# Anatomy and Pathophysiology for ICD-10

## 2014

## Module 5


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# Contents

Module 5

# Cardiovascular System

## Terminology

**Angina**—Episodes of severe chest pain due to inadequate blood flow to the heart.

**Anomaly**—Deviation from normal.

**Arteries**—Large blood vessels that carry blood away from the heart to the other areas of the body.

**Asystole**—Absence of contractions of the heart.

**Atherosclerosis**—Hardening of the arteries due to fatty deposits building up in the inner layers of the walls of larger arteries.

**Autologous**—Providing a graft to yourself.

**Beta-blocker**—A form of medication used to reduce the workload of the heart by slowing the rate of the heart beat.

**Bruit**—An abnormal sound heard when listening to a carotid artery.

**Capillaries**—The smallest blood vessels in the body.

**Carditis**—Inflammation of the heart muscles.

**Claudication**—Cramping of the claves due to poor circulation to leg muscles.

**Cusp**—Small flaps on the valves of the heart.

**Dysrhythmia**—Abnormal rhythm of the heart.

**Embolus**—A mass or object (blood, gas or tissue) that travels through the blood stream and lodges in a vessel to cause blockage.

**Hypoxemia**—Insufficient oxygenation of arterial blood.

**Infarction**—An area of tissue death (necrosis) due to a local lack of oxygen caused by an obstruction of the tissue's blood supply.

**Ischemia**—A condition in which an insufficient supply of oxygen flows to a part of the body due to a restriction in the blood flow.

**Nitroglycerin**—A form of medication called a vasodilator that is used to relieve or prevent the pain of angina by dilating the blood vessels to the heart.

**Phlebitis**—Inflammation of a vein.

**Pulse**—The rhythmic pressure against the walls of an artery caused by the contraction of the heart.

## Introduction

The cardiovascular system is made up of the heart, arteries, veins, and capillaries. The system carries blood from the heart to the lungs, then into pulmonary circulation to the rest of the body, then back to the heart in systemic circulation. It transports 300 quarts of blood an hour through almost 60,000 miles of blood vessels in the average adult.

The system also delivers oxygen and nutrients to the body, as well as transports waste products (eg, carbon dioxide) to organs so they can be excreted from the body.

## Cells of the Cardiovascular Tract

Cells that make up the cardiovascular system include:

- Endothelial cells
- Connective tissue cells
- Cardiac muscle tissue cells
- Smooth muscle tissue cells

The endothelium is the thin layer of cells that lines the interior surface of blood vessels, forming an interface between circulating blood in the lumen and the rest of the vessel wall. These cells are called endothelial cells and they line the entire circulatory system from the heart to the smallest capillary. These cells reduce turbulence of the flow of blood, allowing the fluid to be

pumped farther. Cardiac muscle tissue cells form the walls of the heart and smooth muscle tissue cells form the walls of the blood vessels.

## Cardiovascular System Tissue

Different tissue and tissue types from the cardiovascular organs, including:

- Epithelial tissue (Simple squamous epithelium)
- Connective tissue
- Cardiac muscle tissue
- Smooth muscle tissue

Epithelial tissue covers the whole surface of the body. It is made up of cells closely packed and ranged in one or more layers. This tissue is specialized to form the covering or lining of all internal and external body surfaces. Epithelial tissue that occurs on surfaces on the interior of the body is known as endothelium. Epithelial cells are packed tightly together, with almost no intercellular spaces and only a small amount of intercellular substance. Epithelial tissue, regardless of the type, is usually separated from the underlying tissue by a thin sheet of connective tissue called basement membrane. The basement membrane provides structural support for the epithelium and also binds it to neighboring structures.

Epithelial tissue can be divided into two groups depending on the number of layers of which it is composed. Epithelial tissue, which is only one cell thick, is known as simple epithelium. If it is two or more cells thick such as the skin, it is known as stratified epithelium. The function of simple squamous epithelium is to assist in the passage of materials by diffusion. It forms the walls of the capillaries and the smooth interior lining of the heart, blood vessels, and the thoracic cavity, for example.

Connective tissue is composed mainly of branching elastic fibers with fibroblasts present between the fibers. Elastic connective tissue is found in the walls of arteries and its function is to stretch. Elastic fibers are bundles of proteins found in extracellular matrix of connective tissue and produced by fibroblasts and smooth muscle cells in arteries. These fibers can stretch up to 1.5 times their length, and snap back to their original length when relaxed. Elastic fibers include elastin, elaunin and oxytalan. Elastic fibers are found in the skin, lungs, arteries, veins, connective tissue proper, elastic cartilage, periodontal ligament, fetal tissue and other structures.

Cardiac muscle is so named because it is found in the heart. Cardiac muscle is branched, striated, involuntary muscle. Cells are joined to one another by intercalated discs, which allow the synchronization of the heartbeat. This makes possible the maximal ejection of blood from the ventricle during contraction and occurs without nervous innervation to each cell or group of cells. This is what makes cardiac muscle different from skeletal and smooth muscle. Cardiac muscle also differs from the other two muscle types in that contraction can occur even without an initial nervous input. The cells that produce the stimulation for contraction without nervous input are called the pacemaker cells**.** Cardiac muscle is like skeletal muscle in that it is striated and multinucleate, and like smooth muscle in that the nuclei are centrally located and many cells are required to span the length of the muscle.

