CD Part 4

Heart and Blood Vessel Diseases

A. Definitions

The following definitions are for words used in this chapter and during the SSA disability process. If you need additional definitions, consult a good medical dictionary, available in most bookstores and libraries. You can also look at online medical dictionaries like the one at www.medlineplus.gov.

AK amputation. Above the knee amputation.

Akinesis. Absence of wall motion in a particular area of the heart. Usually evidence of a prior heart attack.

Aneurysm. Enlarged, weakened area in a body structure.

Angina pectoris. Chest pain caused by cardiac ischemia.

Angiography. Any technique to produce images of arteries, such as by x-rays or MRI scans. Usually involves injection of contrast material into the artery to make it visible. Also known as *arteriography*.

Ankle-brachial ratio (A/B Ratio). See *Doppler index (DI)*.

Annuloplasty. Surgery on the circular fibrous ring (annulus) that attaches a heart valve to the heart, as might be done to tighten a loose valve.

Anticoagulation. Drug treatment to slow the blood's clotting ability.

Aorta. Largest artery in the body, arising from the left ventricle of the heart and carrying blood to the entire body.

Aortic stenosis. Narrowing of the aortic heart valve.

Aortofemoral bypass grafting (AFBG). Surgery to restore blood flow to the legs by sewing artificial conduits around blockages in the aorta, iliac, or femoral arteries.

Arrhythmia. Abnormality in the rate or rhythm of heart beats.

Arterial blood gases (ABGS). The measurement of oxygen gas pressure, carbon dioxide gas pressure, acidity, and bicarbonate concentration in the blood. A sample of arterial blood is usually obtained in a syringe by needle puncture of the radial artery in the wrist.

Arteries. Blood vessels that carry blood away from the heart toward other tissues.

Arthralgia. Joint pain. Not the same as arthritis, which is disease affecting a joint. Arthralgia usually accompanies arthritis.

Ascites. Abnormal fluid accumulation in the abdomen. Advanced congestive heart failure is one possible cause of ascites.

Ataxic gait. Uncoordinated gait—inability to walk in a normal, smooth manner.

Atherosclerosis. General process of degeneration of the inner lining of arteries, particularly associated with fat and calcium deposits. Atherosclerosis is the major cause of coronary artery disease and peripheral vascular disease.

Atresia. Failure of an organ or tissue to develop during embryonic life. For example, failure of the aortic valve of the heart to develop is known as *aortic valve atresia*.

Atria. The smaller two chambers of the heart, consisting of the right and left atrium. The atria sit on top of the larger, ventricular chambers of the heart.

Atrial fibrillation (AF). Arrhythmia arising from the atrial chambers of the heart. Uncontrolled atrial fibrillation can cause blood clots inside the heart. If such a clot is then pumped to the brain, it can block a cerebral artery and result in a stroke.

Atrial septal defect (ASD). Congenital heart disease characterized by an abnormal hole between the small atrial chambers of the heart.

A-V canal defects. Congenital heart disease characterized by ventricular and atrial septal defects occurring near the heart valves, usually causing valve malfunction.

A-V dissociation. A type of heart block so severe that there is no coordination between the beating of the atria and ventricles.

Bicycle ergometer. Stationary bicycle that is sometimes used for cardiac exercise testing. It is particularly useful for people who cannot walk on a moving treadmill because of balance or other problems.

BK amputation. Below the knee amputation.

Bradycardia. Abnormally slow heart rate. Bradycardia is said to be present with any heart rate less than 60 beats/minute in adults. Normal heart rate is age-dependent in children.

Brawny edema. Swelling of the legs in chronic venous insufficiency caused by water and protein seepage from stagnant venous blood.

Bronchitis. Inflammation of bronchial airways; may be associated with infection or other sources of irritation such as allergy, smoke, or chemical fumes.

Bypass graft. Conduit to carry blood around blockages in arteries. Grafts may be segments of arteries, veins, or artificial materials.

Cardiac catheterization. Insertion of hollow tubes (catheters) into the heart. May involve ventriculography or coronary angiography (procedure for visualizing coronary arteries, usually by injecting x-ray contrast material into a coronary artery during cardiac catheterization) for treatment purposes, pressure readings, or x-rays. Pressure readings can also be made in the pulmonary arteries and aorta.

Cardiac enzymes. Chemicals released into the blood as a result of heart muscle damage. Creatine phosphokinase (CPK), lactic dehydrogenase (LDH), cardiac troponin T (cTnT), and cardiac troponin I (cTnI), are types of cardiac enzymes.

Cardiac ischemia. Decreased blood flow to a part of the heart muscle, usually as a result of coronary artery disease. Also known as *myocardial ischemia*.

Cardiac syncope. Loss of consciousness as a result of heart disease.

Cardiomegaly. Enlargement of the heart. When measured on chest x-ray, expressed as *cardiothoracic (CT) ratio*. May be due to either increased heart muscle thickness or increased size of the heart's chambers.

Cardiomyopathy. Any disease of heart muscle. Many things can cause cardiomyopathies including ischemia, viruses, drugs, alcohol, and autoimmune disorders like systemic lupus erythematosus (SLE).

Cardiothoracic (CT) ratio. Calculated by dividing the width of the heart by the width of the chest. Normal adults do not have a CT ratio of over about 50%. For purposes of the listings, children one year old or less are considered to have cardiomegaly with a CT ratio over 60%. For children over age one year, the CT ratio must be at least 55% for cardiomegaly to be considered present on standard chest x-rays.

Cardiovascular. Reference to the heart and system of blood vessels.

Cardioversion. Treatment of arrhythmia by restoration of normal heart rhythm through delivery of an electrical shock.

Carditis. Inflammation of the heart.

Cerebral perfusion. Blood flow to the brain.

Chorea. Involuntary jerking motion of the limbs. May be associated with neurological disorders, as well as rheumatic fever.

Coarctation of the aorta. Congenital disorder characterized by narrowing in a part of the aorta.

Computerized axial tomography (CAT or CT) scan. X-rays taken under computer guidance that can show much greater detail than regular x-rays.

Conduction system. The network of nerves in the heart that controls the timing and pattern of heart beats.

Congenital. Dating from birth. Congenital disorders may result from abnormal genes or some abnormality in the intrauterine environment before birth.

Contrast. Material that is injected during angiography, either for x-rays or MRI scans, to improve image quality.

Coronary arteries. Arteries that supply the heart itself with fresh blood. Of most interest are the larger coronary arteries that run near the surface of the heart, which become blocked in coronary artery disease. The major coronary arteries are the left main coronary artery, the left anterior descending coronary artery (LAD), the right coronary artery (RCA), and the left circumflex coronary artery (left Cx).

Coronary artery bypass grafting (CABG). Surgery to restore blood flow around blockages in the larger coronary arteries. Grafts for carrying the new blood supply can consist of segments of veins from the legs or can be made from the internal mammary artery in the chest.

Coronary artery disease (CAD). Partial or complete blockage of a coronary artery with abnormal deposits of fat, calcium, and fibrous material. Although the coronary arteries can have diseases other than those involving fatty blockages, common use of the words "coronary artery disease" usually means disease associated with such fatty occlusions. Also known as *atherosclerotic heart disease (ASHD)*.

Costochondritis. Inflammation of the rib joints where they connect to the sternum (breastbone); a cause of chest pain not related to heart disease. Unlike heart disease, pressing on the chest will cause pain.

C-reactive protein. Nonspecific blood test for inflammation; tends to be high in infection such as *rheumatic fever*.

Critical aortic stenosis. Aortic stenosis so severe that it is life threatening.

Critical coarctation of aorta. *Coarctation of the aorta* so severe that it is life threatening.

CT ratio. See *cardiothoracic ratio.*

Cyanosis. Bluish discoloration of the skin and mucous membranes that indicates inadequate oxygenation of tissues. It is most easily observed in the fingertips, toes, lips, earlobes, and nose.

Deep venous thrombosis (DVT). Formation of blood clots (thrombi) in the deep system of veins in the lower extremities. If such clots move to another location, they are called emboli. For example, blood clots from the legs that move into the lungs are referred to as pulmonary thromboemboli.

Diaphragm. Muscular sheet separating the chest and abdominal cavities; important in breathing.

Diastole. Part of heart cycle during which the heart is at rest (relaxed), and filling with blood.

Diastolic blood pressure. Pressure inside arteries during the time between heart beats**.** The diastolic pressure is the second number in a blood pressure reading. For example, 120/80 means the diastolic blood pressure is 80 mm Hg.

Diastolic heart failure. A common disorder in which the heart cannot relax enough to hold normal amounts of blood (decreased left ventricular volume), decreasing the amount of blood that can be pumped out with each beat. So, cardiac output of pumped blood over time will be decreased. The left atrium may be enlarged and parts of the heart walls thickened. However, the heart may be of fairly normal size, and the left ventricular ejection fraction normal or even increased. Contrast with *systolic heart failure.*

Digitalis. Any one of the digitalis glycosides, especially digoxin or digitoxin. Digitalis has always had an important role in the treatment of heart failure and the arrhythmia known as *atrial fibrillation.*

Dissection (of aneurysm). Tear and bleeding into the inner wall of an artery, in association with an aneurysm. Most commonly seen with aortic aneurysms.

Doppler index (DI). Method of expressing the amount of blood flow to the legs by dividing the systolic blood pressure in the ankle by that in the arm. The Doppler index is also known as the *ankle-brachial ratio (A/B ratio).*

Doppler ultrasound. Imaging method that uses high-frequency sound and the Doppler principle to measure blood flow. Color Doppler ultrasound allows additional determination of the direction of blood flow.

Dyskinesis. Wall motion abnormality of heart, characterized by an outward bulging of a diseased area while the surrounding healthy muscle contracts.

Echocardiography. Any of the methods of imaging the heart using high-frequency sound (ultrasound). Results are called *echocardiograms*, because the sound bounces off of the heart and returns to a receiver in the transducer used to produce it. The "echoed" sound can then be used to make images. There are many types of echocardiography, such as M-mode, two-dimensional (2-D), three-dimensional (3-D), and color Doppler. M-mode echocardiograms can be useful in measuring heart valve sizes. 2-D and 3-D echocardiograms can provide useful information about the size and function of the heart's chambers. Color Doppler echocardiograms can show both the velocity and direction of blood flow through a heart valve—useful information in determining valve size and whether the valve provides a good seal when it closes.

