The Muscular (Arterial) Branches	
The Profunda Femoris Artery (or Deep Femoral Artery)	
Branches and Subordinate Branches of the Profunda Femoris Artery	The Lateral Femoral Circumflex Artery
	Sub-Branches
	The Ascending (Arterial) Branch The Descending (Arterial) Branch The Transverse (Arterial) Branch
Sub-Branches	The Medial Femoral Circumflex Artery (or Internal Circumflex Artery)
	The Superficial (Arterial) Branch The Deep (Arterial) Branch
	The Acetabular (Arterial) Branch
Sub-Branches	The Perforating Arteries
	The First Perforating Artery The Second Perforating Artery The Third Perforating Artery
	The Muscular (Arterial) Branches
The Highest Genicular Artery (or Anastomotica Magna Artery)	

The Branches of the Femoral Artery	
Branches of the Highest Genicular Artery	The Saphenous (Arterial) Branch
	The Musculoarticular (Arterial) Branch

- b) Popliteal Artery- A tabular presentation of the branches of the popliteal artery is given below:

The Branches of the Popliteal Artery	
The Superior Muscular Branches	
The Sural Arteries (or Inferior Muscular Arteries)	
The Cutaneous Branches	
The Superior Genicular Arteries (or Superior Articular Arteries)	
Branches of the Superior Genicular Arteries	The Medial Superior Genicular Artery
	The Lateral Superior Genicular Artery
The Middle Genicular Artery (or Azygos Articular Artery)	
The Inferior Genicular Arteries (or Inferior Articular Arteries)	
Branches of the Inferior Genicular Arteries	The Medial Inferior Genicular Artery
	The Lateral Inferior Genicular Artery

- c) Anterior Tibial Artery
- i) Posterior Tibial Recurrent Artery
 - ii) Fibular Artery
 - iii) Anterior Tibial Recurrent Artery
 - iv) Muscular (Arterial) Branches
 - v) Anterior Medial Malleolar Artery (or Internal Malleolar Artery)
 - vi) Anterior Lateral Malleolar Artery (or External Malleolar Artery)
- d) Dorsalis Pedis Artery (or Dorsal Artery of Foot)- A tabular presentation of the branches of the dorsalis pedis artery is given below:

Branches of the Dorsalis Pedis Artery	
The lateral Tarsal Artery (or Tarsal Artery)	
The Medial Tarsal Arteries	
The Arcuate Artery (or Metatarsal Artery)	
Branches of Arcuate Artery	The Second Dorsal Metatarsal Artery
	The Third Dorsal Metatarsal Artery
	The Fourth Dorsal Metatarsal Artery
The First Dorsal Metatarsal Artery	
The Deep Plantar Artery (or Communicating Artery)	

- e) Posterior Tibial Artery- The branching tree of the posterior tibial artery is presented below:

Branches of the Posterior Tibial Artery	
The Peroneal Artery	
Branches of Peroneal Artery	The Muscular (Arterial) Branches
	The Nutrient Artery of Fibula
	The Perforating Branch (or Anterior Peroneal Artery)
	The Communicating Branch of Peroneal Artery
The Lateral Calcaneal Arteries (or External Calcaneal Arteries)	
The Nutrient Artery of Tibia	
The Muscular Branches of the Posterior Tibial Artery	
The Posterior Medial Malleolar Artery (or Internal Malleolar Artery)	
The Communicating Branch of Posterior Tibial Artery	
The Medial Calcaneal Arteries (or Internal Calcaneal Arteries)	
The Medial Plantar Artery (or Internal Plantar Artery)	
The Lateral Plantar Artery (or External Plantar Artery)	

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:

- a) 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

- i) 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)

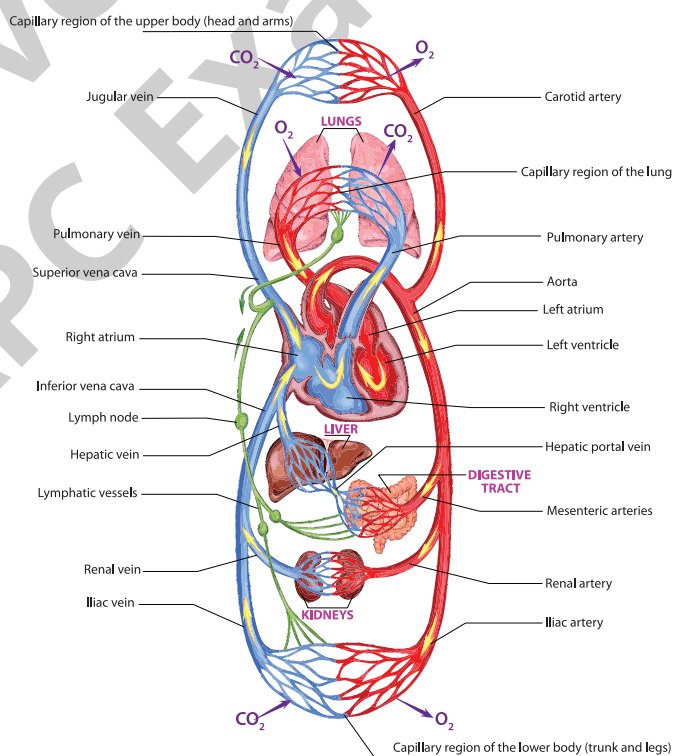


Figure 9.3 Path of Oxygenated and De-oxygenated Blood Throughout the Circulatory System

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

- vii) intercapitular veins
- viii) dorsal metacarpal veins
- ix) dorsal digital veins
- b) Deep Veins of the Upper Extremity
 - i) radial veins
 - ii) ulnar veins
 - iii) brachial veins
 - iv) axillary veins
 - v) subclavian veins
 - vi) deep palmar venous arch
- c) Veins of the Thorax
 - i) innominate veins (or brachiocephalic veins)
 - ii) internal mammary veins (or internal thoracic veins)
 - iii) inferior thyroid veins
 - iv) highest intercostal vein (or superior intercostal vein)
 - v) right superior intercostal vein
 - vi) left superior intercostal vein
 - vii) superior vena cava
 - viii) azygos vein
 - ix) hemiazygos vein
 - x) accessory hemiazygos vein (or vena azygos minor superior)
 - xi) bronchial veins
- d) Veins of the Vertebral Column
 - i) external vertebral venous plexuses (or extraspinal veins)
 - ii) anterior external vertebral plexuses
 - iii) posterior external vertebral plexuses
 - iv) internal vertebral venous plexus (or intraspinal veins)
 - v) basivertebral veins
 - vi) intervertebral veins
 - vii) veins of the medulla spinalis (or veins of spinal cord)

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
 - iv) anterior tibial veins
 - v) popliteal vein
 - vi) femoral vein
 - vii) deep femoral vein (or profunda femoris vein)
 - viii) common femoral vein
 - ix) external iliac vein
- c) Major Veins of Abdomen and Pelvis
 - i) ascending lumbar vein
 - ii) left gastric vein

- iii) right gastric vein
- iv) left gastro-omental vein
- v) right gastro-omental vein
- vi) left hepatic vein
- vii) middle hepatic vein
- viii) right hepatic vein
- ix) superior mesenteric vein
- x) inferior phrenic veins
- xi) inferior vena cava
- xii) left renal vein
- xiii) right renal vein
- xiv) splenic vein
- xv) suprarenal veins
- xvi) deep dorsal vein of clitoris
- xvii) deep dorsal vein of penis
- xviii) external pudendal veins
- xix) internal pudendal vein
- xx) ovarian vein
- xxi) pampiniform venous plexus
- xxii) prostatic venous plexus
- xxiii) rectal venous plexus
- xxiv) uterine venous plexus
- xxv) vaginal venous plexus
- xxvi) common iliac veins
- xxvii) middle sacral veins
- xxviii) vesical venous plexus

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 Gastroepiploic Vein
	The Pancreatic Veins
	The Inferior Mesenteric Vein
The Tributaries of Inferior Mesenteric Vein	The Sigmoid Veins
	The Left Colic Vein
The Superior Mesenteric Vein	
The Tributaries of Superior Mesenteric Vein	The Right Gastroepiploic 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 it 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).

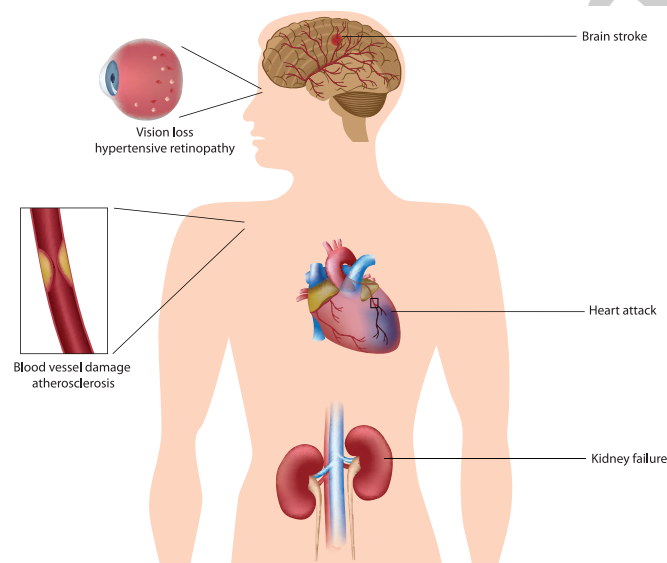


Figure 9.4 Main Complications of Hypertension

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.