Smooth muscle is made of single, spindle-shaped cells. It gets its name because no striations are visible in them. Smooth muscle is found in the walls of all the hollow organs of the body (except the heart), like blood vessels and lymph vessels. Its contraction reduces the size of these structures, such as regulating the flow of blood in the arteries. Each smooth muscle cell contains myosin (thick) and actin (thin) filaments. These filaments slide against each other to produce the contraction of the cell. Contractions of smooth muscle tend to be slower that striated muscle, but sustained for longer periods.

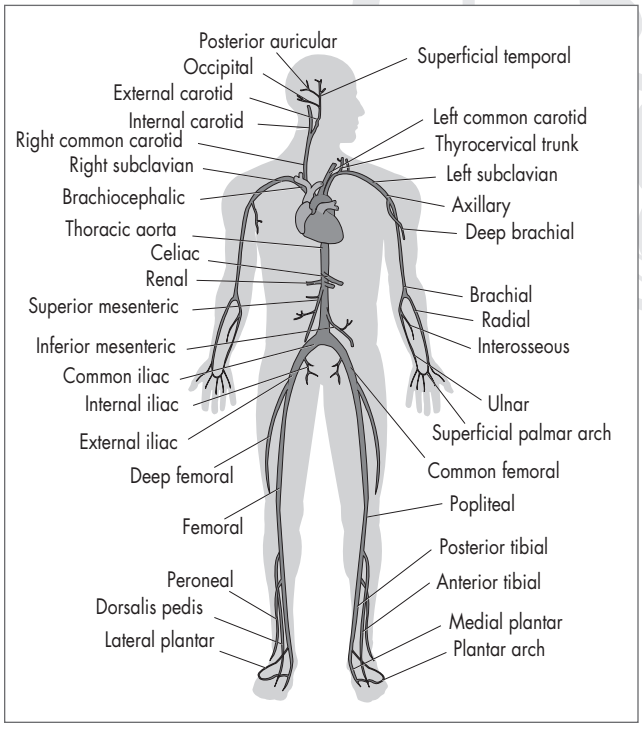
## Cardiovascular Organs—Function and Structure

### Heart

The heart is a muscular, four-chambered organ responsible for pumping blood throughout the blood vessels by repeated, rhythmic contractions. The term cardiac means "related to the heart." The average human heart, beating at 72 beats per minute, will beat approximately 2.5 billion times during an average 66-year lifespan. It weighs approximately 250 to 300 grams (9 to 11 oz) in females and 300 to 350 grams (11 to 12 oz) in males and is about the size of a fist. It is anterior to the vertebral column and

posterior to the sternum. The upper chambers are called the atria and the lower chambers are called the ventricles. The atria receive and the ventricles discharge. The right and left sides are separated by a septum.

The right atrium receives the deoxygenated blood from the superior vena cava, inferior vena cava, and the coronary sinus. The blood drains into the right ventricle through the tricuspid valve. The right ventricle pushes it up through the pulmonary valve into the pulmonary arteries, which carry the blood to the lungs to receive oxygen. The oxygen-rich blood is returned to the heart via the four pulmonary veins and enters into the left atrium. The left atrium drains the blood into the left ventricle through the mitral valve. From the left ventricle the oxygenated blood is pumped through the aortic valve, into the aorta and out to the body.






The heart is enclosed in a double-walled sac that contains the heart and the roots of the great vessels called the pericardium. There are two layers to the pericardial sac. The superficial part of this sac is called the fibrous pericardium and it binds the heart to surrounding structures and is made up of areolar connective tissue, a loose connective tissue. This sac protects the heart, anchors its surrounding structures, and prevents overfilling of the heart with blood. The serous pericardium is the deeper layer and is divided into another two layers: a parietal layer and a visceral layer. When the visceral layer comes in contact with the heart it is known as the epicardium.

The heart wall is composed of three layers:

- Epicardium
- Myocardium
- Endocardium

The epicardium is the outer layer, also called the visceral pericardium since it is also the inner wall of the pericardium. It produces pericardial fluid, which lubricates motion between the inner and outer layers of the pericardium. During ventricular contraction, the wave of depolarization moves from endocardial to epicardial surface. The middle layer is the myocardium and is the thickest layer. It is composed of spontaneously contractile cardiac muscle fibers allow the heart to contract, pumping blood from the ventricles. It also relaxes the heart to allow the atria to receive blood. The endocardium is the inner layer and is in contact with the blood that is pumped in the heart. It consists of epithelial and connective tissue. The endocardium lines the inner cavities of the heart, covers heart valves, and merges with the endothelium of blood vessels. The Purkinje fibers are located in the endocardium, which are part of the conduction system of the heart.