Edema. Excessive fluid retention in a tissue, such as *peripheral edema* in the legs or *pulmonary edema* in the lungs.

Eisenmenger's physiology. Abnormal condition associated with a large and untreated ventricular septal defect (VSD). Consists of right to left shunting of blood through the VSD, right ventricular hypertrophy (thickening of the muscle of the right ventricle), and severe pulmonary hypertension. Also known as *Eisenmenger's complex.*

Ejection fraction (EF). Percentage of blood that a heart chamber can pump out when it contracts. The left ventricular ejection fraction (LVEF) is that from the left ventricle and the right ventricular ejection fraction (RVEF) is that from the right ventricle. When medical reports say "ejection fraction," they usually mean the left ventricular ejection fraction. A normal LVEF is about 55%. Decreased ejection fractions indicate poor function of a ventricle, such as from a heart attack or other disease. Ejection fractions can be measured by cardiac catheterization, radionuclide studies, and echocardiography.

Electrocardiogram (EKG, ECG). Recording on the surface of the chest of the heart's electrical activity. A standard EKG uses 12 electrodes that record from different electrical positions. In unusual circumstances, additional recording leads may be

used such as a lead that is swallowed (esophageal lead).

Electrolytes. Electrically charged elements or chemicals with important functions that occur naturally in the blood. Examples of electrolytes are potassium, sodium, calcium, phosphate, and magnesium.

Electrophysiologic studies (EPS). Exacting measurement and testing of the heart's electrical activities by electrodes placed within the heart during cardiac catheterization. EPSs are sometimes needed to find out the exact nature of an arrhythmia in regard to its origin in the heart, how it is triggered, and how it can be stopped.

Endocarditis. Infection inside the heart.

Erythema marginatum. A rash that can be associated with streptococcal infection, such as in *rheumatic fever*.

Erythrocyte sedimentation rate (ESR). Test that measures how quickly red blood cells settle; the faster the settling, the more abnormal the result. An elevated ESR indicates some type of inflammation, not one particular disease. A normal ESR is about ten mm/hr or less in men and 20 mm/hr or less in women, depending on the method used by the reporting laboratory.

Esophagitis. Inflammation of the esophagus, usually caused by the reflux of stomach acid into the esophagus.

Fixed perfusion defect. Area of heart muscle with no blood flow as seen on a radionuclide scan. Suggests an area of dead heart muscle—a heart attack at some time in the past.

Gallop. Abnormal heart sound heard with a stethoscope; suggests abnormality of the heart's ventricles. There are S3 and S4 gallops.

Gangrene. Death of soft tissues, associated with a loss of blood supply and possibly followed by bacterial infection. If there is no bacterial infection, it is called dry gangrene.

Gastritis. Inflammation of the inner lining of the stomach.

Heart attack. Death of a piece of heart muscle, as a result of insufficient blood flow to maintain life in the tissue. Also known as a *myocardial infarction (MI)*.

Heart block. Condition in which the nerve conduction system of the heart has difficulty transmitting electrical impulses. There are several types of heart block: left bundle branch block; right bundle branch block; and first, second, and third degree heart blocks.

Heart valves. Structures that open and shut to control the flow of blood within the heart and out of the heart. The four heart valves are the mitral, aortic, pulmonary, and tricuspid. Artificial heart valves can be mechanical or made from the heart valve tissue of other animals.

Hematocrit (Hct). Percentage of red blood cells in a volume of blood. For example, a hematocrit of 50% means that half of the blood volume is made up of red cells. In men, a normal Hct is about 42–48% and in women about 38–44% at sea level. At high altitudes, normal values are higher. Also known as the *volume of packed red cells (VPRC)*.

Hepatomegaly. Enlarged liver of many possible causes, including congestive heart failure.

Hiatal hernia. Common disorder characterized by bulging of part of the stomach into the chest cavity through a weak area where the esophagus passes through the diaphragm.

High blood pressure. See *hypertension*.

Holter monitor. EKG recorder worn by a patient that permits continuous monitoring of heart rate and rhythm over prolonged periods of time during their normal daily activities. Also known as *ambulatory electrocardiography*.

Hypercyanotic spells. Episodes of increased cyanosis, resulting from decreased oxygenation of tissues. Characteristic of a type of congenital heart disease known as *tetralogy of Fallot*.

Hyperlipidemia. Excessive amount of blood fats (lipids). Such fats include cholesterol and triglycerides.

Hypertension. High blood pressure. The word "hypertension" is usually understood to mean *systemic* hypertension, which is high blood pressure in the arterial system of the body other than the lungs. Hypertension in adults is defined as any pressure of 140/90 or greater. In children, normal expected blood pressure varies with age. The arteries of the lungs are a special low-pressure system different than that of the rest of the body. High blood pressure inside the arteries of the lungs is called *pulmonary hypertension* or *pulmonary vascular hypertension*, and can only be measured with catheters inserted into a pulmonary artery.

Hypertrophic cardiomyopathy. Genetic disorder in which there is a disorganized thickening and enlargement of heart muscle.

Hypokinesis. Decreased movement in a particular area of the heart. Hypokinesis is frequently seen in the presence of *cardiac ischemia*.

Hypoplastic left heart syndrome. Congenital heart disease characterized by poor development of the left side of the heart.

Hypoxemia. Decreased oxygenation of arterial blood.

Infarction. Death of a piece of tissue, as a result of insufficient blood flow. See *myocardial infarction*.

Intermittent claudication. Pain in the lower extremities occurring with walking, and caused by ischemia of leg muscles. The pain is usually of an aching quality in the calves of the legs and resolves with several minutes of rest. Less commonly, the pain of intermittent claudication is in the thighs or pelvic area.

Iridocyclitis. Inflammation of the eye's iris and ciliary body (small muscle in the eye that changes the shape of the lens and the muscles of the iris that control the size of the pupil).

Ischemia. Inadequate arterial blood flow to a tissue.

Ischemic cardiomyopathy. Diseased heart muscle as a result of decreased blood flow. Also known as *ischemic heart disease*.

Left bundle branch block (LBBB). Type of heart block characterized by absent electrical conduction in the left bundle branch of nerves of the heart.

Left-to-right shunt. Abnormal direction of blood flow from left to right inside the heart; usually associated with some kind of congenital heart defect.

Left ventricle (LV). The heart's most powerful chamber; pumps blood through the aorta to the rest of the body.

Left ventricular end diastolic diameter (LVEDD). Maximum inside diameter of the left ventricular cavity, measured when the heart is relaxed between beats and filled with blood. Sometimes abbreviated to LVDD or EDD. Also known as the *left ventricular inside diameter during diastole (LVIDD)*.

Lipids. Blood fats.

Lymphadenopathy. Enlarged lymph nodes.

Magnetic resonance imaging (MRI). Method of producing pictures of internal body structures using magnetic fields and radiofrequency fields. MRI does not use x-rays or other radiation.

Meningitis. Inflammation of the any part of the membranes (meninges) covering the spinal cord and brain. There are many possible causes of meningitis.

MET. Metabolic equivalent. A way of measuring exercise capacity based on oxygen used per unit of body weight. Sitting requires about one MET. Doing sedentary type work requires about five METs.

Migratory polyarthritis. Arthritis moving among multiple joints.

Multiform beats. Ventricular premature beats coming from more than one location in the heart.

Murmur. Abnormal sound heard within the heart and caused by the turbulent flow of blood, such as through a diseased heart valve. Some mild murmurs do not indicate heart disease.

Myocardial infarction (MI). Death of a part of the heart muscle; a heart attack.

Myocardial ischemia. See *cardiac ischemia*.

Myocarditis. Heart muscle inflammation.

Myocardium. Heart muscle.

Near syncope. Decreased awareness short of complete loss of consciousness.

Orthopnea. Shortness of breath when lying down, but not in the upright position. Orthopnea may result from pulmonary edema caused by congestive heart failure.

Oxygen saturation. See *pulse oximetry* and *SaO_2*.

Oxygenation. Supply of oxygen to tissues.

Pacemaker. Battery-powered device, implanted under the skin, with electrodes running into the heart's chambers. Pacemakers are common and highly useful in controlling atrial fibrillation as well as keeping up heart rates in bradycardia (abnormally slow heart rate) resulting from heart blocks. Demand pacemakers adjust heart rates with exercise level.

Palpitations. Sensations in the chest of forceful, irregular, or rapid heart beats.

PaO_2. Oxygen pressure in arterial blood, expressed as millimeters of mercury (mm Hg). Normal value (at sea level): 80–100 mm Hg.

Paroxysmal nocturnal dyspnea (PND). Sudden shortness of breath awakening a patient from sleep. PND may be caused by pulmonary edema resulting from congestive heart failure.

Patent ductus arteriosus (PDA). Congenital heart disease characterized by failure of the ductus arteriosus to close after birth. The ductus arteriosus is a vessel that normally connects the aorta and pulmonary artery before birth.

Percentile. Method of comparing something (like height or weight) to normal expected values, in order to decide the probability that it is normal or abnormal. For example, a person with a weight in the 60th percentile is heavier than 60% of other people and lighter than 40% of other people.

Percutaneous transluminal coronary angioplasty (PTCA). Inflation of a catheter in the area of a coronary artery plaque to squeeze the fatty blockage out of the way, thereby restoring blood flow to the part of the heart served by that artery.

Perfusion defect. Area of the heart with poor blood flow on a radionuclide scan. Reversible defects appear with exercise or drug stimulation and disappear with rest, suggesting *ischemia*. Fixed defects do not change with exercise or drug stimulation and suggest a prior heart attack.

Pericarditis. Inflammation of the pericardial membrane that surrounds the heart. There are many possible causes of pericarditis.

Peripheral arterial disease. Any disease of the arteries in the arms or legs.

Peripheral edema. Swelling in the feet or legs caused by fluid retention.