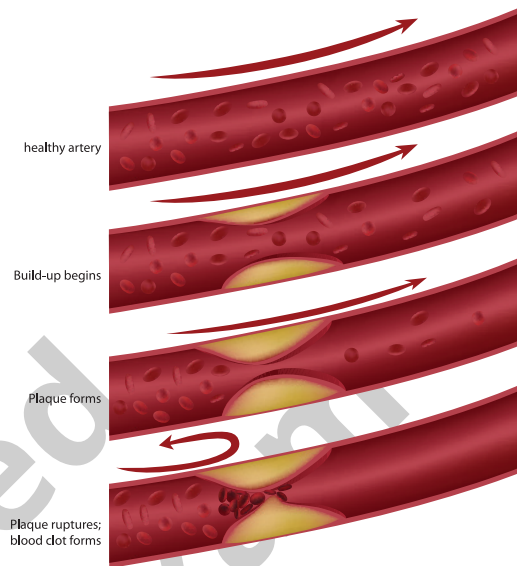


Figure 9.5 Healthy Artery and Artery with Atherosclerosis

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

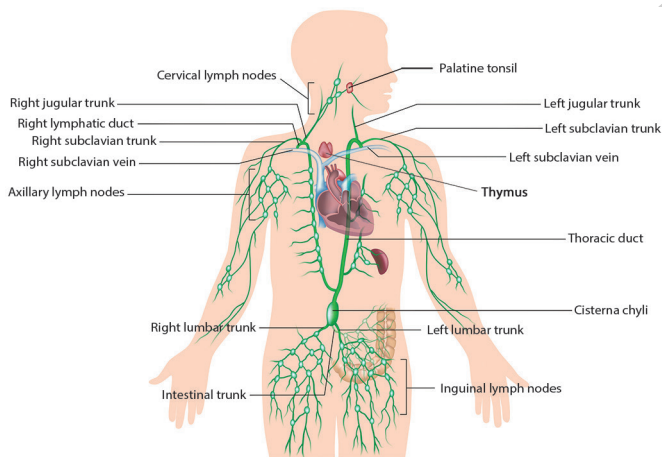


Figure 9.6 Lymphatic System Anatomy

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, chyloferous 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.

e) 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:

- i) 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.
- ii) 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.
- iii) 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:
 - i) 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.
- d) 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:

- 6. Lymphatic Vessels of the Eyelids and Conjunctiva:** The lymphatic vessels of the eyelids and conjunctiva form the following two groups:
- 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.
 - 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.
 - Lymphatic Vessels of the Cheeks:** The superficial and deep lymphatic vessels of the cheeks usually communicate with the submaxillary glands.
 - 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.
 - 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.
 - Lymphatic Vessels of the Mouth:** The lymphatic vessels of the mouth can be divided into the following groups:
 - 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.
 - Lymphatic Vessels of the Tongue:** The lymphatic vessels of the tongue are divided into the following three groups:
 - anterior lymph vessels of the tongue drain lymph fluid from the tip and lower surface of the tongue to the submental glands.
 - 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.
 - posterior lymph vessels of the tongue drain lymph fluid from the portion of the tongue, which lies in the anterior wall of pharynx.
 - 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.
 - 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.
- 7. The Lymphatics of the Upper Extremity:** The lymph glands of the upper extremity are divisible into the following two groups:
- 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.
 - deltoideopectoral lymph glands are located in the groove between the pectoralis major and deltoid muscles.
 - 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.
 - anterior group of axillary lymph glands travels from third to sixth intercostal space, along the line of the lateral thoracic artery.
 - posterior group of axillary lymph glands lies along the posterior wall of axilla, and follow the course of the subscapular vessels.
 - central group of axillary lymph glands are located in the central part of the axilla, and along the line of the intercostobrachial nerve.
 - 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.
 - 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.
 - 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:
- 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.
 - Deep Lymph Glands:** The deep lymph glands of the inferior extremity are divided into the following two groups:
 - popliteal lymph glands are located in the popliteal fossa.
 - deep sublingual lymph glands are located in the femoral trigone.
 - 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.
- 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.
 - 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.
 - 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.
 - 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.
 - Hypogastric Glands:** The hypogastric glands of the pelvis are located along the course of the hypogastric vessels.
 - gluteal lymph glands
 - pubo-gluteal lymph glands
 - middle hemorrhoidal gland
 - inter-iliac glands
 - obturator gland
 - Sacral Glands:** The sacral lymph glands of the pelvis are located along the anterior aspect of sacrum, between the anterior sacral foramina.
 - 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:
 - right lateral aortic glands
 - left lateral aortic glands
 - preaortic glands
 - retroaortic glands
 - Superior Gastric Glands:** The superior gastric glands exist in association with the left gastric artery and constitute the following subdivisions:
 - anterior left gastric glands (or lower coronary glands)
 - right paracardial glands
 - left paracardial glands
 - posterior paracardial glands
 - posterior left gastric glands (or upper coronary glands)
 - right gastric gland (or pyloric gland)
 - left suprapancreatic glands
 - right suprapancreatic glands
 - subpyloric glands
 - biliary lymph glands

- i) 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.
- k) 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.
- l) 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
- n) 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
- l) 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
- l) Lymphatic Vessels of the Testis and Epididymis
- m) Lymphatic Vessels of the Anus, Anal Canal and Rectum

12. The Lymphatics of the Thorax

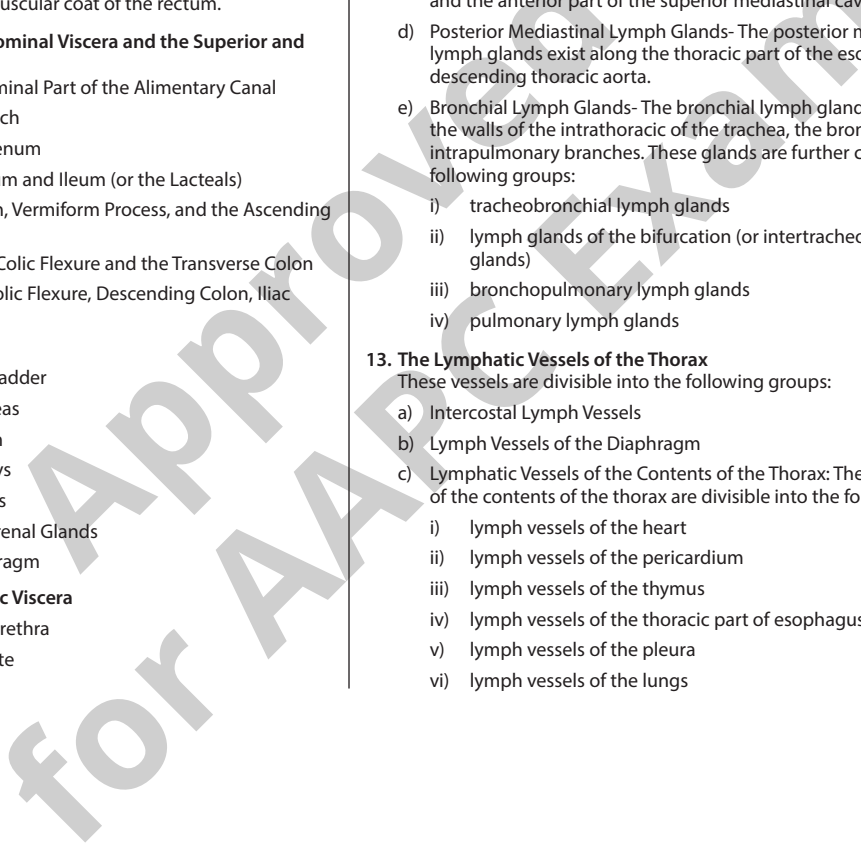
The Lymph Glands of the thorax are separable into the following groups:

- 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
 - ii) 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










Diseases of the circulatory system (I00-I99)

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
- I26-I28 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
- I80-I89 Diseases of veins, lymphatic vessels and lymph nodes, not elsewhere classified
- I95-I99 Other and unspecified disorders of the circulatory system

Acute rheumatic fever (I00-I02)

- I00 Rheumatic fever without heart involvement**
AHA: Q4 2016
INCLUDES arthritis, rheumatic, acute or subacute
EXCLUDES1 rheumatic fever with heart involvement (I01.0-I01.9)
- I01 Rheumatic fever with heart involvement**
EXCLUDES1 chronic diseases of rheumatic origin (I05-I09) unless rheumatic fever is also present or there is evidence of reactivation or activity of the rheumatic process.
- I01.0 Acute rheumatic pericarditis** 
 Any condition in I00 with pericarditis
 Rheumatic pericarditis (acute)
EXCLUDES1 acute pericarditis not specified as rheumatic (I30.-)
- I01.1 Acute rheumatic endocarditis** 
 Any condition in I00 with endocarditis or valvulitis
 Acute rheumatic valvulitis
- I01.2 Acute rheumatic myocarditis** 
 Any condition in I00 with myocarditis
- I01.8 Other acute rheumatic heart disease** 
 Any condition in I00 with other or multiple types of heart involvement
 Acute rheumatic pancarditis
- I01.9 Acute rheumatic heart disease, unspecified** 
 Any condition in I00 with unspecified type of heart involvement
 Rheumatic carditis, acute
 Rheumatic heart disease, active or acute
- I02 Rheumatic chorea**
DEFINITION: Chorea is an abnormal involuntary movement resembling fidgeting or dancing.
INCLUDES Sydenham's chorea
EXCLUDES1 chorea NOS (G25.5)
 Huntington's chorea (G10)
- I02.0 Rheumatic chorea with heart involvement** 
 Chorea NOS with heart involvement
 Rheumatic chorea with heart involvement of any type classifiable under I01.-
- I02.9 Rheumatic chorea without heart involvement** 
 Rheumatic chorea NOS