The heart has four valves: the tricuspid, the mitral, the aortic, and the pulmonary. Each valve has a set of cusps, or leaflets, that allow the valves to open and close fully. The chordae tendineae anchor the valves in and prevent them from inverting. The chordae tendineae are attached to papillary muscles that cause tension to better hold the valve. Together, they are known as the subvalvular apparatus.

The valves are divided into the atrioventricular (AV) and the semilunar (SL) valves. The atrioventricular valves (named so because they are between the atria and the ventricles), are the mitral valve and the tricuspid valve. The mitral valve (also known as the "bicuspid valve" because it contains two flaps) gets its name from the resemblance to a bishop's mitre hat. Located on the left side of the heart, it allows the blood to flow from the left atrium into the left ventricle. A common complication of

rheumatic fever is thickening and stenosis of the mitral valve. The tricuspid valve is the three-flapped valve located on the right side of the heart, between the right atrium and the right ventricle which stops the backflow of blood between the two. The closure of the AV valves contributes to the first heart sound (S1).

The two semilunar valves are the aortic and the pulmonary (or pulmonic) valve. They are in the arteries leaving the heart. These valves allow blood to be forced into the arteries and prevent backflow of blood into the ventricles. They do not have chordae tendineae like the AV valves and are more like the valves in the veins. The aortic valve sits on the left side between the ventricle and the aorta and has three cusps. During ventricular systole, pressure rises in the left ventricle. When it rises above the pressure in the aorta, the aortic valve opens. This allows the blood to exit the left ventricle into the aorta. When systole ends, the pressure in the left ventricle drops rapidly and the aortic pressure forces the valve to close. The closure of the aortic valve contributes the A2 component to the second heart sound (S2). The pulmonary valve sits on the right side between the ventricle and the pulmonary vein and has three cusps. Like the aortic valve, the pulmonary valve opens in ventricle systole. When the pressure rises above the pressure in the pulmonary artery, the pulmonary valve opens. When the systole ends, the pressure in the right ventricle drops rapidly and forces the valve to close. The closure of the pulmonary valve contributes the P2 component of the second heart sound (S2). Since the right heart is a low-pressure system the P2 sound is usually softer than the A2 component.

The heart is able to move blood throughout the body as a result of its conduction system. The system contains pacemaker cells, nodes, the Bundle of His, and the Purkinje fibers. The pacemaker cells have the ability to generate an electrical impulse, to pass that impulse to other cells, and to shorten the fibers in the heart when receiving the impulse. The sinoatrial (SA) node is located in the right atrium by the superior vena cava. It is the normal pacemaker of the heart and generates an electrical impulse between 60–100 times per minute. The SA node fires and sends an impulse through the right and left atria causing an atrial contraction. The atrioventriclar (AV) node is located lower in the septal wall of the right atrium. It slows the impulse conduction down between the atria and the ventricles to allow time for the atria to fill with blood before the ventricles contract. The impulse then travels to the Bundle of His, which are muscle fibers that branch off to the right and left. Then the impulse arrives at the Purkinje fibers at the end of the bundle branches. These fibers lie across the surface of the ventricles and give the final signal for the ventricles to contract. This entire cycle, a single heart beat, lasts about 0.8 seconds. The impulses generated during the heart cycle produce electrical currents, which are conducted through body fluids to the skin, where they can be detected by electrodes and recorded on an electrocardiogram. The events related to the flow or blood pressure that occurs from the beginning of one heartbeat to the beginning of the next is a cardiac cycle.

## Blood Vessels

There are three varieties of blood vessels: arteries, veins, and capillaries. During blood circulation, the arteries carry blood away from the heart. The capillaries connect the arteries to veins. Then the veins carry the blood back to the heart.

Arteries are tough on the outside and smooth on the inside. An artery has three layers: an outer layer of tissue (tunica externa or tunica adventitia), a muscular middle (tunica media), and an inner layer of epithelial cells (tunica interna or tunica intima). The muscle in the middle is elastic and very strong. The inner layer is very smooth so that the blood can flow easily with no obstacles in its path.

Unlike the arteries and veins, capillaries are very thin and fragile. The capillaries are actually only one epithelial cell thick. They are so thin that blood cells can only pass through them in single file. The exchange of oxygen and carbon dioxide takes place through the thin capillary wall.

Veins are similar to arteries but, because they transport blood at a lower pressure, they are not as strong as arteries. Like arteries, veins have three layers: an outer layer of tissue, muscle in the middle, and a smooth inner layer of epithelial cells. However, the layers are thinner, containing less tissue.