Peripheral vascular disease. See *peripheral arterial disease.*

Plaque. Partial occlusion of an artery by fat, calcium, and fibrous material. Also known as an *atherosclerotic plaque.*

Plasmapheresis. Method for removing substances from the blood. Some blood is withdrawn from the body. The liquid part of the blood (plasma) is separated from the cells by spinning in a centrifuge. Blood cells are reinjected along with fresh replacement plasma or albumin. Plasmapheresis is usually done on an outpatient basis. It can be used either to remove unwanted substances from blood (such as elevated cholesterol) or to harvest plasma blood components for donation to patients who need them.

P-R interval. The distance between the p wave and r wave on an EKG. Associated with rheumatic fever.

Prosthetic heart valve. Artificial heart valve.

Pulmonary edema. Abnormal accumulation of fluid within the lungs; when due to heart disease is a sign of advanced heart failure. Pulmonary edema can be seen on a chest x-ray.

Pulmonary hypertension. High blood pressure inside the arterial system of the lungs. *Primary* pulmonary hypertension is a rare disorder of unknown cause, and arises from the arteries of the lungs themselves. *Secondary* pulmonary hypertension is more common and results from diseases starting outside of the lungs' arterial system. Secondary pulmonary hypertension could be caused by lung disease such as emphysema, bronchopulmonary dysplasia, or cystic fibrosis; it can also be caused by disorders outside of the lungs, such as certain forms of congenital heart disease that pump excessive blood through the lung.

Pulmonary thromboembolism. Blood clots pumped into the lungs from their abnormal formation elsewhere in the body, usually from the lower extremities.

Pulmonary vascular obstructive disease (PVOD). Any disorder of the arteries in the lungs causing increased resistance to blood flow. Results in pulmonary hypertension.

Pulse oximetry. Method of measuring oxygen saturation in the blood without having to take an arterial blood gas sample or insert anything into your artery. Done by attaching a small sensor to a finger or ear lobe.

Radionuclide scans (of heart). Use of radioactive isotopes introduced into the body to make images of the heart by emitting x-rays or gamma rays. Technetium and thallium radionuclides are the most widely used in medicine. Cardiac radionuclide scans have a variety of names and specific procedural variations, but the purpose in all of them is to measure blood flow to the heart muscle and/or provide pictures of the way the heart's ventricles pump blood, especially the left ventricle. Examples of names of radionuclide scans are cardiac blood pool scan, rest and/or exercise MUGA, gated cardiac scan, radionuclide angiography (RNA), radionuclide ventriculogram, and wall motion study.

Rheumatic fever. Collection of abnormalities associated with streptococcal bacterial infections in children.

Right bundle branch block (RBBB). Type of heart block preventing electrical conduction in the right bundle branch of nerves of the heart. Generally less serious than a *left bundle branch block*.

Right to left shunt. Abnormal direction of blood flow from right to left inside the heart, usually associated with some kind of congenital heart defect. See *Eisenmenger's physiology*.

Right ventricle (RV). Heart chamber that pumps blood through the lungs.

Room air (RA). Ordinary air, 21% oxygen. Seeing "RA" or "21% oxygen" in association with an arterial blood gas study means the patient was not receiving extra oxygen.

SaO_2. Oxygen saturation of arterial blood, as measured by oximetry. Normal value (at sea level) is 95–99%. SaO_2 is less accurate than arterial oxygen pressure (PaO_2) in evaluating blood oxygenation; it is more useful in noninvasive monitoring to detect changes in oxygenation.

Shortening fraction. Change in the size of the left ventricle when it contracts. A lower shortening fraction means poorer function of the heart's left ventricle.

ST segment. An important part of electrocardiograms (EKG, ECG) done at rest or as part of a stress test, because if it is elevated or depressed it may mean there is cardiac ischemia, a heart attack, pericarditis, hypokalemia (low blood potassium), or just a distortion by drugs like digitalis.

Stasis dermatitis. Skin inflammation and brownish discoloration caused by chronic venous insufficiency.

Stasis ulcers. Areas of dead skin tissue resulting from chronic venous insufficiency.

Stenosis. Narrowing. The word is most commonly used in reference to diseased heart valves and narrowing in arteries.

Stent. Device placed in a blood vessel to keep it open. Metal stents have proved useful in preventing coronary arteries from becoming blocked again after percutaneous transluminal coronary angioplasty (PTCA).

Stress test. Any procedure to put the heart under a stress to test its function, especially those that increase heart rate. Exercise stress tests such as treadmills and bicycle ergometry raise heart rate by physical exertion. Pharmacologic stress tests use drugs like dipyridamole and dobutamine to simulate the effects of exercise in those patients who cannot perform physical exertion for some reason. All forms of stress testing may include imaging of the heart with echocardiography or radionuclides, as well as monitoring EKG, blood pressure, and heart rate.

Subcutaneous nodules. Small, hard lumps beneath the skin that are sometimes associated with rheumatic fever.

Substernal. Beneath the sternum (breastbone)—the classic location of the pain of angina pectoris.

Syncope. Loss of consciousness.

Systemic hypertension. High blood pressure in the general arterial system of the body, excluding the arteries of the lungs. When the word "hypertension" is used, it is usually in reference to systemic hypertension unless otherwise stated.

Systolic blood pressure. Pressure inside arteries during the time the heart is pushing blood into them by contracting. The systolic pressure is the first number in a blood pressure reading. For example, 120/80 means the systolic blood pressure is 120 mm Hg.

Systolic heart failure. A common disorder in which the heart muscle is weakened in its ability to pump out the blood entering it. Unless treated, the heart tends to become enlarged with increased left ventricular volume, and the left ventricular ejection fraction is decreased, with a resulting decreased cardiac output of blood pumped over time. Congestive heart failure is often a result of systolic heart failure. Systolic failure is the type usually seen after heart attacks, with cardiomyopathies, and with severe coronary artery disease. Contrast with *diastolic heart failure*.

Tachycardia. Abnormally fast heart rate. In adults, tachycardia is present with any heart rate over 100 beats/minute. In infants and very young children, normal heart rate varies with age.

Tetralogy of Fallot. Common type of cyanotic congenital heart disease. In this disorder, the aorta is not placed correctly on the heart (overriding aorta), there is a ventricular septal defect, stenosis of the pulmonic heart valve, and right ventricular hypertrophy (thickening of the muscle of the right ventricle).

Total anomalous pulmonary venous connection. Congenital heart disease in which the pulmonary veins that normally carry blood from the lungs to the left side of the heart connect instead to the right side of the heart. The vein connections are therefore "anomalous"—that is, abnormal. An atrial septal defect is an additional abnormality usually seen with this disorder.

Transposition of the great arteries. Congenital heart disease characterized by switching of the normal positions of the aorta and pulmonary arteries in relation to the heart, so that the aorta arises from the right ventricle and the pulmonary artery arises from the left ventricle—just the opposite of the normal condition.

Treadmill stress test (TST, TMST). Common type of stress test in which the patient walks on a moving platform that can be adjusted for grade (tilt) and speed. The amount of grade and speed can be gradually increased in stages. A number of available protocols determine the grade, speed, and duration of each stage of a treadmill stress test. One is the Bruce protocol. The amount of exertion achieved in treadmill stress testing is expressed in METs. Completion of stage I of a standard Bruce protocol requires about five METs' exertion; completion of stage II about seven METs; stage III about ten METs. During treadmill stress testing, the patient's vital signs (heart rate, blood pressure, and respiration) and overall condition are continuously monitored. So is an EKG for arrhythmias or ST segment changes indicative of cardiac ischemia.

Truncus arteriosus. Congenital heart disease in which a single artery arises from both the left and right ventricles of the heart. In contrast, a pulmonary artery normally arises from the right ventricle and the aorta from the left ventricle. A ventricular septal defect is an additional abnormality always present with truncus arteriosus.

Ultrasound. Ultrasound means high-frequency sound. Ultrasound has wide application in the imaging of internal organs, such as echocardiography of the heart. Doppler ultrasound can be used to measure blood flow velocity and direction and blood pressure.

Valvotomy. Surgical incision into a heart valve, as when to open more (dilate) a narrowed valve. Also known as *valvulotomy*.

Valvular insufficiency. Blood flowing back through a heart valve that does not make a good seal when it closes.

Valvular regurgitation. See *valvular insufficiency*.

Valvuloplasty. Surgical repair of a heart valve, such as when a balloon-tipped catheter is inserted into a stenosed valve and inflated to increase the size of the valve (balloon valvuloplasty).

Variant angina. Angina that is caused by vasospasm of a coronary artery and is more often related to emotional stress than physical exertion.

Vasculitis. Inflammation of an artery.

Vasospasm. Contraction of muscles in the wall of an artery, causing it to narrow.

Veins. Blood vessels that carry blood to the heart.

Venography. Any technique to produce images of veins, such as by x-rays or MRI scans. Usually involves injection of contrast material into the artery to make it visible.

Venous insufficiency. Inability of damaged veins to adequately return blood from the legs. Abnormalities with venous sufficiency may include swelling of the legs, stasis dermatitis, varicose veins (enlargement of the superficial veins that can be seen just under the skin), and stasis ulcers—all caused by poor circulation of venous blood.

Ventricles. The heart's main pumping chambers. Also see *left ventricle* or *right ventricle*.

Ventricular dysfunction. Decreased function of the heart's ventricles; if marked, can result in congestive heart failure.

Ventricular premature beat (VPB). An abnormal heartbeat arising from the heart's right or left ventricle. Also known as *premature ventricular contraction (PVC)*.

Ventricular septal defect (VSD). Congenital heart disease characterized by an abnormal hole connecting the left and right ventricles.

Ventriculography (of heart). Evaluation of the function of the right or left ventricles by production of images—x-rays taken during cardiac catheterization, MRI scans of the heart, or radionuclide scans of the heart. If done during catheterization of the heart, pressures inside the ventricles may also be measured.

Vital signs. Blood pressure, heart rate, and respiratory rate.

Wall motion. Motion of the heart's walls, especially of the walls of the ventricles. Wall motion is abnormal in areas of scarring where there have been heart attacks, areas of ischemia where blood flow is inadequate, and in other disorders that affect the health and function of the heart muscle. Wall motion may be seen on various heart imaging tests such as MRI scans, radionuclide scans, echocardiography, and ventriculography done during cardiac catheterization. Wall motion imaging is extremely important in many stress tests.