Chronic rheumatic heart diseases (I05-I09)

- I05 Rheumatic mitral valve diseases**
INCLUDES conditions classifiable to both I05.0 and I05.2-I05.9, whether specified as rheumatic or not
EXCLUDES1 mitral valve disease specified as nonrheumatic (I34.-)
 mitral valve disease with aortic and/or tricuspid valve involvement (I08.-)
- I05.0 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 (I34.0)
- I05.2 Rheumatic mitral stenosis with insufficiency**
 Rheumatic mitral stenosis with incompetence or regurgitation
- I05.8 Other rheumatic mitral valve diseases**
 Rheumatic mitral (valve) failure
- I05.9 Rheumatic mitral valve disease, unspecified**
 Rheumatic mitral (valve) disorder (chronic) NOS
- I06 Rheumatic aortic valve diseases**
EXCLUDES1 aortic valve disease not specified as rheumatic (I35.-)
 aortic valve disease with mitral and/or tricuspid valve involvement (I08.-)
- I06.0 Rheumatic aortic stenosis**
 Rheumatic aortic (valve) obstruction
- I06.1 Rheumatic aortic insufficiency**
 Rheumatic aortic incompetence
 Rheumatic aortic regurgitation
- I06.2 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
- I07 Rheumatic tricuspid valve diseases**
INCLUDES rheumatic tricuspid valve diseases specified as rheumatic or unspecified
EXCLUDES1 tricuspid valve disease specified as nonrheumatic (I36.-)
 tricuspid valve disease with aortic and/or mitral valve involvement (I08.-)
- I07.0 Rheumatic tricuspid stenosis**
 Tricuspid (valve) stenosis (rheumatic)
- I07.1 Rheumatic tricuspid insufficiency**
 Tricuspid (valve) insufficiency (rheumatic)
- I07.2 Rheumatic tricuspid stenosis and insufficiency**
- I07.8 Other rheumatic tricuspid valve diseases**
- I07.9 Rheumatic tricuspid valve disease, unspecified**
 Rheumatic tricuspid valve disorder NOS
- I08 Multiple valve diseases**
INCLUDES multiple valve diseases specified as rheumatic or unspecified
EXCLUDES1 endocarditis, valve unspecified (I38)
 multiple valve disease specified as nonrheumatic (I34.-, I35.-, I36.-, I37.-, I38.-, Q22.-, Q23.-, Q24.8-)
 rheumatic valve disease NOS (I09.1)
- I08.0 Rheumatic disorders of both mitral and aortic valves**
 Involvement of both mitral and aortic valves specified as rheumatic or unspecified
- I08.1 Rheumatic disorders of both mitral and tricuspid valves**
- I08.2 Rheumatic disorders of both aortic and tricuspid valves**
- I08.3 Combined rheumatic disorders of mitral, aortic and tricuspid valves**
- I08.8 Other rheumatic multiple valve diseases**
- I08.9 Rheumatic multiple valve disease, unspecified**
- I09 Other rheumatic heart diseases**
- I09.0 Rheumatic myocarditis** 
EXCLUDES1 myocarditis not specified as rheumatic (I51.4)
- I09.1 Rheumatic diseases of endocardium, valve unspecified**
 Rheumatic endocarditis (chronic)
 Rheumatic valvulitis (chronic)
EXCLUDES1 endocarditis, valve unspecified (I38)

Unspecified Code Other Specified Code **Manifestation Code** **N** Newborn **P** Pediatric **M** Maternity **A** Adult **♂** Male **♀** Female
 ● New Code ▲ Revised Code Title ►◄ Revised Text **NOTES** **INCLUDES** **EXCLUDES1** Not coded here **EXCLUDES2** Not included here
 4th 4th character required 5th 5th character required 6th 6th character required 7th 7th character required **Ⓧ** Extension 'X' Alert
HAC Hospital-acquired condition (HAC) alert **AHA** AHA Coding Clinic **🚨** Code first alert **TIP** Coding guidance

- 109.2 **Chronic rheumatic pericarditis** CC MCE Ex
Adherent pericardium, rheumatic
Chronic rheumatic mediastinopericarditis
Chronic rheumatic myopericarditis
EXCLUDES1 chronic pericarditis not specified as rheumatic (I31.-)
- 5P 109.8 **Other specified rheumatic heart diseases**
109.81 **Rheumatic heart failure** CC HCC RHC CC MCE Ex
Use additional code to identify type of heart failure (I50.-)
109.89 **Other specified rheumatic heart diseases**
Rheumatic disease of pulmonary valve
- 109.9 **Rheumatic heart disease, unspecified**
Rheumatic carditis
EXCLUDES1 rheumatoid carditis (M05.31)

Hypertensive diseases (I10-I16)

Use additional code to identify:

- exposure to environmental tobacco smoke (Z77.22)
- history of tobacco dependence (Z87.891)
- occupational exposure to environmental tobacco smoke (Z57.31)
- tobacco dependence (F17.-)
- tobacco use (Z72.0)

- EXCLUDES1** neonatal hypertension (P29.2)
- primary pulmonary hypertension (I27.0)

- EXCLUDES2** hypertensive disease complicating pregnancy, childbirth and the puerperium (O10-O11, O13-O16)

- 110 **Essential (primary) hypertension** ? RHC
AHA: Q4 2016, Q4 2013
INCLUDES high blood pressure
hypertension (arterial) (benign) (essential) (malignant) (primary) (systemic)
EXCLUDES1 hypertensive disease complicating pregnancy, childbirth and the puerperium (O10-O11, O13-O16)
EXCLUDES2 essential (primary) hypertension involving vessels of brain (I60-I69)
essential (primary) hypertension involving vessels of eye (H35.0-)

- 4P 111 **Hypertensive heart disease (Figure 9.1)**
INCLUDES any condition in I50.-, I51.4-I51.9 due to hypertension

- 111.0 **Hypertensive heart disease with heart failure** HCC RHC
AHA: Q1 2017
Hypertensive heart failure
Use additional code to identify type of heart failure (I50.-)

- 111.9 **Hypertensive heart disease without heart failure** RHC
Hypertensive heart disease NOS

- 4P 112 **Hypertensive chronic kidney disease (Figure 9.1)**
INCLUDES any condition in N18 and N26 - due to hypertension
arteriosclerosis of kidney
arteriosclerotic nephritis (chronic) (interstitial)
hypertensive nephropathy
nephrosclerosis

- EXCLUDES1** hypertension due to kidney disease (I15.0, I15.1)
renovascular hypertension (I15.0)
secondary hypertension (I15.-)
- EXCLUDES2** acute kidney failure (N17.-)

- 112.0 **Hypertensive chronic kidney disease with stage 5 chronic kidney disease or end stage renal disease** CC HCC RHC CC MCE Ex
AHA: Q3 2016
Use additional code to identify the stage of chronic kidney disease (N18.5, N18.6)

- 112.9 **Hypertensive chronic kidney disease with stage 1 through stage 4 chronic kidney disease, or unspecified chronic kidney disease** HCC RHC
Hypertensive chronic kidney disease NOS
Hypertensive renal disease NOS
Use additional code to identify the stage of chronic kidney disease (N18.1-N18.4, N18.9)

- 4P 113 **Hypertensive heart and chronic kidney disease**
INCLUDES any condition in I11.- with any condition in I12.-
cardiorenal disease
cardiovascular renal disease
- 113.0 **Hypertensive heart and chronic kidney disease with heart failure and stage 1 through stage 4 chronic kidney disease, or unspecified chronic kidney disease** CC HCC RHC CC MCE Ex
Use additional code to identify type of heart failure (I50.-)
Use additional code to identify stage of chronic kidney disease (N18.1-N18.4, N18.9)
- 5P 113.1 **Hypertensive heart and chronic kidney disease without heart failure**
113.10 **Hypertensive heart and chronic kidney disease without heart failure, with stage 1 through stage 4 chronic kidney disease, or unspecified chronic kidney disease** HCC RHC
Hypertensive heart disease and hypertensive chronic kidney disease NOS
Use additional code to identify the stage of chronic kidney disease (N18.1-N18.4, N18.9)
113.11 **Hypertensive heart and chronic kidney disease without heart failure, with stage 5 chronic kidney disease, or end stage renal disease** CC HCC RHC CC MCE Ex
Use additional code to identify the stage of chronic kidney disease (N18.5, N18.6)
- 113.2 **Hypertensive heart and chronic kidney disease with heart failure and with stage 5 chronic kidney disease, or end stage renal disease** CC HCC RHC CC MCE Ex
Use additional code to identify type of heart failure (I50.-)
Use additional code to identify the stage of chronic kidney disease (N18.5, N18.6)