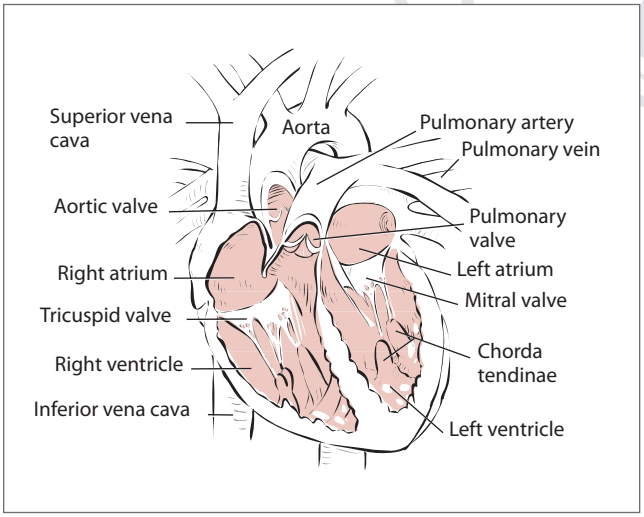
## Circulation

On average, your body has about five liters of blood continually moving through it by way of the circulatory system. The heart, the lungs, and the blood vessels work together to form the circle part of the circulatory system. The pumping of the heart forces the blood on its journey. There are three methods of circulation that carry blood throughout the body: systemic, pulmonary, and coronary.

Systemic circulation supplies nourishment to all of the tissue located throughout the body, with the exception of the heart and lungs because they have their own systems.

Pulmonary circulation is the movement of blood from the heart, to the lungs, and back to the heart again. Pulmonary circulation can be heard through a stethoscope. The "lub" and "dub" sounds that are heard are the ventricles contracting and the valves closing.

Coronary circulation refers to the movement of blood through the tissues of the heart.






## Diseases and Disorders

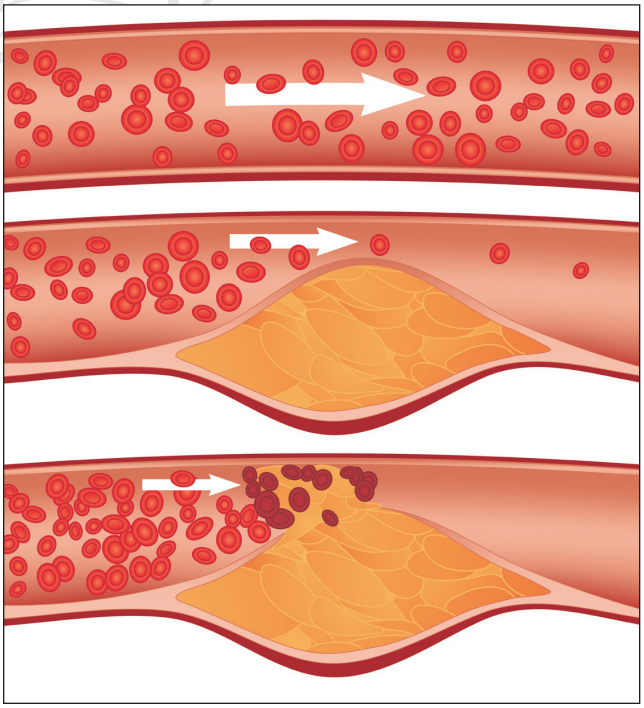
This section will address the diseases that are part of the official ICD-10-CM guidelines for the Cardiovascular system found in chapter 9, Diseases of the Circulatory System.

## Ischemic Heart Diseases

Ischemic heart disease develops when there is a decreased supply of blood of the heart muscle. The vessels that supply the blood to the heart muscle can become filled with plaque, causing narrowing of the coronary arteries. The plaque is made up of cholesterol-rich fatty deposits, collagen, proteins, and excess smooth muscle cells. This condition is known as atherosclerosis, and usually builds up slowly over a long period of time. Complete occlusion of a vessel leads to myocardial infarction.

## Myocardial Infarction

Myocardial infarction (MI) or acute myocardial infarction (AMI), commonly known as a heart attack, is the interruption of blood supply to a part of the heart, causing heart cells to die. This is most commonly due to occlusion of a coronary artery following the rupture of a vulnerable atherosclerotic plaque, which is an unstable collection of lipids and white blood cells (especially macrophages) in the wall of an artery. The resulting ischemia and oxygen shortage, if left untreated for a sufficient period of time, can cause damage or death of myocardium.



Source: AAPC

There are two basic types of acute myocardial infarction:

- **Transmural:** associated with atherosclerosis involving major coronary artery. It can be subclassified into anterior, posterior, or inferior. Transmural infarcts extend through the whole thickness of the heart muscle and are usually a result of complete occlusion of the area's blood supply.
- **Subendocardial:** involving a small area in the subendocardial wall of the left ventricle, ventricular septum, or papillary muscles. Subendocardial infarcts are thought to be a result of locally decreased blood supply, possibly from a narrowing of the coronary arteries. The subendocardial area is farthest from the heart's blood supply and is more susceptible to this type of pathology.

Clinically, a myocardial infarction can be further subclassified into a ST elevation MI (STEMI) versus a non-ST elevation MI (NSTEMI) based on ECG changes. The 12 lead ECG is used to classify MI patients into one of three groups:

1. Those with ST segment elevation or new bundle branch block,
2. Those with ST segment depression or T wave inversion (suspicious for ischemia), and
3. Those with a so-called non-diagnostic or normal ECG. However, a normal ECG does not rule out acute myocardial infarction.