Watt. Measure of energy needed to complete different levels of exercise on bicycle stress testing. When the SSA uses watts as a measure of exercise ability, they are converted to the equivalent number of METs.

B. General Information

The SSA makes decisions about disability based on symptoms, physical signs, laboratory test abnormalities, and responses to treatment. Regarding heart and blood vessel (cardiovascular) disease, the SSA requires medical records over a period of at least three months. The SSA believes that three months are needed to reach a diagnosis, decide the type of treatment, and see how well you will respond. Sometimes, especially after multiple surgeries, the SSA needs six months to make an accurate decision.

Cardiovascular disease appears in five basic forms:

- disease of the coronary or peripheral arteries
- disease of the heart muscle
- disease of the nerves of the heart
- disease of the heart valves, and
- congenital heart disease.

Each one of these forms of heart disease can be disabling because it produces one or more of these limitations:

- chronic heart failure
- angina pectoris or intermittent claudication
- syncope or near-syncope caused by inadequate blood flow to the brain, or
- poor oxygenation of blood.

A further common consequence of the above four factors is exercise intolerance manifested by easy fatigability and shortness of breath.

a. Disease of the Coronary Arteries

The most common cause of heart disease in adults is coronary artery disease. Coronary artery disease develops from a combination of genetic predisposition and a diet with a high fat content. When the coronary artery begins to block, blood flow to the heart will decrease. A significant decrease in the blood flow will occur when 70% of the artery is blocked. But even a 50% blockage of the left main coronary artery is considered dangerous because it affects other major coronary arteries.

Blood flow through a coronary artery doesn't have to be completely blocked by a fatty deposit (plaque) to cause a heart attack. Heart attacks are sudden, unpredictable events that can occur with relatively minor plaques, because of the additional formation of a blood clot that completely stops blood flow.

b. Disease of the Heart Muscle

Diseases of heart muscle, cardiomyopathies, have many different possible causes, including:

- decreased blood supply—ischemia or heart attacks
- viral infections
- poisons and toxins
- alcohol—alcoholic cardiomyopathy is common
- drugs
- parasites
- cancer, and
- genetics.

c. Disease of the Nerves of the Heart

The nerves that carry impulses to stimulate the heart muscle to contract in a certain pattern are vital to cardiac function. Nerves of the heart's conduction system can be susceptible to many disorders, including all of those mentioned above for cardiomyopathies.

Malfunction of the heart's conduction system can be manifested by various kinds of arrhythmias, as well as blocks to nerve conduction, such as left bundle branch block (LBBB), right bundle branch block (RBBB), and first, second, and third degree atrioventricular (AV) heart blocks. Heart blocks can be seen on an electrocardiogram (EKG) and are identifiable by a doctor.

d. Disease of the Heart Valves

The heart has four valves that allow blood to flow one way through the heart. These valves sometimes become damaged by disease. One of the most frequent causes of valvular heart disease is infection, such as rheumatic fever in a child. Long after the rheumatic fever is gone—in fact, years later —residual damage can show up on one of the heart valves. When such damage occurs, it usually involves the mitral or aortic valves. Intravenous drug abusers risk infecting their tricuspid valve if they do not use clean needles and syringes.

Disease of any of the valves can cause failure of the heart's ability to pump blood adequately in one of two ways: Either the valve becomes stenosed so that the heart has trouble pushing blood through it, or the valve has become incompetent so that blood flows in two directions. An incompetent valve is said to have valvular insufficiency. Valvular insufficiency causes regurgitation of the blood back through the valve in the wrong direction.

Prosthetic heart valves are highly effective in restoring cardiac function and alleviating symptoms. Operations on heart valves like annuloplasty and valvotomy can restore the function of some valves without requiring a prosthetic replacement.

e. Congenital Heart Disease

Most congenital heart disease is genetic. Congenital heart disease is a problem of substantial complexity because of the many possible malformations of the heart with different consequences. Congenital heart disease can be classified as cyanotic (involving inadequate oxygenation) or noncyanotic.

Common types of congenital heart disease are ventricular septal defect (VSD), tetralogy of Fallot, and atrial septal defects. All of these diseases can usually be surgically corrected. Some VSDs are so small they don't require surgery. Failure to perform needed surgery on tetralogy of Fallot or large VSDs, however, can be fatal for a child. Similarly, a patent ductus arteriosus can have little effect on a person if it is small, while a large one represents serious heart disease.

1. Heart Attacks

The SSA sees many applications for disability based on an allegation of a heart attack, but many people are confused about what this really means. Heart attacks are common and can be a serious cause of disability; you need to know a few basic facts about them and the various tests used to diagnose a heart attack.

To begin, the medical term for a heart attack is myocardial infarction (MI)—part of heart muscle tissue (myocardium) has been killed (infarcted) and replaced with scar tissue. It is important for you to understand that angina (chest pain) is not a heart attack. Angina related to cardiac ischemia is reversible and does not result in the death of myocardium.

Most heart attacks involve the heart's large left ventricle, which pumps blood through the arterial system of the body. It is possible to have heart attacks involving the right ventricle, but these are more unusual.

The SSA requires objective evidence of an MI before accepting your treating doctor's diagnosis. Generally, proof of an MI can be established several ways.

- *EKG abnormalities.* An EKG can show an old (remote) or a new (acute) MI. An EKG doesn't always show an MI, however, especially when the heart attack occurred in the distant past.
- *Cardiac enzymes.* Enzymes are chemicals released into the bloodstream from the heart when it is damaged from an MI. Enzymes rise during an acute MI—that is, when the heart attack is taking place. How high enzymes go is related to the size of the heart attack. Enzyme levels generally return to normal levels within about one week of an MI. Therefore, an enzyme blood test won't diagnose a heart attack that occurred years, or even months, earlier. The SSA needs the dates of the tests and enzyme values showing the specific enzyme blood concentrations. The SSA accepts the new enzyme test (troponins) as well as the old tests (LDH or CPK).
- *Radionuclide scans and ventriculograms.* Thallium and technetium studies of the heart can be used to diagnose heart attacks in one of

two ways: video showing fixed perfusion defects where there is no longer blood flow, and video showing akinesis of where the heart muscle has died. The SSA needs the results of the tests, but not the actual films.

- *Cardiac catheterization.* Ventriculograms done during cardiac catheterization can show a heart attack by the presence of akinesis. Coronary artery blockages can verify the presence of the fatty blockages that are usually responsible for heart attacks. The SSA needs the results of the tests, but not the actual films.
- *Echocardiogram.* Echocardiograms can provide imaging of the ability of the heart's ventricles to contract. Akinesis in the left ventricle suggests scar tissue from a prior heart attack. The SSA needs the results of the tests, but not the images or tracings.

The degree of disability a heart attack produces depends on how large it is and the severity of associated coronary artery disease. If an MI kills a large part of the heart muscle, the heart cannot function and death will occur. For example, a person with a heart attack that involves half of his heart muscle will not survive, while a person with a minor heart attack and little damage to the heart muscle might not even be considered disabled. The absence of coronary artery disease makes heart attacks unlikely, but vasospasm of an otherwise healthy coronary artery can, in rare instances, block blood flow long enough to cause a heart attack. Such vasospasm may be of unknown cause or induced by the use of cocaine.

2. Angina Pectoris

Angina is most frequently associated with coronary artery disease. Angina is pain caused by cardiac ischemia. Pain refers to any type of chest discomfort. If you have a claim for disability based on heart disease, you must understand angina and how it is evaluated by the SSA. Because angina is a symptom rather than something that can be directly measured, you must be able to accurately describe your chest pains.

Angina has the following general characteristics:

- *Location.* Substernal or central chest, radiating to the left arm. It is possible to have angina that is not in the center of the chest; it can occur in just the left arm, shoulder, or jaw.
- *Quality.* Pain which is aching, dull, tight, squeezing, or heavy. People use different terms to describe the quality of the chest pain. Disability applicants frequently use the word "sharp" because they can't think of a better word. This word only confuses matters because angina is not generally considered a sharp or sticking pain. Most importantly, angina is never rhythmic. A rhythmic pain is one that rapidly changes on and off like a stabbing or jabbing or throbbing pain, or like pins and needles.
- *Cause.* Physical exertion or intense emotion. Angina is predictably related to exertion and emotion because a faster beating heart needs more blood flow and oxygen. But not all chest pain related to exertion and emotion is angina. If you do not get sufficient blood flow through diseased coronary arteries to your heart during exercise, the result is the release of chemicals inside the heart muscle that stimulates pain nerves to produce angina. On the other hand, chest pain occurring in a random relationship to exertion and emotion (where there is no predictable cause and effect) is probably not angina.
- *Relief.* Rest and nitrate drugs such as nitroglycerin. Just as exercise can cause angina, rest can decrease the heart's need of oxygen and the chest pain disappears. In addition, certain nitrate drugs widen arteries to the heart and help relieve pain by improving blood flow to heart muscle.
- *Duration.* Three to five minutes. Longer episodes of chest pain are generally called *unstable angina.* Unstable angina is a medical emergency requiring treatment in a hospital.

Some claimants report chest pain that lasts for hours a day. The SSA will not accept such a claim as being angina pectoris. Unstable angina, which could last for hours, must be documented by hospital records. Even if you have unstable angina, the duration will decrease to a few minutes after treatment. And a person with unstable angina would

not be discharged from a hospital until the unstable angina is controlled. Claimants who have chest pain lasting several hours per day are not having angina, especially if the episodes have been occurring for months or years.

If you are not sure how long your chest pain lasts, time some episodes with a watch. Just as chest pain lasting more than a few minutes is not likely angina, chest pain lasting less than one minute is usually not angina either. Nor are chest pains associated with twisting or turning movements, pushing on the chest, or coughing.

Often, medical records do not contain a complete description of chest pains. If you have heart disease with angina and want to apply for disability, make sure you have carefully described your chest pain to your doctor and that your description is in your records. If your records are incomplete, the SSA may have to contact your doctor, which can delay your disability decision considerably. If your treating doctor refuses to provide the SSA with a description, you might have to undergo a consultative examination, which can also delay your decision. Also, the SSA needs a description that applies to your condition at the time the disability determination is being made—a chest pain description taken before you receive treatment might no longer apply.