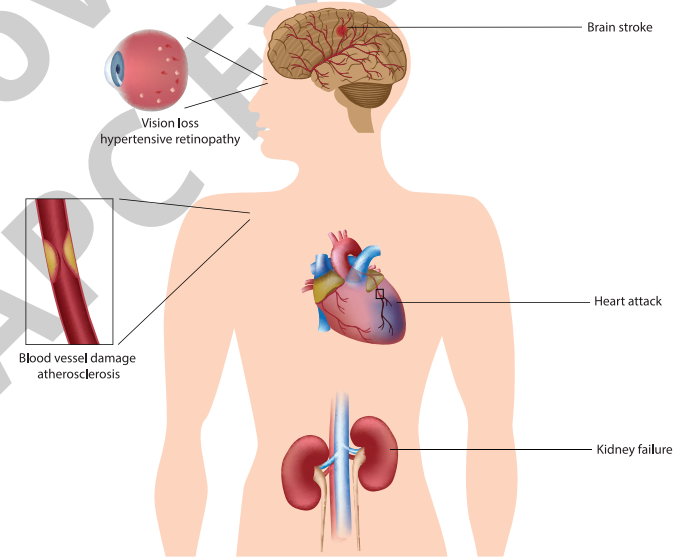


Figure 9.1 Complications of Hypertension

- 4P 115 **Secondary hypertension**
Code also underlying condition
EXCLUDES1 postprocedural hypertension (I97.3)
EXCLUDES2 secondary hypertension involving vessels of brain (I60-I69)
secondary hypertension involving vessels of eye (H35.0-)
- 115.0 **Renovascular hypertension** RHC
- 115.1 **Hypertension secondary to other renal disorders** RHC
AHA: Q3 2016
- 115.2 **Hypertension secondary to endocrine disorders** RHC
- 115.8 **Other secondary hypertension** RHC
- 115.9 **Secondary hypertension, unspecified** RHC

Unacceptable principal diagnosis symbol per Medicare code edits	Code exempt from diagnosis present on admission requirement
Questionable admission	Major complication or comorbidity
Principal diagnosis as its own CC	Major complication or comorbidity CC/MCC exclusion
Principal diagnosis as its own MCC	HCC diagnosis code
MACRA code	RxHCC diagnosis code
Z code as first-listed diagnosis	DEFINITION Describes condition/terminology

- 4th I16 Hypertensive crisis
Code also any identified hypertensive disease (I10-I15)
- I16.0 Hypertensive urgency
- AHA: Q4 2016
- I16.1 Hypertensive emergency
- AHA: Q4 2016
- I16.9 Hypertensive crisis, unspecified
- AHA: Q4 2016

Ischemic heart diseases (I20-I25)

- Use additional code to identify presence of hypertension (I10-I16)
- 4th I20 Angina pectoris
Use additional code to identify:
 exposure to environmental tobacco smoke (Z77.22)
 history of tobacco dependence (Z87.891)
 occupational exposure to environmental tobacco smoke (Z57.31)
 tobacco dependence (F17.-)
 tobacco use (Z72.0)
EXCLUDES1 angina pectoris with atherosclerotic heart disease of native coronary arteries (I25.1-)
 atherosclerosis of coronary artery bypass graft(s) and coronary artery of transplanted heart with angina pectoris (I25.7-)
 postinfarction angina (I23.7)
 - I20.0 Unstable angina
 Accelerated angina
 Crescendo angina
 De novo effort angina
 Intermediate coronary syndrome
 Preinfarction syndrome
 Worsening effort angina
 - I20.1 Angina pectoris with documented spasm
 Angiospastic angina
 Prinzmetal angina
 Spasm-induced angina
 Variant angina
 - I20.8 Other forms of angina pectoris
 Angina equivalent
 Angina of effort
 Coronary slow flow syndrome
 Stenocardia
 Stable angina
 Use additional code(s) for symptoms associated with angina equivalent
 - I20.9 Angina pectoris, unspecified
 Angina NOS
 Anginal syndrome
 Cardiac angina
 Ischemic chest pain
 - 4th I21 Acute myocardial infarction
INCLUDES cardiac infarction
 coronary (artery) embolism
 coronary (artery) occlusion
 coronary (artery) rupture
 coronary (artery) thrombosis
 infarction of heart, myocardium, or ventricle
 myocardial infarction specified as acute or with a stated duration of 4 weeks (28 days) or less from onset
Use additional code, if applicable, to identify:
 exposure to environmental tobacco smoke (Z77.22)
 history of tobacco dependence (Z87.891)
 occupational exposure to environmental tobacco smoke (Z57.31)
 status post administration of tPA (rtPA) in a different facility within the last 24 hours prior to admission to current facility (Z92.82)
 tobacco dependence (F17.-)
 tobacco use (Z72.0)
EXCLUDES2 old myocardial infarction (I25.2)
 postmyocardial infarction syndrome (I24.1)
 subsequent type 1 myocardial infarction (I22.-)

- 5th I21.0 ST elevation (STEMI) myocardial infarction of anterior wall
 Type 1 ST elevation myocardial infarction of anterior wall
- I21.01 ST elevation (STEMI) myocardial infarction involving left main coronary artery
 AHA: Q4 2017
- I21.02 ST elevation (STEMI) myocardial infarction involving left anterior descending coronary artery
 AHA: Q4 2017, Q1 2013
 ST elevation (STEMI) myocardial infarction involving diagonal coronary artery
- I21.09 ST elevation (STEMI) myocardial infarction involving other coronary artery of anterior wall
 AHA: Q4 2017, Q4 2012
 Acute transmural myocardial infarction of anterior wall
 Anteroapical transmural (Q wave) infarction (acute)
 Anterolateral transmural (Q wave) infarction (acute)
 Anteroseptal transmural (Q wave) infarction (acute)
 Transmural (Q wave) infarction (acute) (of) anterior (wall) NOS
- 5th I21.1 ST elevation (STEMI) myocardial infarction of inferior wall
 Type 1 ST elevation myocardial infarction of inferior wall
- I21.11 ST elevation (STEMI) myocardial infarction involving right coronary artery
 AHA: Q4 2017
- I21.19 ST elevation (STEMI) myocardial infarction involving other coronary artery of inferior wall
 AHA: Q4 2017, Q4 2012
 Acute transmural myocardial infarction of inferior wall
 Inferolateral transmural (Q wave) infarction (acute)
 Transmural (Q wave) infarction (acute) (of) diaphragmatic wall
 Transmural (Q wave) infarction (acute) (of) inferior (wall) NOS
EXCLUDES2 ST elevation (STEMI) myocardial infarction involving left circumflex coronary artery (I21.21)
- 5th I21.2 ST elevation (STEMI) myocardial infarction of other sites
 Type 1 ST elevation myocardial infarction of other sites
- I21.21 ST elevation (STEMI) myocardial infarction involving left circumflex coronary artery
 AHA: Q4 2017
 ST elevation (STEMI) myocardial infarction involving oblique marginal coronary artery
- I21.29 ST elevation (STEMI) myocardial infarction involving other sites
 AHA: Q4 2017
 Acute transmural myocardial infarction of other sites
 Apical-lateral transmural (Q wave) infarction (acute)
 Basal-lateral transmural (Q wave) infarction (acute)
 High lateral transmural (Q wave) infarction (acute)
 Lateral (wall) NOS transmural (Q wave) infarction (acute)
 Posterior (true) transmural (Q wave) infarction (acute)
 Posterobasal transmural (Q wave) infarction (acute)
 Posterolateral transmural (Q wave) infarction (acute)
 Posteroseptal transmural (Q wave) infarction (acute)
 Septal transmural (Q wave) infarction (acute) NOS
- I21.3 ST elevation (STEMI) myocardial infarction of unspecified site
 AHA: Q4 2017, Q1 2013
 Acute transmural myocardial infarction of unspecified site
 Transmural (Q wave) myocardial infarction NOS
 Type 1 ST elevation myocardial infarction of unspecified site
- I21.4 Non-ST elevation (NSTEMI) myocardial infarction
 AHA: Q1 2017, Q4 2017, Q2 2015
 Acute subendocardial myocardial infarction
 Non-Q wave myocardial infarction NOS
 Nontransmural myocardial infarction NOS
 Type 1 non-ST elevation myocardial infarction
- I21.9 Acute myocardial infarction, unspecified
 AHA: Q4 2017
 Myocardial infarction (acute) NOS

Unspecified Code
 Other Specified Code
 Manifestation Code
 N Newborn
 P Pediatric
 M Maternity
 A Adult
 ♂ Male
 ♀ Female
 ● New Code
 ▲ Revised Code Title
 ▶◀ Revised Text
 NOTES
 INCLUDES
 EXCLUDES1 Not coded here
 EXCLUDES2 Not included here
 4th 4th character required
 5th 5th character required
 6th 6th character required
 7th 7th character required
 8th Extension 'X' Alert
HAC Hospital-acquired condition (HAC) alert
AHA AHA Coding Clinic®
CF Code first alert
TIP Coding guidance

I21.A Other type of myocardial infarction

I21.A1 Myocardial infarction type 2 **HA: 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 (N17.0-N19)
 shock (R57.0-R57.9)

I21.A9 Other myocardial infarction type **HA: Q4 2017**
 Myocardial infarction associated with revascularization procedure
 Myocardial infarction type 3
 Myocardial infarction type 4a
 Myocardial infarction type 4b
 Myocardial infarction type 4c
 Myocardial infarction type 5
Code first, if applicable, postprocedural myocardial infarction following cardiac surgery (I97.190), or postprocedural myocardial infarction during cardiac surgery (I97.790)
Code also complication, if known and applicable, such as:
 (acute) stent occlusion (T82.897-)
 (acute) stent stenosis (T82.857-)
 (acute) stent thrombosis (T82.867-)
 cardiac arrest due to underlying cardiac condition (I46.2)
 complication of percutaneous coronary intervention (PCI) (I97.89)
 occlusion of coronary artery bypass graft (T82.218-)