Injured heart tissue conducts electrical impulses more slowly than normal heart tissue. The difference in conduction velocity between injured and uninjured tissue can trigger re-entry or a feedback loop that is believed to be the cause of many lethal arrhythmias (abnormal heartbeat). The most serious of these arrhythmias is ventricular fibrillation (*V-Fib*/VF), an extremely fast and chaotic heart rhythm that is the leading cause of sudden cardiac death, which occurs when the heart stops beating. Another life threatening arrhythmia is ventricular tachycardia (*V-Tach*/VT), which may or may not cause sudden cardiac death. However, ventricular tachycardia usually results in rapid heart rates that prevent the heart from pumping blood effectively. Cardiac output and blood pressure may fall to dangerous levels, which can lead to further coronary ischemia and extension of the infarct.

The ICD-10-CM code range for myocardial infarctions is I21.01–I22.9. In order to code myocardial infarctions in ICD-10-CM the following is necessary:

- Heart wall involved
- Initial or subsequent
- STEMI or NSTEMI

Following are the ICD-10-CM codes for myocardial infarction:

| | |
|---|---|
| ST elevation myocardial infarction involving the left main coronary artery | I21.01 |
| ST elevation myocardial infarction involving the left anterior descending coronary artery | I21.02 |
| ST elevation myocardial infarction involving other coronary artery of anterior wall | I21.09 |
| ST elevation myocardial infarction involving right coronary artery | I21.11 |
| ST elevation myocardial infarction involving other coronary artery of inferior wall | I21.19 |
| ST elevation myocardial infarction involving left circumflex coronary artery | I21.21 |
| ST elevation myocardial infarction involving other sites | I21.29 |

| | |
|---|---|
| ST elevation myocardial infarction of unspecified site | I21.3 |
| Non-ST elevation myocardial infarction | I21.4 |

| | |
|---|---|
| Subsequent ST elevation myocardial infarction of anterior wall | I22.0 |
| Subsequent ST elevation myocardial infarction of inferior wall | I22.1 |

| | |
|---|---|
| Subsequent non-ST elevation myocardial infarction | I22.2 |
| Subsequent ST elevation myocardial infarction of other sites | I22.8 |
| Subsequent ST elevation myocardial infarction of unspecified site | I22.9 |

According to the guidelines, ICD-10-CM code I21.3 *ST elevation myocardial infarction of unspecified site* is the default for the unspecified term acute myocardial infarction. If only STEMI or transmural MI without site is documented, query the provider as to the site, or assign code I21.3. The guidelines also state that subsequent MI codes are to be used when a patient who has suffered an AMI has a new AMI within the 4-week time frame of the initial AMI. A code from category I22 must be used in conjunction with a code from category I21.

## Angina

Angina pectoris is a symptom of atherosclerosis. Worsening angina attacks, sudden onset at rest, and pain lasting more than 15 minutes are symptoms of unstable angina and could be early warning signs of a heart attack. Immediate medical attention should be sought.

The ICD-10-CM code range for angina pectoris is I20.0–I20.9. In order to code angina pectoris in ICD-10-CM the following is necessary:

- Type

| | |
|---|---|
| Unstable angina | I20.0 |
| Angina pectoris with documented spasm | I20.1 |
| Other forms of angina pectoris | I20.8 |
| Angina pectoris, unspecified | I20.9 |

Additional guidance in the tabular section of the ICD-10-CM manual indicates to:

Use additional code to identify:

Exposure to environmental tobacco smoke (Z77.22)

History of tobacco use (Z87.891)

Occupational exposure to environmental tobacco smoke (Z57.31)

Tobacco dependence (F17-)

Tobacco use (Z72.0)

## Chronic ischemic heart disease

When coding for this condition it is important to understand the history of the patient as well as any symptoms they may be experiencing.

The ICD-10-CM code range for chronic ischemic heart disease is I25. To code for these conditions the following is necessary:

- Location of blockage
- Past medical history of the patient
- Type of angina present, if applicable

| | |
|---|---|
| Atherosclerotic heart disease of native coronary artery without angina pectoris | I25.10 |
| Atherosclerotic heart disease of native coronary artery with unstable angina pectoris | I25.110 |
| Atherosclerotic heart disease of native coronary artery with angina pectoris with documented spasm | I25.111 |
| Atherosclerotic heart disease of native coronary artery with other forms of angina pectoris | I25.118 |
| Atherosclerotic heart disease of native coronary artery with unspecified angina pectoris | I25.119 |
| Old myocardial infarction | I25.2 |