Chest pain is one of the most difficult allegations for the SSA to evaluate because so many disorders can cause such pain, such as cracked ribs, pneumonia, arthritis in the neck, bronchitis, tumors, hiatal hernias, costochondritis, gastritis, peptic ulcers, pancreatitis, esophagitis, bile duct disease, and spasms of the esophagus. Also, many treating doctors give an incomplete description of chest pain so the SSA has to send a claimant for a consultative examination.

Additionally, claimants frequently describe the pain differently to different treating doctors, and the doctors inside and outside of the SSA's disability system. The bottom line: Pay close attention to the characteristics of your chest pain and try to not give multiple or conflicting descriptions.

3. Congestive Heart Failure

Congestive heart failure (CHF) means the underlying heart disease is so severe that the heart cannot keep up with pumping out the blood flowing into it. The resulting backed-up pressure causes fluid congestion of organs, such as pulmonary edema or congestion of the liver. Pulmonary edema can be heard as abnormal sounds (rales) in the chest with a stethoscope and can also be seen on chest x-ray. Through a stethoscope, a person with heart failure may have an abnormal sound called an S3 gallop. An enlarged heart may be shown by a chest x-ray, echocardiography, radionuclide scan, or MRI scan. An enlarged heart does not in itself imply the presence of heart failure.

CHF can be of all degrees of severity. Acute heart failure means heart failure present at the time of examination with signs of fluid congestion such as peripheral or pulmonary edema. Florid heart failure refers to obvious and severe acute heart failure. Chronic heart failure means the heart's pumping function remains limited enough that significant symptoms of easy fatigability and shortness of breath with exertion remain even after treatment.

The SSA will want to know how well you have responded to whatever treatment has been given. Digitalis and angiotensin-converting enzyme (ACE) inhibitors are particularly important in the treatment of heart failure, as well as diuretics to decrease the fluid load on the heart. Digitalis is commonly used in the treatment of heart disease and can cause distortion of EKG results. Although you won't be trying to read your own EKG results, know that the SSA will be particularly interested in whether you are taking any form of digitalis.

4. Cardiac Stress Tests

The basic purpose of stress tests is to put some type of stress on the heart either to diagnose ischemic heart disease or to find out a person's exercise capacity. The importance of stress tests is that the heart may not reveal its difficulties in the resting state. The essence of all cardiac stress testing is to increase the heart rate and then try to find out if the heart is getting enough blood at that heart rate.

There are two broad categories of stress tests:

- Exercise stress tests, such as walking on treadmills (measured in METs), and riding stationary bicycles (measured in watts). If the SSA wants to send you for a stress test, it requests an exercise test, usually a treadmill test.
- Phamacologic stress testing, in which the heart is stimulated by drugs. These tests use echocardiography or radionuclide scans to detect abonormal wall motions of the heart under stress to diagnose cardiac ischemia. Dobutamine and dipyridamole are the most commonly used drugs in pharmacologic stress testing, but there are others.

The SSA should not ask you to undergo cardiac stress testing unless you cannot be granted benefits without such a test, because any stress testing has some risk. If you can't be allowed benefits in any other way, only a doctor should decide if stress testing is indicated or not. Disability examiners, case managers, disability hearing officers, and other medically unqualified individuals should never decide that you need a stress test or that it is safe for you to undergo such a test. Furthermore, the SSA should never schedule a stress test without also arranging for you to be thoroughly examined before. And a doctor should always be present during a stress test.

Situations in which you should not have a stress test include the following:

- heart attack within the past three months
- advanced heart failure
- cardiac drug toxicity
- uncontrolled serious arrhythmias
- uncontrolled severe systemic hypertension
- marked pulmonary hypertension
- marked stenosis of the aortic valve
- stenosis of 50% or more of the left main coronary artery
- dissecting aortic aneurysm that has not been surgically repaired
- recent pulmonary embolism
- musculoskeletal or neurological disorders that might interfere with your ability to safely perform testing, and
- significant acute illness, such as pneumonia.

The SSA should give great weight to your treating doctor's opinion regarding whether it is safe for you to undergo stress testing. Rarely will the SSA ask you to undergo stress testing against the advice of your treating doctor. If your doctor cannot provide a reasonable medical basis for why you cannot undergo stress testing, however, the SSA can request such testing anyway.

Cardiac stress testing is infrequently performed in children, but the SSA may do so—subject to the same limitations for adults—if necessary to evaluate some arrhythmias, the severity of chronic heart failure, or recovery of function following heart surgery or other therapy. Such testing usually cannot be performed in children under age six, and must be done by a facility qualified to perform exercise testing on children.

5. Peripheral Arterial Disease and Doppler Exercise Tests

Most of the peripheral arterial disease (PAD) responsible for disability is atherosclerosis of the arterial blood supply to the lower extremities. Decreased blood flow leads to the symptoms of intermittent claudication. Where possible, the most effective treatment of PAD is surgery to insert grafts that carry blood around the blockages. If surgery has been done, the SSA will generally need at least three months to properly evaluate the outcome.

The presence and severity of PAD can be diagnosed with angiography showing blockages in the arteries. The SSA cannot order an angiography on the arteries to your legs because it is invasive, requiring the insertion of a catheter into the aorta and the injection of x-ray contrast material. If angiography is called for, your treating doctor must do it.

Another way to determine the severity of PAD is to use a Doppler transducer to measure the systolic blood pressure in peripheral arteries. If you won't be given benefits in any other way, the SSA may ask that you undergo Doppler measurements of blood pressure in your legs with exercise. Although the goal is to evaluate blood flow in the legs with exercise, the same precautions must be taken as discussed above with a cardiac stress test. If you need exercise Dopplers, you'll be asked to walk on a treadmill at two miles per hour on a 10% or 12% grade for five minutes. The doctor will measure the blood pressure in your arm and ankle arteries before and right after exercise.

Doppler studies apply only to diseases affecting the larger arteries. Doppler ultrasound cannot measure the severity of disease in small arteries, as occurs with diabetes.

6. Effects of Obesity

The combined effects of obesity and cardiovascular impairments can be greater than the effect of each impairment considered separately. Therefore, when the SSA determines whether an obese person with breathing problems has a listing level impairment or combination of impairments, and when assessing the RFC, the SSA will consider the effects of obesity. For example, a significantly overweight person with heart or peripheral vascular disease might be capable of less exertion than a person of normal weight with the same disorder.

C. Specific Listings and Residual Functional Capacity

The listings that follow are in the federal regulations. They have been interpreted and commented on for greater ease of understanding while explaining their requirements. It is impossible to discuss here all of the medical possibilities related to every kind of disorder, and you may need to seek help from your treating doctor to more fully understand how your particular impairment relates to these listings. The discussion of residual functional capacity does not apply to children.

1. Listing 4.02: Chronic Heart Failure (Adults)

The most frequent causes of adult chronic congestive heart failure (CHF) the SSA sees are coronary artery disease and alcoholic cardiomyopathy. Early alcoholic damage to the heart can substantially improve with abstinence from alcohol. Some degree of reversibility may also be present with viral infections of the heart.

Patients with heart failure because of heart valve disease can often be returned to good cardiac function with an artificial valve replacement. Similarly, some forms of congenital heart disease can be markedly improved with surgery, such as patching the hole that is a ventricular septal defect or atrial septal defect. Congenital heart disease is covered in Listing 4.06.

Most cases of CHF can be improved with medical treatment, but the underlying disease may still be present. In such cases, return to completely normal functional ability will not occur. The prognosis for CHF caused by ischemic heart disease is poor—as high as 50% mortality per year in some cases.

The absence of heart failure after treatment is known as compensated heart failure. If, on the other hand, signs and symptoms of heart failure remain after treatment, you have chronic heart failure or partially compensated heart failure. Because most cases of CHF are caused by ischemic heart disease, the possible presence of angina pectoris must always be considered. Chronic heart failure is functionally limiting because of symptoms of dyspnea, especially with exertion, and fatigue that interfere with activities of daily living without frequent rest periods, even without angina.

To show chronic heart failure, the listing does not require signs of fluid retention such as pulmonary edema, hepatomegaly, ascites, or peripheral edema at the time you apply for disability. But your medical records must document signs of vascular congestion at some point in time.

a. Listing Level Severity

Once heart failure at some time has been established, you must satisfy Ⓐ and Ⓑ to show severe continuing (chronic) heart failure. Imaging studies of the heart are necessary to obtain the needed information and could include cardiac catheterization, magnetic resonance imaging of the heart (cardiac MRI), cardiac radionuclide scans, or echocardiography.

Ⓐ Demonstration of systolic or diastolic heart failure as follows:

- Systolic heart failure, with left ventricular end diastolic dimensions greater than 6.0 cm or ejection fraction of 30% or less during a period of stability (not during an episode of acute heart failure), or
- Diastolic heart failure, documented by all of the following:
  1. thickness of the back side of the heart wall (left ventricular posterior wall) plus thickness of the wall separating the heart's ventricles

(septal thickness) totaling 2.5 cm or greater on imaging
2. enlargement of the left atrium greater than or equal to 4.5 cm, and
3. with normal or elevated ejection fraction during a period of stability (not during an episode of acute heart failure).

Ⓑ To qualify, one of the following must be present:

- Persistent symptoms of heart failure (such as weakness and shortness of breath) which very seriously limit the ability to start, maintain, or finish activities of daily living. In this case, a SSA medical consultant, preferably one experienced in the care of patients with cardiovascular disease, must certify that exercise testing would present a significant risk.
- Three or more separate episodes of acute heart failure within a consecutive 12-month period. Acute failure must be shown by evidence of fluid retention (such as pulmonary edema, peripheral edema, or enlarged liver). Such fluid retention must be demonstrated by physical exam or imaging studies done at the time of the episodes. Each acute episode must require extended physician intervention (such as hospitalization or emergency room treatment for 12 hours or more), and be separated by periods of stabilization (absence of congestion as fluid retention).
- Inability to complete the entire Stage I of a standard Bruce treadmill protocol would satisfy the requirement of being less than five METs, or equivalent decreased capacity measured by other types of exercise protocols. For example, if you were unable to complete the entire three minutes of Bruce Stage I, this requirement would be satisfied. Additionally, at least one of the following abnormalities must be present to show the physical basis for inability to continue the exercise test:
  1. Shortness of breath (dyspnea), fatigue, palpitations, or chest discomfort.
  2. Three or more consecutive premature ventricular contractions (ventricular tachycardia), or increasing frequency of such beats (ventricular ectopy) with at least six such premature ventricular contractions per minute.
  3. Decrease of ten mm Hg or more in systolic pressure below the baseline systolic blood pressure or the preceding systolic pressure measured during exercise due to left ventricular dysfunction, despite an increase in workload.
  4. Signs attributable to inadequate cerebral perfusion, such as ataxic gait or mental confusion. In other words, if your heart cannot pump enough blood to your brain during exercise, you may have difficulty walking or in thinking clearly.

b. Residual Functional Capacity

If you don't qualify under the listing and have had CHF, it is still possible for you to receive a restricted RFC. Because of the many possibilities for CHF, the SSA does not have exact rules for every cause and severity of CHF. Medical judgment must be applied on a case-by-case basis.