I22 Subsequent ST elevation (STEMI) and non-ST elevation (NSTEMI) myocardial infarction

INCLUDES acute myocardial infarction occurring within four weeks (28 days) of a previous acute myocardial infarction, regardless of site
 cardiac infarction
 coronary (artery) embolism
 coronary (artery) occlusion
 coronary (artery) rupture
 coronary (artery) thrombosis
 infarction of heart, myocardium, or ventricle
 recurrent myocardial infarction
 reinfarction of myocardium
 rupture of heart, myocardium, or ventricle
 subsequent type 1 myocardial infarction

Use additional code, if applicable, to identify:
 exposure to environmental tobacco smoke (Z77.22)
 history of tobacco dependence (Z87.891)
 occupational exposure to environmental tobacco smoke (Z57.31)
 status post administration of tPA (rTPA) in a different facility within the last 24 hours prior to admission to current facility (Z92.82)
 tobacco dependence (F17.-)
 tobacco use (Z72.0)

EXCLUDES1 subsequent myocardial infarction, type 2 (I21.A1)
 subsequent myocardial infarction of other type (type 3) (type 4) (type 5) (I21.A9)

I22.0 Subsequent ST elevation (STEMI) myocardial infarction of anterior wall
 Subsequent acute transmural myocardial infarction of anterior wall
 Subsequent transmural (Q wave) infarction (acute)(of) anterior (wall) NOS
 Subsequent anteroapical transmural (Q wave) infarction (acute)
 Subsequent anterolateral transmural (Q wave) infarction (acute)
 Subsequent anteroseptal transmural (Q wave) infarction (acute)

I22.1 Subsequent ST elevation (STEMI) myocardial infarction of inferior wall **HA: Q4 2012**
 Subsequent acute transmural myocardial infarction of inferior wall
 Subsequent transmural (Q wave) infarction (acute)(of) diaphragmatic wall
 Subsequent transmural (Q wave) infarction (acute)(of) inferior (wall) NOS
 Subsequent inferolateral transmural (Q wave) infarction (acute)
 Subsequent inferoposterior transmural (Q wave) infarction (acute)

I22.2 Subsequent non-ST elevation (NSTEMI) myocardial infarction
 Subsequent acute subendocardial myocardial infarction
 Subsequent non-Q wave myocardial infarction NOS
 Subsequent nontransmural myocardial infarction NOS

I22.8 Subsequent ST elevation (STEMI) myocardial infarction of other sites
 Subsequent acute transmural myocardial infarction of other sites
 Subsequent apical-lateral transmural (Q wave) myocardial infarction (acute)
 Subsequent basal-lateral transmural (Q wave) myocardial infarction (acute)
 Subsequent high lateral transmural (Q wave) myocardial infarction (acute)
 Subsequent transmural (Q wave) myocardial infarction (acute) (of) lateral (wall) NOS
 Subsequent posterior (true) ▶transmural◀ (Q wave) myocardial infarction (acute)
 Subsequent posterobasal transmural (Q wave) myocardial infarction (acute)
 Subsequent posterolateral transmural (Q wave) myocardial infarction (acute)
 Subsequent posteroseptal transmural (Q wave) myocardial infarction (acute)
 Subsequent septal NOS transmural (Q wave) myocardial infarction (acute)

I22.9 Subsequent ST elevation (STEMI) myocardial infarction of unspecified site
 Subsequent acute myocardial infarction of unspecified site
 Subsequent myocardial infarction (acute) NOS

I23 Certain current complications following ST elevation (STEMI) and non-ST elevation (NSTEMI) myocardial infarction (within the 28 day period)

I23.0 Hemopericardium as current complication following acute myocardial infarction
EXCLUDES1 hemopericardium not specified as current complication following acute myocardial infarction (I31.2)

I23.1 Atrial septal defect as current complication following acute myocardial infarction
EXCLUDES1 acquired atrial septal defect not specified as current complication following acute myocardial infarction (I51.0)

I23.2 Ventricular septal defect as current complication following acute myocardial infarction
EXCLUDES1 acquired ventricular septal defect not specified as current complication following acute myocardial infarction (I51.0)

I23.3 Rupture of cardiac wall without hemopericardium as current complication following acute myocardial infarction **HA: Q2 2017**

Unacceptable principal diagnosis symbol per Medicare code edits	Code exempt from diagnosis present on admission requirement
Questionable admission	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

- I23.4 Rupture of chordae tendineae as current complication following acute myocardial infarction** **EXCLUDES1** rupture of chordae tendineae not specified as current complication following acute myocardial infarction (I51.1)
- I23.5 Rupture of papillary muscle as current complication following acute myocardial infarction** **EXCLUDES1** rupture of papillary muscle not specified as current complication following acute myocardial infarction (I51.2)
- I23.6 Thrombosis of atrium, auricular appendage, and ventricle as current complications following acute myocardial infarction** **EXCLUDES1** thrombosis of atrium, auricular appendage, and ventricle not specified as current complication following acute myocardial infarction (I51.3)
- I23.7 Postinfarction angina** **AHA: Q2 2015**
- I23.8 Other current complications following acute myocardial infarction**
- I24 Other acute ischemic heart diseases** **EXCLUDES1** angina pectoris (I20.-) transient myocardial ischemia in newborn (P29.4)
- I24.0 Acute coronary thrombosis not resulting in myocardial infarction** **AHA: Q1 2013**
Acute coronary (artery) (vein) embolism not resulting in myocardial infarction
Acute coronary (artery) (vein) occlusion not resulting in myocardial infarction
Acute coronary (artery) (vein) thromboembolism not resulting in myocardial infarction
EXCLUDES1 atherosclerotic heart disease (I25.1-)
- I24.1 Dressler's syndrome** Postmyocardial infarction syndrome
EXCLUDES1 postinfarction angina (I23.7)
- I24.8 Other forms of acute ischemic heart disease** **AHA: Q4 2017**
EXCLUDES1 myocardial infarction due to demand ischemia (I21.A1)
- I24.9 Acute ischemic heart disease, unspecified** **EXCLUDES1** ischemic heart disease (chronic) NOS (I25.9)
- I25 Chronic ischemic heart disease**
Use additional code to identify:
chronic total occlusion of coronary artery (I25.82)
exposure to environmental tobacco smoke (Z77.22)
history of tobacco dependence (Z87.891)
occupational exposure to environmental tobacco smoke (Z57.31)
tobacco dependence (F17.-)
tobacco use (Z72.0)
- I25.1 Atherosclerotic heart disease of native coronary artery** Atherosclerotic cardiovascular disease
Coronary (artery) atheroma
Coronary (artery) atherosclerosis
Coronary (artery) disease
Coronary (artery) sclerosis
Use additional code, if applicable, to identify:
coronary atherosclerosis due to calcified coronary lesion (I25.84)
coronary atherosclerosis due to lipid rich plaque (I25.83)
EXCLUDES2 atheroembolism (I75.-)
atherosclerosis of coronary artery bypass graft(s) and transplanted heart (I25.7-)
- I25.10 Atherosclerotic heart disease of native coronary artery without angina pectoris** **AHA: Q2 2015, Q4 2013**
Atherosclerotic heart disease NOS
- I25.11 Atherosclerotic heart disease of native coronary artery with angina pectoris**
- I25.110 Atherosclerotic heart disease of native coronary artery with unstable angina pectoris** **EXCLUDES1** unstable angina without atherosclerotic heart disease (I20.0)
- I25.111 Atherosclerotic heart disease of native coronary artery with angina pectoris with documented spasm** **EXCLUDES1** angina pectoris with documented spasm without atherosclerotic heart disease (I20.1)
- I25.118 Atherosclerotic heart disease of native coronary artery with other forms of angina pectoris** **AHA: Q2 2015**
EXCLUDES1 other forms of angina pectoris without atherosclerotic heart disease (I20.8)
- I25.119 Atherosclerotic heart disease of native coronary artery with unspecified angina pectoris** Atherosclerotic heart disease with angina NOS
Atherosclerotic heart disease with ischemic chest pain
EXCLUDES1 unspecified angina pectoris without atherosclerotic heart disease (I20.9)
- I25.2 Old myocardial infarction** Healed myocardial infarction
Past myocardial infarction diagnosed by ECG or other investigation, but currently presenting no symptoms
- I25.3 Aneurysm of heart** Mural aneurysm
Ventricular aneurysm
- I25.4 Coronary artery aneurysm and dissection**
- I25.41 Coronary artery aneurysm** Coronary arteriovenous fistula, acquired
EXCLUDES1 congenital coronary (artery) aneurysm (Q24.5)
- I25.42 Coronary artery dissection**
- I25.5 Ischemic cardiomyopathy** **EXCLUDES2** coronary atherosclerosis (I25.1-, I25.7-)
- I25.6 Silent myocardial ischemia**
- I25.7 Atherosclerosis of coronary artery bypass graft(s) and coronary artery of transplanted heart with angina pectoris** **Use additional code, if applicable, to identify:**
coronary atherosclerosis due to calcified coronary lesion (I25.84)
coronary atherosclerosis due to lipid rich plaque (I25.83)
EXCLUDES1 atherosclerosis of bypass graft(s) of transplanted heart without angina pectoris (I25.812)
atherosclerosis of coronary artery bypass graft(s) without angina pectoris (I25.810)
atherosclerosis of native coronary artery of transplanted heart without angina pectoris (I25.811)
- I25.70 Atherosclerosis of coronary artery bypass graft(s), unspecified, with angina pectoris**
- I25.700 Atherosclerosis of coronary artery bypass graft(s), unspecified, with unstable angina pectoris** **EXCLUDES1** unstable angina pectoris without atherosclerosis of coronary artery bypass graft (I20.0)
- I25.701 Atherosclerosis of coronary artery bypass graft(s), unspecified, with angina pectoris with documented spasm** **EXCLUDES1** angina pectoris with documented spasm without atherosclerosis of coronary artery bypass graft (I20.1)