| | |
|---|---|
| Aneurysm of heart | I25.3 |
| Coronary artery aneurysm | I25.41 |
| Coronary artery dissection | I25.42 |
| Ischemic cardiomyopathy | I25.5 |
| Silent myocardial ischemia | I25.6 |
| Atherosclerosis of coronary artery bypass graft(s), unspecified, with unstable angina pectoris | I25.700 |
| Atherosclerosis of coronary artery bypass graft(s), unspecified, with angina pectoris with documented spasm | I25.701 |
| Atherosclerosis of coronary artery bypass graft(s), unspecified, with other forms of angina pectoris | I25.708 |
| Atherosclerosis of coronary artery bypass graft(s), unspecified, with unspecified angina pectoris | I25.709 |
| Atherosclerosis of autologous vein coronary artery bypass graft(s), unspecified, with unstable angina pectoris | I25.710 |
| Atherosclerosis of autologous vein coronary artery bypass graft(s), unspecified, with angina pectoris with documented spasm | I25.711 |
| Atherosclerosis of autologous vein coronary artery bypass graft(s), unspecified, with other forms of angina pectoris | I25.718 |
| Atherosclerosis of autologous vein coronary artery bypass graft(s), unspecified, with unspecified angina pectoris | I25.719 |
| Atherosclerosis of autologous artery coronary artery bypass graft(s) with unstable angina pectoris | I25.720 |
| Atherosclerosis of autologous artery coronary artery bypass graft(s) with angina pectoris with documented spasm | I25.721 |
| Atherosclerosis of autologous artery coronary artery bypass graft(s) with other forms of angina pectoris | I25.728 |
| Atherosclerosis of autologous artery coronary artery bypass graft(s) with unspecified angina pectoris | I25.729 |
| Atherosclerosis of nonautologous biological coronary artery bypass graft(s) with unstable angina | I25.730 |
| Atherosclerosis of nonautologous biological coronary artery bypass graft(s) with angina pectoris with documented spasm | I25.731 |
| Atherosclerosis of nonautologous biological coronary artery bypass graft(s) with other forms of angina pectoris | I25.738 |
| Atherosclerosis of nonautologous biological coronary artery bypass graft(s) with unspecified angina pectoris | I25.739 |
| Atherosclerosis of native coronary artery of transplanted heart with unstable angina | I25.750 |
| Atherosclerosis of native coronary artery of transplanted heart with angina pectoris with documented spasm | I25.751 |
| Atherosclerosis of native coronary artery of transplanted heart with other forms of angina pectoris | I25.758 |
| Atherosclerosis of native coronary artery of transplanted heart with unspecified angina pectoris | I25.759 |
| Atherosclerosis of bypass graft of coronary artery of transplanted heart with unstable angina | I25.760 |

| | |
|---|---|
| Atherosclerosis of bypass graft of coronary artery of transplanted heart with angina pectoris with documented spasm | I25.761 |
| Atherosclerosis of bypass graft of coronary artery of transplanted heart with other forms of angina pectoris | I25.768 |
| Atherosclerosis of bypass graft of coronary artery of transplanted heart with unspecified angina pectoris | I25.769 |
| Atherosclerosis of other coronary artery bypass graft(s) with unstable angina | I25.790 |
| Atherosclerosis of other coronary artery bypass graft(s) with angina pectoris with documented spasm | I25.791 |
| Atherosclerosis of other coronary artery bypass graft(s) with other forms of angina pectoris | I25.798 |
| Atherosclerosis of other coronary artery bypass graft(s) with unspecified angina pectoris | I25.799 |
| 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 |
| Atherosclerosis of bypass graft of coronary artery of transplanted heart without angina pectoris | I25.812 |
| Chronic total occlusion of coronary artery | I25.82 |
| Coronary atherosclerosis due to lipid rich plaque | I25.83 |
| Other forms of chronic ischemic heart disease | I25.89 |
| Chronic ischemic heart disease, unspecified | I25.9 |

## Heart Valve Disorders

There are many disorders that may affect the heart valves, including:

- Stenosis
- Prolapse
- Regurgitation

Stenosis is a narrowing of the valve orifice. In the case of stenosis of the mitral valve, it is almost always caused by rheumatic fever. With the aortic valve, it is usually age-related progressive calcification of the normal trileaflet valve.

Prolapse is a condition that affects the mitral valve (MVP) and is one of the most common heart valve abnormalities, affecting 5 to 10 percent of the world population. It is also known as "Click Murmur Syndrome" and "Barlow's Syndrome." The mitral apparatus (the cusps and chordate) becomes affected by myxomatous degeneration, which occurs when the structural protein collagen forms abnormally and causes thickening, enlargement, and redundancy of the leaflets and chordae. When the ventricles contract, the redundant leaflets prolapse, or flop backwards into the left atrium, sometimes allowing leakage of blood through the valve opening (mitral regurgitation).

Regurgitation is also called incompetence or insufficiency occurs when the heart valve does not close properly when the heart pumps out blood, causing blood to flow backwards into the heart. The most common cause of regurgitation is prolapse. This leads to a decrease in blood flow to the rest of the body. As a result, the heart may try to pump harder. This may lead to congestive heart failure.