Still, two factors are most important in determining your RFC:

- symptoms related to the heart's decreased ability to pump blood—dyspnea, easy fatigability with exertion, and possibly angina, and
- objective severity—especially measurement of the heart's pumping ability.

It is an unofficial SSA rule that someone who has had one episode of CHF should not receive an RFC higher than for medium work, even if the heart size is normal with treatment. The reasoning is that the underlying disease that caused the heart failure, usually coronary artery disease, is still present and there is no way full heart function can be restored to the ability to do heavy work. If you were treated for heart failure and still have cardiomegaly as shown by a CT ratio of at least 55%, you probably shouldn't receive an RFC for more than light work.

Of course, if treatment or surgery has restored your heart function to normal, then you may not get any RFC restriction. The SSA should not claim, however, that you have no restrictions just because you don't have symptoms at rest. You might be very symptomatic at a certain level of exertion. That is why it is important for the SSA to have good examples of the types and amounts of activities you can carry out before you develop symptoms. For example, there is a significant difference between someone who can

walk several miles briskly and someone who gets shortness of breath walking slowly for a half a block.

In considering what your RFC might be on the basis of the objective evidence, the SSA is going to be most interested in how well the ventricles of your heart perform—especially the left ventricle. The LVEF is important in this regard. While the SSA has no absolute rules, the following guidelines can be useful:

If you also have a decrease in the right ventricular ejection fraction (RVEF), then your restrictions may be greater.

You don't have to be able to interpret heart studies to find out what your ejection fraction is—it should be on the test report of your cardiac catheterization, echocardiogram, or radionuclide study.

Many older claimants with ischemic heart disease also have lung disease related to cigarette smoking. These two separate impairments interact because the action of the heart and lungs affect each other. The SSA should take this interaction into account. For example, suppose you have lung disease that taken alone would restrict you to an RFC for medium work and a heart disorder that taken alone would restrict you to medium work. A final RFC rating for medium work would be a mistake—the combined disorders should result in no higher than an RFC for light work. On the other hand, arthritis and heart disease that would, if considered separately, each warrant an RFC for medium work would probably not produce an overall restriction to an RFC for light work.

If you have a history of congestive heart failure, your RFC should have you avoid exposure to extremes of heat and cold, because such environmental factors put a strain on the cardiovascular system.

2. Listing 104.02: Chronic Heart Failure (Children)

In children, the most common cause of chronic heart failure is congenital heart disease, such as abnormal heart valves. Unlike adults, children may have decreased growth as a result of chronic heart failure.

The listing does not require signs of fluid retention such as pulmonary edema, hepatomegaly, ascites, or peripheral edema at the time the child applies for disability because potent diuretic drugs can usually remove excess fluid. But there must be signs of vascular congestion at some point in time—past or present—documented in the child's medical records.

In infants, chronic heart failure can manifest itself differently than in older children and adults. In infants, fatigue and exercise intolerance caused by chronic heart failure may manifest itself as prolonged feeding time, breathing with effort, and sweating. Other manifestations of chronic heart failure during infancy may include failure to gain weight or involuntary loss of weight and repeated episodes of pneumonia.

a. Listing Level Severity

Once heart failure at some time has been established, Ⓐ, Ⓑ, or Ⓒ must be satisfied to show severe continuing (chronic) heart failure. Imaging studies of the heart are necessary to obtain the needed information and could include cardiac catheterization, magnetic resonance imaging of the heart (cardiac MRI), cardiac radionuclide scans, or echocardiography.

Ⓐ Persistent fast heart rate at rest as specified in Table I.

Table I—Tachycardia at Rest

Age	Heart Rate Over (beats per minute)
under 1 year	150
1–3 years	130
4–9 years	120
10–15 years	110
over 15 years	100

An increased rate is the heart's attempt to compensate for its weakened condition. Heart rate taken during physical exertion or emotional upset cannot be used because a heart rate normally increases under those conditions. A doctor must do measurements of heart rate; rates reported by parents cannot be used. Persistent means that all or at least most readings satisfy Table I. One heart rate measurement is not enough—the SSA must have at least two to three readings over a period of at least three months.

Ⓑ Persistent fast breathing at rest as specified in Table II, or markedly decreased exercise tolerance.

Table II—Tachycardia at Rest

Age	Heart Rate Over (beats per minute)
under 1 year	40
1–5 years	35
6–9 years	30
over 9 years	25

The information about the heart rate in part Ⓐ applies here.

Note that part Ⓑ can also be satisfied by a markedly decreased exercise tolerance. The SSA applies medical judgment because no exercise test is given. Exercise tolerance must be evaluated in the context of what a child of the same age would normally be capable of doing. As discussed above, exercise intolerance in infants may manifest differently than in older children and adults.

Ⓒ Growth disturbance with 1 or 2.

1. Involuntary weight loss (or failure to gain weight at an appropriate rate for age). This involuntary weight loss must result in a fall of at least 15 percentiles on standard growth charts, which lasts at least two months.
2. Involuntary weight loss (or failure to gain weight at an appropriate rate for age). This involuntary weight loss must result in a fall to below the third percentile on standard growth charts, which lasts at least two months.

3. Listing 4.04: Ischemic Heart Disease (Adults)

Ischemic heart disease deprives the heart muscle of sufficient blood flow. Many people who do not have cardiac ischemia at rest do have it with some level of exertion depending on the severity of the disease. Some people have such severe heart disease that ischemia is present even at rest. Most adults with heart disease are evaluated for disability under this listing.

Most ischemic heart disease is caused by coronary artery disease, but other possible causes include narrowed heart valves and vasospasm of a coronary artery.

Because ischemic heart disease can exist in any degree of severity, how much exertion produces symptoms (fatigue, shortness of breath, angina) is important to disability determination. So is knowing at what level of exertion objective abnormalities appear—such as ST segment depression or elevation on EKGs performed at rest or with exercise. Ischemia can be diagnosed in other ways. One way is with an EKG to show abnormal motion of the heart's walls during exercise. Another is through radionuclide imaging with thallium and other isotopes to show wall motion abnormalities compatible with ischemia and to detect decreased blood flow to the heart during exercise that improves with rest. Most of the cardiac stress tests requested by the SSA are treadmill stress tests done with EKG and vital sign monitoring. (See discussion of stress testing at the beginning of the chapter.)

To satisfy any part of the listing, you must have established a history of chest pain compatible with angina—you are not required to have angina during the stress test itself. Symptoms during testing, however, can be relevant to the disability determination. Make sure you describe any symptoms you have to the doctor performing the test—both for your safety and your disability claim.

a. Listing Level Severity

Chest pain compatible with angina. Additionally, your condition must satisfy Ⓐ, Ⓑ, or Ⓒ, below.

Ⓐ Cardiac exercise stress test (walking on a treadmill or riding a stationary bicycle) with abnormalities appearing at an exertion level equivalent to five METs or less. Acceptable abnormalities are 1, 2, 3, or 4.

1. Horizontal or downsloping ST segment depression at least 1.0 mm on the EKG, indicative of cardiac ischemia. (Digitalis, low blood potassium, or other factors that can interfere with interpretation of the ST segment must not be present.) The abnormalities must last at least one minute into the recovery period after exercise.
2. At least 1.0 mm of ST segment elevation during exercise and lasting at least three minutes into the recovery period after exercise.
3. Decrease of 10 mm Hg or more in systolic pressure below the baseline blood pressure or the preceding systolic pressure measured during

exercise due to left ventricular dysfunction, despite an increase in workload.

4. Documented ischemia at an exercise level equivalent to 5 METs or less on appropriate medically acceptable imaging, such as radionuclide perfusion scans or stress echocardiography. There are a number of exercise protocols in which the heart is imaged with echocardiograms or radioactive isotopes. All have the same goal: to see how the heart performs during exertion.

   Inability to complete the entire Stage I of a standard Bruce treadmill protocol would satisfy the requirement of being less than 5 METs, or equivalent decreased capacity measured by other types of exercise protocols. For example, if you were unable to complete the entire three minutes of Bruce Stage I, this requirement would be satisfied.

Ⓑ Three separate cardiac ischemic episodes, each requiring revascularization or not amenable to revascularization, within a consecutive 12-month period. Revascularization means angioplasty or coronary artery bypass surgery. Multiple ischemic episodes during the same hospitalization only count as one episode. Inability to perform revascularization can be either due to the nature of the heart disease itself, or because a different impairment (like advanced lung disease) makes it too dangerous for heart surgery to be done.

Ⓒ Coronary artery disease, demonstrated by cardiac catheterization (done by your treating doctor), and an SSA medical consultant doctor decision that an exercise stress test would be a significant risk to you. Additionally, 1 and 2 must be present.

1. Angiographic evidence of coronary artery narrowing as in a, b, c, d, or e.
   a. 50% or more narrowing of a nonbypassed left main coronary artery.
   b. 70% or more narrowing of another nonbypassed coronary artery.
   c. 50% or more narrowing involving a long (more than one centimeter) segment of a nonbypassed coronary artery.
   d. 50% or more narrowing of at least two nonbypassed coronary arteries.
   e. 70% or more blockage of a blood vessel used as a bypass graft.
2. Resulting in very serious limitations in your ability to start, maintain, or finish activities of daily living.

b. Residual Functional Capacity

Significant ischemic heart disease that does not satisfy the listing must have an RFC. Some common RFC levels associated with ischemic heart disease follow. These are not official rules, but are reasonable and generally followed by the SSA.