Unspecified Code Other Specified Code Manifestation Code **N** Newborn **P** Pediatric **M** Maternity **A** Adult **♂** Male **♀** Female
 ● New Code ▲ Revised Code Title ►◄ Revised Text **NOTES** **INCLUDES** **EXCLUDES1** Not coded here **EXCLUDES2** Not included here
 4th 4th character required 5th 5th character required 6th 6th character required 7th 7th character required 8th 8th character required **Ⓢ** Extension 'X' Alert
HAC Hospital-acquired condition (HAC) alert **AHA** AHA Coding Clinic **CF** Code first alert **TIP** Coding guidance

- 125.708** **Atherosclerosis of coronary artery bypass graft(s), unspecified, with other forms of angina pectoris** A CC HCC RHC RHC CC/MCC/Exc
EXCLUDES1 other forms of angina pectoris without atherosclerosis of coronary artery bypass graft (I20.8)
- 125.709** **Atherosclerosis of coronary artery bypass graft(s), unspecified, with unspecified angina pectoris** A CC HCC RHC RHC CC/MCC/Exc
EXCLUDES1 unspecified angina pectoris without atherosclerosis of coronary artery bypass graft (I20.9)
- 6th** **125.71** **Atherosclerosis of autologous vein coronary artery bypass graft(s) with angina pectoris**
- 125.710** **Atherosclerosis of autologous vein coronary artery bypass graft(s) with unstable angina pectoris** A CC HCC RHC RHC CC/MCC/Exc
EXCLUDES1 unstable angina without atherosclerosis of autologous vein coronary artery bypass graft(s) (I20.0)
EXCLUDES2 embolism or thrombus of coronary artery bypass graft(s) (I82.8-)
- 125.711** **Atherosclerosis of autologous vein coronary artery bypass graft(s) with angina pectoris with documented spasm** A CC HCC RHC RHC CC/MCC/Exc
EXCLUDES1 angina pectoris with documented spasm without atherosclerosis of autologous vein coronary artery bypass graft(s) (I20.1)
- 125.718** **Atherosclerosis of autologous vein coronary artery bypass graft(s) with other forms of angina pectoris** A CC HCC RHC RHC CC/MCC/Exc
EXCLUDES1 other forms of angina pectoris without atherosclerosis of autologous vein coronary artery bypass graft(s) (I20.8)
- 125.719** **Atherosclerosis of autologous vein coronary artery bypass graft(s) with unspecified angina pectoris** A CC HCC RHC RHC CC/MCC/Exc
EXCLUDES1 unspecified angina pectoris without atherosclerosis of autologous vein coronary artery bypass graft(s) (I20.9)
- 6th** **125.72** **Atherosclerosis of autologous artery coronary artery bypass graft(s) with angina pectoris**
 Atherosclerosis of internal mammary artery graft with angina pectoris
- 125.720** **Atherosclerosis of autologous artery coronary artery bypass graft(s) with unstable angina pectoris** A CC HCC RHC RHC CC/MCC/Exc
EXCLUDES1 unstable angina without atherosclerosis of autologous artery coronary artery bypass graft(s) (I20.0)
- 125.721** **Atherosclerosis of autologous artery coronary artery bypass graft(s) with angina pectoris with documented spasm** A CC HCC RHC RHC CC/MCC/Exc
EXCLUDES1 angina pectoris with documented spasm without atherosclerosis of autologous artery coronary artery bypass graft(s) (I20.1)
- 125.728** **Atherosclerosis of autologous artery coronary artery bypass graft(s) with other forms of angina pectoris** A CC HCC RHC RHC CC/MCC/Exc
EXCLUDES1 other forms of angina pectoris without atherosclerosis of autologous artery coronary artery bypass graft(s) (I20.8)
- 125.729** **Atherosclerosis of autologous artery coronary artery bypass graft(s) with unspecified angina pectoris** A CC HCC RHC RHC CC/MCC/Exc
EXCLUDES1 unspecified angina pectoris without atherosclerosis of autologous artery coronary artery bypass graft(s) (I20.9)
- 6th** **125.73** **Atherosclerosis of nonautologous biological coronary artery bypass graft(s) with angina pectoris**
- 125.730** **Atherosclerosis of nonautologous biological coronary artery bypass graft(s) with unstable angina pectoris** A CC HCC RHC RHC CC/MCC/Exc
EXCLUDES1 unstable angina without atherosclerosis of nonautologous biological coronary artery bypass graft(s) (I20.0)
- 125.731** **Atherosclerosis of nonautologous biological coronary artery bypass graft(s) with angina pectoris with documented spasm** A CC HCC RHC RHC CC/MCC/Exc
EXCLUDES1 angina pectoris with documented spasm without atherosclerosis of nonautologous biological coronary artery bypass graft(s) (I20.1)
- 125.738** **Atherosclerosis of nonautologous biological coronary artery bypass graft(s) with other forms of angina pectoris** A CC HCC RHC RHC CC/MCC/Exc
EXCLUDES1 other forms of angina pectoris without atherosclerosis of nonautologous biological coronary artery bypass graft(s) (I20.8)
- 125.739** **Atherosclerosis of nonautologous biological coronary artery bypass graft(s) with unspecified angina pectoris** A CC HCC RHC RHC CC/MCC/Exc
EXCLUDES1 unspecified angina pectoris without atherosclerosis of nonautologous biological coronary artery bypass graft(s) (I20.9)
- 6th** **125.75** **Atherosclerosis of native coronary artery of transplanted heart with angina pectoris**
EXCLUDES1 atherosclerosis of native coronary artery of transplanted heart without angina pectoris (I25.811)
- 125.750** **Atherosclerosis of native coronary artery of transplanted heart with unstable angina** CC HCC RHC RHC CC/MCC/Exc
- 125.751** **Atherosclerosis of native coronary artery of transplanted heart with angina pectoris with documented spasm** CC HCC RHC RHC CC/MCC/Exc
- 125.758** **Atherosclerosis of native coronary artery of transplanted heart with other forms of angina pectoris** CC HCC RHC RHC CC/MCC/Exc
- 125.759** **Atherosclerosis of native coronary artery of transplanted heart with unspecified angina pectoris** CC HCC RHC RHC CC/MCC/Exc
- 6th** **125.76** **Atherosclerosis of bypass graft of coronary artery of transplanted heart with angina pectoris**
EXCLUDES1 atherosclerosis of bypass graft of coronary artery of transplanted heart without angina pectoris (I25.812)

PDR Unacceptable principal diagnosis symbol per Medicare code edits PDR Questionable admission CC Complication or comorbidity MCC Major complication or comorbidity CC/MCC/Exc CC/MCC exclusion PDR Principal diagnosis as its own CC MCC Principal diagnosis as its own MCC A HCC HCC diagnosis code RHC RxHCC diagnosis code A MACRA code Z Z code as first-listed diagnosis DEFINITION Describes condition/terminology

- 125.760 Atherosclerosis of bypass graft of coronary artery of transplanted heart with **unstable angina** A CC HCC PDX RBHCC CC/MCC/Exc
- 125.761 Atherosclerosis of bypass graft of coronary artery of transplanted heart with angina pectoris with documented spasm A CC HCC PDX RBHCC CC/MCC/Exc
- 125.768 Atherosclerosis of bypass graft of coronary artery of transplanted heart with other forms of angina pectoris A CC HCC RBHCC CC/MCC/Exc
- 125.769 **Atherosclerosis of bypass graft of coronary artery of transplanted heart with unspecified angina pectoris** A CC HCC RBHCC CC/MCC/Exc
- 6th 125.79 Atherosclerosis of **other coronary artery** bypass graft(s) with angina pectoris
- 125.790 Atherosclerosis of other coronary artery bypass graft(s) with **unstable angina pectoris** A CC HCC PDX RBHCC CC/MCC/Exc
EXCLUDES1 unstable angina without atherosclerosis of other coronary artery bypass graft(s) (I20.0)
- 125.791 Atherosclerosis of other coronary artery bypass graft(s) with angina pectoris with **documented spasm** A CC HCC RBHCC
EXCLUDES1 angina pectoris with documented spasm without atherosclerosis of other coronary artery bypass graft(s) (I20.1)
- 125.798 Atherosclerosis of other coronary artery bypass graft(s) with **other forms of angina pectoris** A CC HCC RBHCC
EXCLUDES1 other forms of angina pectoris without atherosclerosis of other coronary artery bypass graft(s) (I20.8)
- 125.799 **Atherosclerosis of other coronary artery bypass graft(s) with unspecified angina pectoris** A CC HCC RBHCC
EXCLUDES1 unspecified angina pectoris without atherosclerosis of other coronary artery bypass graft(s) (I20.9)
- 5th 125.8 **Other forms of chronic ischemic heart disease**
- 6th 125.81 Atherosclerosis of other coronary vessels **without angina pectoris**
Use additional code, if applicable, to identify:
coronary atherosclerosis due to calcified coronary lesion (I25.84)
coronary atherosclerosis due to lipid rich plaque (I25.83)
EXCLUDES1 atherosclerotic heart disease of native coronary artery without angina pectoris (I25.10)
- 125.810 Atherosclerosis of **coronary artery bypass graft(s) without angina pectoris** A CC RBHCC
AHA: Q4 2016
Atherosclerosis of coronary artery bypass graft NOS
EXCLUDES1 atherosclerosis of coronary bypass graft(s) with angina pectoris (I25.70-I25.73-, I25.79-)
- 125.811 Atherosclerosis of **native coronary artery of transplanted heart without angina pectoris** CC RBHCC CC/MCC/Exc
Atherosclerosis of native coronary artery of transplanted heart NOS
EXCLUDES1 atherosclerosis of native coronary artery of transplanted heart with angina pectoris (I25.75-)