## ICD-10-CM for Valve Disorders

The ICD-10-CM codes for valve disorders will vary depending on diagnosis. To code valve disorders in ICD-10-CM the following is necessary:

- Type of disorder
- Valve(s) involved
- Cause of disorder, if applicable
- Congenital or non-congenital

Following are examples of ICD-10-CM codes for valve disorders:

| | | | |
|---|---|---|---|
| Rheumatic mitral stenosis | I05.0 | Nonrheumatic mitral prolapse | I34.1 |
| Rheumatic mitral insufficiency | I05.1 | Nonrheumatic aortic insufficiency | I35.1 |
| Rheumatic tricuspid stenosis | I07.0 | Nonrheumatic pulmonary valve stenosis | I37.0 |

## Conduction Disorders

Conduction disorders, also referred to as blocks, are caused by abnormalities in the generation or conduction of the heart's electrical impulses or both. The conduction system includes the sinoatrial and atrioventricular nodes, atrioventricular bundle, and Purkinje fibers. The name of the block may be related to the portion of the conduction system affected and the extent of the block (eg, incomplete AV block). Arrhythmias or dysrrhythmias also fall into this category, as they describe any of a large number of conditions in which there is abnormal electrical activity in the heart. We will discuss premature beats, fibrillation, tachycardia, bradycardia, and ventricular arrhythmias.

Source: AAPC

**Premature beats.** In this condition, the heart beat is abnormal. Depending on which chambers are affected, they are termed PVCs (premature ventricular contractions) or PACs (premature atrial contractions). PVCs that occur after every normal bear are called ventricular begeminy. PVCs that occur at intervals of two normal beats to every one PVC are called trigeminy. If there are three PVCs grouped together, it is called a run of PVCs, but if it lasts longer than three beats it is generally called ventricular tachycardia.

**Tachycardia.** In adults and children over 15, resting heart rate faster than 100 beats/minute is defined as tachycardia. Although tachycardia may result in palpitations, it is not necessarily an arrhythmia. Increased heart rate may be a normal response to physical exercise or emotional stress, which is mediated by the sympathetic nervous system on the sinus node, thus called sinus tachycardia. Other things that increase sympathetic nervous system activity in the heart include ingested or injected substances such as caffeine or amphetamines, and hyperthyroidism.

**Bradycardia.** A slow rhythm of less than 60 beats/min is defined as bradycardia. This may be caused by a slowed signal from the sinus node (termed sinus bradycardia), a pause in the normal activity of the sinus node (termed sinus arrest), or by blocking of the electrical impulse on its way from the atria to the ventricles (termed AV block or heart block).

**Atrial filbrillation (A-fib).** Fibrillation occurs when an entire chamber of the heart is involved in multiple micro-reentry circuits, which cause it to quiver with chaotic electrical impulses rather than beat normally. Atrial fibrillation reduces the pumping action in the upper chambers of the heart. Some blood also remains in the atria when this condition is present, which raises the risk of blood clot formation. Atrial fibrillation is the second most common arrhythmia.

**Ventricular arrhythmias.** Ventricular arrhythmias are potentially life-threatening conditions that include ventricular tachycardia (V-tach) and ventricular fibrillation (V-fib). Ventricular tachycardia is a fast heart rhythm, that originates in one of the ventricles of the heart and may be a life-threatening arrhythmia because it may lead to ventricular fibrillation, asystole, and sudden death. Ventricular tachycardia can be classified based on its morphology (monomorphic or polymorphic) or its duration. Three or more beats in a row on an ECG that originate from the ventricle at a rate of

more than 100 beats per minute constitute a ventricular tachycardia. If the fast rhythm self-terminates within 30 seconds, it is non-sustained V-tach. If the rhythm lasts more than 30 seconds, it is sustained V-tach.

Ventricular fibrillation is a condition in which there is uncoordinated contraction of the cardiac muscle of the lower chambers in the heart, making them quiver rather than contract properly. When a heart goes into V-fib, effective pumping of the blood stops. While there is activity, it is undetectable by palpation at major pulse points of the carotid and femoral arteries. Ventricular fibrillation is a medical emergency that requires prompt interventions because should the arrhythmia continue for more than a few seconds, it will likely degenerate further into asystole. Cardiogenic shock, which is cessation of effective blood circulation, and sudden cardiac death will result in a matter of minutes

## ICD-10-CM for Conduction Disorders

The ICD-10-CM codes for conduction disorders will vary depending on diagnosis. To code conduction disorders in ICD-10-CM the following is necessary:

- Type of disorder
- Site involved

Following are examples of ICD-10-CM codes for conduction disorders:

| | | | |
|---|---|---|---|
| Paroxysmal atrial fibrillation | I48.0 | Ventricular fibrillation | I49.01 |
| Persistent atrial fibrillation | I48.1 | Ventricular flutter | I49.02 |
| Atrial premature depolarization | I49.1 | Re-entry ventricular arrhythmia | I47.0 |
| Bradycardia | R00.1 | Tachycardia | R00.0 |

**Heart Failure.** Heart failure occurs when the heart is unable to supply sufficient blood flow to meet the body's needs. This occurs most commonly when the cardiac output is low, and is often called "congestive heart failure" or CHF, because the body becomes congested with fluid. Over time these increases in workload will produce changes to the heart itself, such as:

- A reduced stroke volume, as a result of a failure of systole, diastole or both
- Reduced spare capacity increased heart rate, stimulated by increased sympathetic activity in order to maintain cardiac output
- Hypertrophy of the myocardium, caused by the terminally differentiated heart muscle fibers increasing in size in an attempt to improve contractility
- Enlargement of the ventricles, contributing to the enlargement and spherical shape of the failing heart

There are many different ways to categorize heart failure, including:

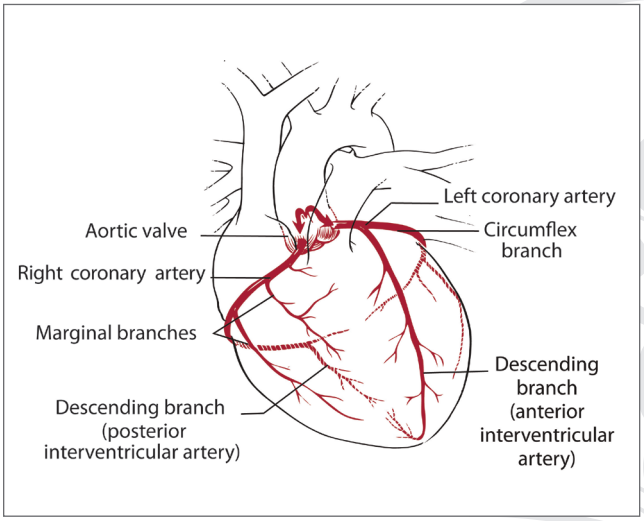
- The side of the heart involved, (left heart failure versus right heart failure). Left heart failure compromises aortic flow to the body and brain. Right heart failure compromises pulmonic flow to the lungs. Mixed presentations are common, especially when the cardiac septum is involved.
- Whether the abnormality is due to insufficient contraction and/or relaxation of the heart (systolic dysfunction vs. diastolic dysfunction).
- Whether the abnormality is due to low cardiac output with high systemic vascular resistance or high cardiac output with low vascular resistance.
- The degree of functional impairment conferred by the abnormality.
- The degree of coexisting illness: eg, heart failure/systemic hypertension, heart failure/pulmonary hypertension, heart failure/diabetes, heart failure/renal failure, etc.

The general effect is one of reduced cardiac output and increased strain on the heart, which increases the risk of cardiac arrest and reduces blood supply to the rest of the body. In chronic disease the reduced cardiac output causes a number of changes in the rest of the body, like reduced perfusion to the kidneys and fall in arterial blood pressure.

## ICD-10-CM for Heart Failure

Most of the ICD-10-CM codes for heart failure are found in the I50 category. To code heart failure in ICD-10-CM the following is necessary:

- Site
- Acute/Chronic/Acute on Chronic
- Type of failure






Following are the ICD-10-CM codes from the I50 category for heart failure

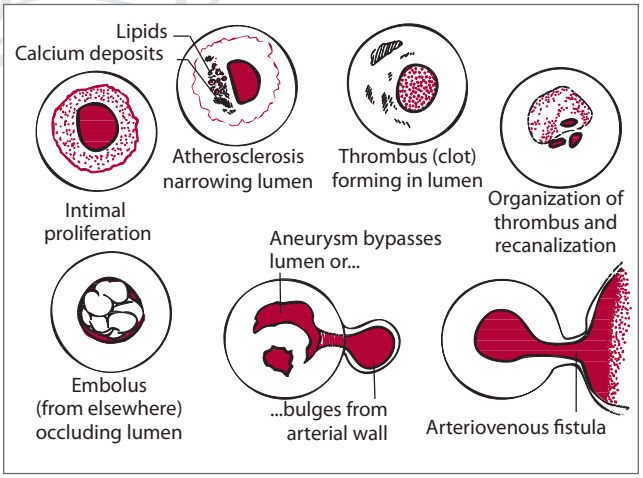
| | |
|---|---|
| Left ventricular failure | I50.1 |
| Unspecified systolic (congestive) heart failure | I50.20 |
| Acute systolic (congestive) heart failure | I50.21 |
| Chronic systolic (congestive) heart failure | I50.22 |
| Acute on chronic systolic (congestive) heart failure | I50.23 |

| | |
|---|---|
| Heart failure, unspecified | I50.9 |
| Unspecified diastolic (congestive) heart failure | I50.30 |
| Acute diastolic (congestive) heart failure | I50.31 |

| | |
|---|---|
| Chronic diastolic (congestive) heart failure | I50.32 |
| Acute on chronic diastolic (congestive) heart failure | I50.33 |

| | |
|---|---|
| Unspecified combined systolic and diastolic (congestive) heart failure | I50.40 |
| Acute combined systolic and diastolic (congestive) heart failure | I50.41 |
| Chronic combined systolic and diastolic (congestive) heart failure | I50.42 |
| Acute on chronic combined systolic and diastolic (congestive) heart failure | I50.43 |

The code for heart failure may not be a first listed code. Under the category I50, heart failure it states that it may be necessary to code first heart failure following surgery (I97.13-), heart failure due to hypertension (I11.0), or rheumatic heart failure (I09.81), for example.



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