- Heart attack: medium RFC or lower.
- Heart attack severe enough to also have produced heart failure: light RFC or lower.
- Blockage in one coronary artery between 50–70%: medium RFC or lower.
- Angina and a stress test positive for ischemia at the seven MET level: light RFC or lower.
- Angina and a stress test positive for ischemia at the ten MET level: medium RFC or lower.
- Significant lung disease occurring with heart disease: RFC lower than either alone.
- Prior history of coronary artery bypass surgery: medium RFC or lower, unless higher work capacity is proven with a cardiac exercise test.
- Prior history of percutaneous transluminal coronary angioplasty: medium RFC or lower if remaining lesions block at least 50%.
- Heart attack so severe that it produces a bulging scar in the left ventricle (aneurysm): light RFC or lower.

Sometimes, a claimant suffers from decreased blood flow to the heart but is unaware of it because he doesn't feel any angina. This type of silent ischemia can be associated with weakness and fatigue. Moreover, silent ischemia can cause dangerous arrhythmias that may result in sudden unexpected death. In cases of silent ischemia, the SSA should give an RFC below the exertion level that is thought to cause the ischemia.

4. Listing 4.05: Arrhythmias (Adults)

In adults, arrhythmias—disturbances of the heart's rate or rhythm—are most often caused by ischemic heart disease and other types of cardiomyopathies. In these instances, decreased blood flow to the heart's nerve conduction system, or to areas of heart muscle, interferes with the normal electrical functions in the heart. Also, the resulting scar tissue from a prior

heart attack can disrupt electrical impulses spreading through the heart.

One of the most frequent types of arrhythmias the SSA sees is atrial fibrillation (AF). AF is frequently found in middle-aged and older persons, and alcohol use can trigger this arrhythmia in people who would otherwise not have it. In many instances, AF can be controlled with drugs. If not, a pacemaker can usually achieve control. It would be extremely unusual for atrial arrhythmias of any kind to qualify under this listing, but they can still affect your RFC.

The most dangerous kinds of arrhythmias usually occur as a result of ischemic heart disease or cardiomyopathies, and involve the ventricles of the heart. Ventricular heart beats that occur at the wrong time are called ventricular premature beats (VPBs). Ventricular arrhythmias are the cause of most cases of sudden cardiac death. Electronic devices known as implantable cardiac defibrillators (ICDs) are sometimes used to help people whose ventricular arrhythmias cannot be controlled with medication or surgery. ICDs are not the same as pacemakers, but deliver powerful electric shocks to terminate dangerous ventricular arrhythmias in people at risk for sudden death. If you have an ICD, the SSA needs all of the information it can get about your arrhythmia—including your symptoms before and after implantation of the ICD and how often it shocks you to correct a ventricular arrhythmia. You also must describe how the shocks affect your ability to carry out your daily activities.

Cardiac arrhythmias are diagnosed on EKGs. Cardiac arrhythmias often come and go, however, rather than being present all of the time. A resting EKG may not show a serious arrhythmia. Prolonged EKG records can be made with a Holter monitor to continuously record your EKG for 12–24 hours while you carry out your normal activities. The SSA sometimes requires Holter monitor tests on claimants to evaluate alleged symptoms that might be caused by an arrhythmia. If you have Holter monitoring, keep a diary of the time, nature, and duration of your symptoms. The doctor interpreting the Holter monitor can see if your symptoms match patterns of abnormal heart rhythms appearing on the Holter EKGs. Without keeping such a record, the SSA won't know how any abnormalities on the Holter monitor affect you.

Sometimes cardiac catheterization with electrophysiologic studies (EPS) are needed to find out the exact nature of the arrhythmia regarding its origin in the heart, how it is triggered, and how it can be stopped. Small surgical procedures can sometimes be done in conjunction with EPS, such as with lasers, to suppress abnormal nerve conduction pathways. The SSA cannot order an EPS, but if you have had it done, make sure the SSA has the results.

The SSA does not define how often recurrent must be. Medical judgment is applied case by case, depending on your overall ability to function. The more severe the arrhythmia and associated symptoms, the fewer episodes it would take to be disabling.

a. Listing Level Severity

To meet the severity requirements of the listing, you must have recurrent episodes of arrhythmia, not related to reversible causes such as electrolyte imbalance, digitalis, or drugs used to treat arrhythmias. The arrhythmia must cause repeated episodes of cardiac syncope or near-syncope despite prescribed treatment. Resting EKGs or Holter monitoring must show the arrhythmia occurring at the same time as the alleged symptoms.

b. Residual Functional Capacity

Although most arrhythmias don't qualify under the listing, many qualify for an RFC. RFCs given for arrhythmias depend on their seriousness, their causes, and their response to treatment. AF completely controlled with a drug would probably not rate any restriction nor receive an RFC. But AF that drove the ventricles of the heart too fast and was not controllable with drugs would be a different matter because symptoms and functional limitations would be present.

Ventricular arrhythmias often warrant more restrictions because they are likely to lead to sudden death with exertion. All arrhythmias that are severe enough to produce dizziness or lightheadedness should have restrictions against driving, work at unprotected heights, or work around hazardous machinery.

An RFC should take into account that arrhythmias can limit the amount of weight that you can lift or carry because arrhythmias can decrease blood flow to the brain, heart, and other parts of the body, resulting in symptoms such as dizziness, loss of balance, weakness, and shortness of breath. If you have a history of arrhythmias triggered by lifting or other

exertion, your RFC should reflect that. Certainly, if you have an arrhythmia associated with a known amount of exertion on a cardiac stress test, your RFC should be for below that level of exertion. For example, if you had an arrhythmia at seven METs on a treadmill stress test, your RFC should be for no more than light work. If you had an arrhythmia at five or six METs, your RFC should be for sedentary work.

Environmental factors can also affect your RFC. Extremes of heat and cold make people more susceptible to arrhythmias. Psychological stress can cause arrhythmias to worsen—sometimes fatally. And while job stress is subjective, depending on the individual, the SSA should make a reasonable judgment. Few people would disagree that air traffic controllers, police officers, and prison guards generally have high-stress jobs. If stress that affects you personally is not obvious to the SSA, let the SSA know. If your arrhythmia was worsened by your prior work, that fact needs to be documented in your medical records. One strong indicator that your prior work contributed to the severity of your arrhythmia is improvement after you stopped working—any such change should be documented by your treating doctor. Such details are important, because if you can't do your prior work you are one step closer to being found disabled.

5. Listing 104.05: Arrhythmias (Children)

Although ischemic heart disease is a frequent cause of arrhythmias in adults, children are most likely to have arrhythmias as a result of congenital heart defects or other diseases affecting the heart. Heart blocks with slow heart rates are a particular problem in children. Some types of heart block are minor and produce few symptoms or limitations. Severe heart blocks, consisting of atrio-ventricular dissociation (A-V dissociation), can be life threatening and require a pacemaker for control.

The SSA does not define how often recurrent must be. Medical judgment must be applied on an individual basis, depending on the child's overall ability to function. The more severe the arrhythmia and associated symptoms, the fewer episodes it would take to be disabling. Because children cannot keep records of their symptoms, a parent or other caregiver must do so. Such records should include what the symptoms are, what the child was doing when the symptoms appeared, the date, the time of day, and how long the symptoms lasted.

a. Listing Level Severity

The listing requires the child to have recurrent episodes of arrhythmias, such as persistent or recurrent severe heart block (A-V dissociation), not related to reversible causes such as electrolyte imbalance, digitalis, or drugs used to treat arrhythmias. The arrhythmia must cause repeated episodes of cardiac syncope or near-syncope (dizziness, lightheadedness) despite prescribed treatment, including a pacemaker. Resting EKGs or Holter monitoring must show the arrhythmia occurring at the same time as the alleged symptoms.

6. Listing 4.06: Congenital Heart Disease (Adults)

Congenital heart abnormalities involve some kind of malformation like holes that shouldn't be present, absence of a part of the heart, or misplacement of the aorta or large veins (vena cavae) in relation to the heart. A ventricular septal defect (VSD) is the most common. Atrial septal defect (ASD) also occurs with some frequency. Most congenital heart disease is seen in children, but many children now survive into adulthood thanks to advanced surgical procedures. Although VSDs and ASDs alone can be easy to repair with a patch covering the abnormal hole, congenital heart diseases like tetralogy of Fallot can involve multiple defects.

An important distinction in types of congenital heart disease is whether the disease is cyanotic or acyanotic. Cyanotic congenital heart disease is associated with difficulty oxygenating blood because of shunting of blood flow away from the lungs. Examples of cyanotic heart disease include failure to develop heart valves (tricuspid valve atresia, aortic valve atresia, pulmonary valve atresia), tetralogy of Fallot, transposition of the great arteries, truncus arteriosus, and total anomalous pulmonary venous connection. Examples of acyanotic heart disease are ventricular septal defects, atrial septal defects, and patent ductus arteriosus. The difference between cyanotic and acyanotic heart disease is not absolute. People with cyanotic heart disease may not always

show the bluish skin discoloration of cyanosis, especially at rest. Similarly, someone with severe acyanotic heart disease may develop cyanosis, particularly with exercise.

a. Listing Level Severity

Your condition must satisfy Ⓐ, Ⓑ, or Ⓒ below.

Ⓐ Cyanosis at rest. Additionally, you must satisfy 1 or 2.

1. Hematocrit of 55% or greater.
2. Arterial oxygen saturation (SaO_2) of less than 90% in room air or a resting arterial oxygen pressure (PaO_2) of 60 mm Hg or less.

Ⓑ Intermittent right to left shunting of blood within the heart resulting in cyanosis on exertion (such as Eisenmenger's physiology) and with an arterial oxygen pressure (PaO_2) of 60 mm Hg or less at a workload of five METs or less.

Ⓒ Secondary pulmonary vascular obstructive disease (PVOD) with a pulmonary arterial blood pressure elevated to at least 70% of the systemic arterial pressure—that is, congenital heart disease with abnormally increased blood flow through the lungs. The abnormal flow damages the lungs so they increasingly resist the flow. PVOD causes blood pressure to go up in the pulmonary arteries (pulmonary hypertension).