- 125.812 Atherosclerosis of **bypass graft of coronary artery of transplanted heart without angina pectoris** A CC RBHCC CC/MCC/Exc
Atherosclerosis of bypass graft of transplanted heart NOS
EXCLUDES1 atherosclerosis of bypass graft of transplanted heart with angina pectoris (I25.76)
- 125.82 **Chronic total occlusion of coronary artery** RBHCC PDX/In
Complete occlusion of coronary artery
Total occlusion of coronary artery
Code first coronary atherosclerosis (I25.1-, I25.7-, I25.81-)
EXCLUDES1 acute coronary occlusion with myocardial infarction (I21.0-I21.9, I22.-)
acute coronary occlusion without myocardial infarction (I24.0)
- 125.83 **Coronary atherosclerosis due to lipid rich plaque** A RBHCC PDX/In
Code first coronary atherosclerosis (I25.1-, I25.7-, I25.81-)
- 125.84 **Coronary atherosclerosis due to calcified coronary lesion** RBHCC PDX/In
Coronary atherosclerosis due to severely calcified coronary lesion
Code first coronary atherosclerosis (I25.1-, I25.7-, I25.81-)
- 125.89 **Other forms of chronic ischemic heart disease** RBHCC
- 125.9 **Chronic ischemic heart disease, unspecified** RBHCC
Ischemic heart disease (chronic) NOS

Pulmonary heart disease and diseases of pulmonary circulation (I26-I28)

- 4th I26 **Pulmonary embolism**
INCLUDES pulmonary (acute) (artery)(vein) infarction
pulmonary (acute) (artery)(vein) thromboembolism
pulmonary (acute) (artery)(vein) thrombosis
EXCLUDES2 chronic pulmonary embolism (I27.82)
personal history of pulmonary embolism (Z86.711)
pulmonary embolism complicating abortion, ectopic or molar pregnancy (O00-O07, O08.2)
pulmonary embolism complicating pregnancy, childbirth and the puerperium (O88.-)
pulmonary embolism due to trauma (T79.0, T79.1)
pulmonary embolism due to complications of surgical and medical care (T80.0, T81.7-, T82.8-)
septic (non-pulmonary) arterial embolism (I76)
- 5th I26.0 **Pulmonary embolism with acute cor pulmonale**
- I26.01 **Septic pulmonary embolism with acute cor pulmonale** HCC MCC PDX/In RBHCC PDX/In CC/MCC/Exc
Code first underlying infection
- I26.02 **Saddle embolus of pulmonary artery with acute cor pulmonale** HAC HCC MCC PDX/In RBHCC CC/MCC/Exc
- I26.09 **Other pulmonary embolism with acute cor pulmonale** HAC HCC MCC PDX/In RBHCC CC/MCC/Exc
Acute cor pulmonale NOS
- 5th I26.9 **Pulmonary embolism without acute cor pulmonale**
- I26.90 **Septic pulmonary embolism without acute cor pulmonale** HCC MCC PDX/In RBHCC PDX/In CC/MCC/Exc
Code first underlying infection
- I26.92 **Saddle embolus of pulmonary artery without acute cor pulmonale** HAC HCC MCC PDX/In RBHCC CC/MCC/Exc
- I26.99 **Other pulmonary embolism without acute cor pulmonale** HAC HCC MCC PDX/In RBHCC CC/MCC/Exc
Acute pulmonary embolism NOS
Pulmonary embolism NOS
- 4th I27 **Other pulmonary heart diseases**
- I27.0 **Primary pulmonary hypertension** CC HCC RBHCC CC/MCC/Exc
Heritable pulmonary arterial hypertension
Idiopathic pulmonary arterial hypertension
Primary group 1 pulmonary hypertension
Primary pulmonary arterial hypertension

Unspecified Code Other Specified Code Manifestation Code N Newborn P Pediatric M Maternity A Adult ♂ Male ♀ Female
 ● New Code ▲ Revised Code Title ► Revised Text NOTES INCLUDES EXCLUDES1 Not coded here EXCLUDES2 Not included here
 4th 4th character required 5th 5th character required 6th 6th character required 7th 7th character required Extension 'X' Alert
 HAC Hospital-acquired condition (HAC) alert AHA AHA Coding Clinic Code first alert TIP Coding guidance

EXCLUDES1 persistent pulmonary hypertension of newborn (P29.30)
 pulmonary hypertension NOS (I27.20)
 secondary pulmonary arterial hypertension (I27.21)
 secondary pulmonary hypertension (I27.29)

I27.1 **Kyphoscoliotic heart disease**

I27.2 **Other secondary pulmonary hypertension**

Code also associated underlying condition
EXCLUDES1 Eisenmenger's syndrome (I27.83)

I27.20 **Pulmonary hypertension, unspecified**

Pulmonary hypertension NOS

I27.21 **Secondary pulmonary arterial hypertension**

(Associated) (drug-induced) (toxin-induced)
 pulmonary arterial hypertension NOS

(Associated) (drug-induced) (toxin-induced)
 (secondary) group 1 pulmonary hypertension

Code also associated conditions if applicable, or
adverse effects of drugs or toxins, such as:

adverse effect of appetite depressants (T50.5X5)

congenital heart disease (Q00-Q28)

human immunodeficiency virus [HIV] disease (B20)

polymyositis (M33.2-)

portal hypertension (K76.6)

rheumatoid arthritis (M05.-)

schistosomiasis (B65.-)

Sjögren syndrome (M35.0-)

systemic sclerosis (M34.-)

I27.22 **Pulmonary hypertension due to left heart**

disease

Group 2 pulmonary hypertension

Code also associated left heart disease, if known,

such as:

multiple valve disease (I08.-)

rheumatic mitral valve diseases (I05.-)

rheumatic aortic valve diseases (I06.-)

I27.23 **Pulmonary hypertension due to lung diseases and**

hypoxia

Group 3 pulmonary hypertension

Code also associated lung disease, if known, such as:

bronchiectasis (J47.-)

cystic fibrosis with pulmonary manifestations

(E84.0)

interstitial lung disease (J84.-)

pleural effusion (J90)

sleep apnea (G47.3-)

I27.24 **Chronic thromboembolic pulmonary**

hypertension

Group 4 pulmonary hypertension

Code also associated pulmonary embolism, if

applicable (I26.-, I27.82)

I27.29 **Other secondary pulmonary hypertension**

Group 5 pulmonary hypertension

Pulmonary hypertension with unclear multifactorial

mechanisms

Pulmonary hypertension due to hematologic disorders

Pulmonary hypertension due to metabolic disorders

Pulmonary hypertension due to other systemic disorders

Code also other associated disorders, if known, such as:

chronic myeloid leukemia (C92.10- C92.22)

essential thrombocythemia (D47.3)

Gaucher disease (E75.22)

hypertensive chronic kidney disease with end stage

renal disease (I12.0, ▶I13.11, ◀I13.2)

hyperthyroidism (E05.-)

hypothyroidism (E00-E03)

polycythemia vera (D45)

sarcoidosis (D86.-)

I27.8 **Other specified pulmonary heart diseases**

I27.81 **Cor pulmonale (chronic)**

Cor pulmonale NOS

EXCLUDES1 acute cor pulmonale (I26.0-)

I27.82 **Chronic pulmonary embolism**

Use additional code, if applicable, for associated long-

term (current) use of anticoagulants (Z79.01)

EXCLUDES1 personal history of pulmonary embolism

(Z86.711)

I27.83 **Eisenmenger's syndrome**

Eisenmenger's complex

(Irreversible) Eisenmenger's disease

Pulmonary hypertension with right to left shunt

related to congenital heart disease

Code also underlying heart defect, if known, such as:

atrial septal defect (Q21.1)

Eisenmenger's defect (Q21.8)

patent ductus arteriosus (Q25.0)

ventricular septal defect (Q21.0)

I27.89 **Other specified pulmonary heart diseases**

I27.9 **Pulmonary heart disease, unspecified**

Chronic cardiopulmonary disease

I28 **Other diseases of pulmonary vessels**

I28.0 **Arteriovenous fistula of pulmonary vessels**

EXCLUDES1 congenital arteriovenous fistula (Q25.72)

I28.1 **Aneurysm of pulmonary artery**

EXCLUDES1 congenital aneurysm (Q25.79)

congenital arteriovenous aneurysm (Q25.72)

I28.8 **Other diseases of pulmonary vessels**

Pulmonary arteritis

Pulmonary endarteritis

Rupture of pulmonary vessels

Stenosis of pulmonary vessels

Stricture of pulmonary vessels

I28.9 **Disease of pulmonary vessels, unspecified**

Other forms of heart disease (I30-I52)

I30 **Acute pericarditis**

INCLUDES acute mediastinopericarditis

acute myopericarditis

acute pericardial effusion

acute pleuropericarditis

acute pneumopericarditis

EXCLUDES1 Dressler's syndrome (I24.1)

rheumatic pericarditis (acute) (I01.0)

viral pericarditis due to Coxsackie virus (B33.23)

I30.0 **Acute nonspecific idiopathic pericarditis**

I30.1 **Infective pericarditis**

Pneumococcal pericarditis

Pneumopyopericardium

Purulent pericarditis

Pyopericarditis

Pyopericardium

Pyopneumopericardium

Staphylococcal pericarditis

Streptococcal pericarditis

Suppurative pericarditis

Viral pericarditis

Use additional code (B95-B97) to identify infectious agent

I30.8 **Other forms of acute pericarditis**

I30.9 **Acute pericarditis, unspecified**

I31 **Other diseases of pericardium**

EXCLUDES1 diseases of pericardium specified as rheumatic (I09.2)

postcardiotomy syndrome (I97.0)

traumatic injury to pericardium (S26.-)























I31.0 **Chronic adhesive pericarditis**










Accretio cordis

Adherent pericardium

Adhesive mediastinopericarditis

Unacceptable principal diagnosis symbol per Medicare code edits Code exempt from diagnosis present on admission requirement
 Questionable admission Complication or comorbidity Major complication or comorbidity CC/MCC exclusion
 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

<p>I31.1 Chronic constrictive pericarditis  Concretio cordis Pericardial calcification</p> <p>I31.2 Hemopericardium, not elsewhere classified  EXCLUDES1 hemopericardium as current complication following acute myocardial infarction (I23.0)</p> <p>I31.3 Pericardial effusion (noninflammatory)  Chylopericardium EXCLUDES1 acute pericardial effusion (I30.9)</p> <p>I31.4 Cardiac tamponade   Code first underlying cause</p> <p>I31.8 Other specified diseases of pericardium  Epicardial plaques Focal pericardial adhesions</p> <p>I31.9 Disease of pericardium, unspecified  Pericarditis (chronic) NOS</p> <p>I32 Pericarditis in diseases classified elsewhere   Code first underlying disease EXCLUDES1 pericarditis (in): coxsackie (virus) (B33.23) gonococcal (A54.83) meningococcal (A39.53) rheumatoid (arthritis) (M05.31) syphilitic (A52.06) systemic lupus erythematosus (M32.12) tuberculosis (A18.84)</p> <p>I33 Acute and subacute endocarditis  EXCLUDES1 acute rheumatic endocarditis (I01.1) endocarditis NOS (I38)</p> <p>I33.0 Acute and subacute infective endocarditis  Bacterial endocarditis (acute) (subacute) Infective endocarditis (acute) (subacute) NOS Endocarditis lenta (acute) (subacute) Malignant endocarditis (acute) (subacute) Purulent endocarditis (acute) (subacute) Septic endocarditis (acute) (subacute) Ulcerative endocarditis (acute) (subacute) Vegetative endocarditis (acute) (subacute) Use additional code (B95-B97) to identify infectious agent</p> <p>I33.9 Acute and subacute endocarditis, unspecified  Acute endocarditis NOS Acute myoendocarditis NOS Acute periendocarditis NOS Subacute endocarditis NOS Subacute myoendocarditis NOS Subacute periendocarditis NOS</p> <p>I34 Nonrheumatic mitral valve disorders  EXCLUDES1 mitral valve disease (I05.9) mitral valve failure (I05.8) mitral valve stenosis (I05.0) mitral valve disorder of unspecified cause with diseases of aortic and/or tricuspid valve(s) (I08.-) mitral valve disorder of unspecified cause with mitral stenosis or obstruction (I05.0) mitral valve disorder specified as congenital (Q23.2, Q23.9) mitral valve disorder specified as rheumatic (I05.-)</p> <p>I34.0 Nonrheumatic mitral (valve) insufficiency Nonrheumatic mitral (valve) incompetence NOS Nonrheumatic mitral (valve) regurgitation NOS</p> <p>I34.1 Nonrheumatic mitral (valve) prolapse Floppy nonrheumatic mitral valve syndrome EXCLUDES1 Marfan's syndrome (Q87.4-)</p> <p>I34.2 Nonrheumatic mitral (valve) stenosis</p> <p>I34.8 Other nonrheumatic mitral valve disorders</p> <p>I34.9 Nonrheumatic mitral valve disorder, unspecified</p> <p>I35 Nonrheumatic aortic valve disorders  EXCLUDES1 aortic valve disorder of unspecified cause but with diseases of mitral and/or tricuspid valve(s) (I08.-) aortic valve disorder specified as congenital (Q23.0, Q23.1) aortic valve disorder specified as rheumatic (I06.-) hypertrophic subaortic stenosis (I42.1)</p>	<p>I35.0 Nonrheumatic aortic (valve) stenosis</p> <p>I35.1 Nonrheumatic aortic (valve) insufficiency Nonrheumatic aortic (valve) incompetence NOS Nonrheumatic aortic (valve) regurgitation NOS</p> <p>I35.2 Nonrheumatic aortic (valve) stenosis with insufficiency</p> <p>I35.8 Other nonrheumatic aortic valve disorders</p> <p>I35.9 Nonrheumatic aortic valve disorder, unspecified</p> <p>I36 Nonrheumatic tricuspid valve disorders  EXCLUDES1 tricuspid valve disorders of unspecified cause (I07.-) tricuspid valve disorders specified as congenital (Q22.4, Q22.8, Q22.9) tricuspid valve disorders specified as rheumatic (I07.-) tricuspid valve disorders with aortic and/or mitral valve involvement (I08.-)</p> <p>I36.0 Nonrheumatic tricuspid (valve) stenosis</p> <p>I36.1 Nonrheumatic tricuspid (valve) insufficiency Nonrheumatic tricuspid (valve) incompetence Nonrheumatic tricuspid (valve) regurgitation</p> <p>I36.2 Nonrheumatic tricuspid (valve) stenosis with insufficiency</p> <p>I36.8 Other nonrheumatic tricuspid valve disorders</p> <p>I36.9 Nonrheumatic tricuspid valve disorder, unspecified</p> <p>I37 Nonrheumatic pulmonary valve disorders  EXCLUDES1 pulmonary valve disorder specified as congenital (Q22.1, Q22.2, Q22.3) pulmonary valve disorder specified as rheumatic (I09.89)</p> <p>I37.0 Nonrheumatic pulmonary valve stenosis</p> <p>I37.1 Nonrheumatic pulmonary valve insufficiency Nonrheumatic pulmonary valve incompetence Nonrheumatic pulmonary valve regurgitation</p> <p>I37.2 Nonrheumatic pulmonary valve stenosis with insufficiency</p> <p>I37.8 Other nonrheumatic pulmonary valve disorders</p> <p>I37.9 Nonrheumatic pulmonary valve disorder, unspecified</p> <p>I38 Endocarditis, valve unspecified  INCLUDES endocarditis (chronic) NOS valvular incompetence NOS valvular insufficiency NOS valvular regurgitation NOS valvular stenosis NOS valvulitis (chronic) NOS EXCLUDES1 congenital insufficiency of cardiac valve NOS (Q24.8) congenital stenosis of cardiac valve NOS (Q24.8) endocardial fibroelastosis (I42.4) endocarditis specified as rheumatic (I09.1)</p> <p>I39 Endocarditis and heart valve disorders in diseases classified elsewhere   Code first underlying disease, such as: Q fever (A78) EXCLUDES1 endocardial involvement in: candidiasis (B37.6) gonococcal infection (A54.83) Libman-Sacks disease (M32.11) listeriosis (A32.82) meningococcal infection (A39.51) rheumatoid arthritis (M05.31) syphilis (A52.03) tuberculosis (A18.84) typhoid fever (A01.02)</p> <p>I40 Acute myocarditis (Figure 9.2)  INCLUDES subacute myocarditis EXCLUDES1 acute rheumatic myocarditis (I01.2)</p> <p>I40.0 Infective myocarditis  Septic myocarditis Use additional code (B95-B97) to identify infectious agent</p> <p>I40.1 Isolated myocarditis  Fiedler's myocarditis Giant cell myocarditis Idiopathic myocarditis</p>
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Unspecified Code	Other Specified Code	Manifestation Code	N Newborn	P Pediatric	M Maternity	A Adult	♂ Male	♀ Female
● New Code	▲ Revised Code Title	▶◀ Revised Text	NOTES	INCLUDES	EXCLUDES1 Not coded here	EXCLUDES2 Not included here		
 4th character required	 5th character required	 6th character required	 7th character required	 Extension 'X' Alert				
 Hospital-acquired condition (HAC) alert	 AHA Coding Clinic	 Code first alert	 Coding guidance					