This listing is satisfied if the pressure inside your pulmonary arteries is 70% or more of your systemic arterial blood pressure. The pressures are measured during cardiac catheterization, which must have been done by your treating doctor. Here's how it works. Let's say your catheterization report gives your systemic arterial pressure as 85 mm Hg. 70% of 85 = 59.5. Therefore, if you had a pulmonary artery pressure of about 59–60 mm Hg or higher you would qualify under the listing. Pulmonary artery pressure is normally only about 15 mm Hg. What if your systemic pressure was 92 mm Hg and your pulmonary artery pressure was elevated at 40 mm Hg? In that case, 40 divided by 92 is 43%—a value that is abnormal but not high enough for the 70% requirement of the listing.

b. Residual Functional Capacity

Congenital heart disease is too complex for the SSA to have specific RFC guidelines. Appropriate medical judgment must be applied to individual cases, taking into account the exact nature of your congenital heart disease, your treatment, and your current symptoms. If your condition is close in severity to the requirements of the listing, you should not receive more than a sedentary RFC. The discussion of RFC under Listing 4.02 regarding congestive heart failure may be appropriate here. If you have arrhythmias, see also the discussion of RFC under Listing 4.05.

7. Listing 104.06: Congenital Heart Disease (Children)

The introduction to Listing 4.06 applies here.

a. Listing Level Severity

The child's condition must satisfy Ⓐ, Ⓑ, Ⓒ, or Ⓓ.

Ⓐ Cyanotic heart disease, with persistent hypoxemia. Additionally, the child's condition must satisfy 1, 2, 3, or 4.

1. Hematocrit of 55% or greater on two or more evaluations within a three-month period.
2. Arterial oxygen saturation (SaO_2) of less than 90% in room air or a resting arterial oxygen pressure (PaO_2) of 60 Torr (mm Hg) or less.
3. Hypercyanotic spells, syncope, characteristic squatting, or other incapacitating symptoms directly related to documented cyanotic heart disease. These symptoms are associated with tetralogy of Fallot. Children with tetralogy of Fallot tend to squat to relieve dyspnea brought on by activity. Any severe symptoms, however, can qualify if they are caused by some type of cyanotic heart disease.
4. Exercise intolerance with increased hypoxemia on exertion. Exercise must be limited or produce distress and be accompanied by a worsening of oxygenation. The degree of worsening is not specified; any amount would be sufficient. Observations of the child during exertion, along with either a fall in arterial oxygen saturation or oxygen pressure should be sufficient to establish hypoxemia. Oxygen saturation is easier to measure because a sensor on the child's finger can provide a readout, while oxygen pressure requires the child's presence in a hospital or clinic.

Ⓑ Secondary pulmonary vascular obstructive disease with a pulmonary arterial blood pressure elevated to at least 70% of the systemic arterial pressure. See discussion of part Ⓒ under adult Listing 4.06.

Ⓒ Symptomatic acyanotic heart disease with ventricular dysfunction that results in significant restriction of age-appropriate daily activities or inability to complete age-appropriate tasks. This covers children whose hearts have difficulty pumping enough blood. Weakness, easy fatigability, and shortness of breath can limit the child's ability to carry out normal daily activities. Similarly, symptoms may prevent a child from finishing tasks.

Ⓓ Infants under 12 months of age at the time of filing for benefits who have a life-threatening congenital heart disease that will require surgery, or who have had surgical treatment in the first year of life. Such infants are considered to be under a disability until they are either one year of age or until 12 months after surgery, whichever is later. Examples of life-threatening congenital heart disease are hypoplastic left heart syndrome, critical aortic valve stenosis, critical coartation of the aorta, complete A-V canal defects, transposition of the great arteries, tetralogy of Fallot, a single ventricle, tricuspid atresia, multiple ventricular septal defects, and atresia of the pulmonary valve.

8. Listing 4.09: Heart Transplants (Adults)

Heart transplants require close monitoring for immune rejection and other possible complications, particularly during the first year after surgery. For example, the coronary arteries of transplanted hearts are extremely prone to development of severe coronary artery disease.

a. Listing Level Severity

An adult is considered disabled for one year following surgery. After that, residual impairment is evaluated under whatever heart listings are appropriate.

b. Residual Functional Capacity

RFCs don't apply because anyone with heart transplant surgery is entitled to benefits for the year after surgery. After that time, each case is evaluated on an individual basis. Heart transplant recipients usually remain in benefit status, however.

9. Listing 104.09: Heart Transplants (Children)

The comments under Listing 4.09 apply here.

a. Listing Level Severity

A child is considered disabled for one year following heart transplant surgery. After that, residual impairment is evaluated under whatever heart listings are appropriate.

10. Listing 4.10: Aneurysms of the Aorta or Major Branches (Adults)

Aneurysms can rupture and result in a quick death from internal bleeding. This is particularly true for aortic aneurysms—the aorta is the largest artery in the body. The listing also permits allowance based on aneurysms of large arteries that branch from the aorta, such as the renal artery to the kidney.

Aneurysms may be associated with entry of blood into the wall of the artery, especially in aortic aneurysms, so that the layers of the artery are split in a lengthwise direction. This process of dissection is dangerous because it might lead to rupture of the aneurysm.

Aortic aneurysms may be short or involve the entire length of the aorta, and therefore vary greatly in severity and possible complications. If an aortic aneurysm extends to the heart itself, it can affect the coronary arteries and function of the aortic valve, resulting in heart failure. If an aortic aneurysm extends to the area where the renal arteries come off of the aorta to the kidneys, kidney failure can result from inadequate blood flow. Large aortic aneurysms may interfere with the blood supply to the spinal cord and produce neurological deficits such as paralysis, which may also be a complication of extensive surgery for such aneurysms.

Aortic aneurysms involving the part of the aorta in the chest (thoracic aortic aneurysms) are generally more dangerous and difficult to surgically repair than abdominal aortic aneurysms. In fact, newer surgical techniques allow the repair of some abdominal aneurysms merely by the insertion of a catheter rather than requiring a large abdominal incision.

Aortic aneurysms have a genetic predisposition, but smoking, atherosclerosis, and uncontrolled high

blood pressure may contribute. Aneurysms may be caused by trauma, infections (such as syphilis), and specific disorders like Marfan's syndrome. Regardless of the cause, the basic aim is the same: prevent rupture. Rupture of an aortic aneurysm is a catastrophic event with high mortality. When aortic aneurysms reach about two inches in diameter (five centimeters), the risk of rupture warrants surgery. With other complications, earlier surgery may be required. Aneurysms tend to enlarge over time; they never become smaller. The rate at which aneurysms enlarge is highly variable among individuals. Some people have aortic aneurysms that enlarge so slowly they avoid surgery for years or even die of other causes before surgery is needed. Others have rapidly enlarging aneurysms that must be treated aggressively.

The easiest way to follow the size of many aneurysms is with ultrasonic imaging, because the use of high-frequency sound bounced off of internal organs to make pictures is safe, painless, and quick. Other imaging techniques are also possible, such as MRI and x-ray angiography.

Allowances under this listing are rare because afflicted individuals who could satisfy the listing usually have suffered a fatal rupture or are improved with surgical intervention. Claimants with aneurysms of lesser severity or who have received surgery, however, may have RFCs that significantly affect their ability to work.

a. Listing Level Severity

Aortic or branch artery aneurysms can be due to any cause. The SSA gives specific examples as atherosclerosis, cystic medial necrosis, Marfan syndrome, and trauma. Diagnosis must be done with some type of appropriate imaging, such as MRI, CT scan, aortic angiography, or ultrasound. In addition there must be dissection of the aneurysm despite treatment. This also would require imaging.

Aortic aneurysms can be associated with numerous complications (strokes, heart failure, kidney failure), depending on the size and location of the aneurysm. In that event those problems would be evaluated under the appropriate listing. This listing can only be satisfied if there is dissection of the aneurysm despite treatment. Dissection means the aneurysm is in danger of rupturing, because blood has forced its way into the wall of the aorta or branch artery. A major branch of the aorta could be any of the aorta's main branches, such as a subclavian artery, renal artery, or a major artery supplying the intestine.

While there are very rare cases that qualify under this listing, most people have surgical repair of their aneurysms if there is uncontrolled dissection. If they are too sick for surgery, they would be an allowance on some other medical grounds anyway. Most involve deciding what the residual functional capacity will be (see below).

b. Residual Functional Capacity

It is difficult to say how much weight a person with an aneurysm can safely lift and carry before and after aneurysm surgery because no doctor is going to carry out such a study. Nevertheless, reasonable medical judgment can be applied on a case-by-case basis.

An unrepaired aortic aneurysm that is large enough to present a danger of rupturing should receive an RFC for no higher than light work. Extremely small aneurysms may warrant no restrictions. Size and location are important: Involvement of the aortic root where the aorta attaches to the left ventricle of the heart is particularly dangerous, as are long aneurysms extending from the chest down into the abdomen. Such long aneurysms could easily result in restrictions to sedentary work before surgery even if they produce no symptoms. In fact, unless they are dissecting and about to rupture, aneurysms don't tend to cause symptoms. During dissection, severe chest and back pain should be treated as a medical emergency. If you have high blood pressure, controlling it will decrease the chance of rupture. If your blood pressure is not under good control, the SSA should lower your RFC appropriately.

Extensive surgical repair of a large, complicated aneurysm involving the heart or other organs may warrant restrictions to no higher than a medium or light RFC, even if the surgery was successful. On the other hand, lower abdominal aortic aneurysms that have been surgically repaired without complications often leave no significant impairment, and require no restrictions.

11. Listing 4.11: Chronic Venous Insufficiency (Adults)

Chronic venous insufficiency is a serious and common disorder in adults. Inflammation, trauma, and hereditary predisposition may be associated with the development of venous insufficiency.

Veins are very delicate—they have thin walls with essentially no muscle. Although they do not become blocked with fatty deposits like arteries, they can become damaged through infection or other diseases. While the heart forces blood through the arteries, the movement of blood upward through the leg veins is helped greatly by the pressure applied by surrounding muscles. Veins have one-way valves that allow blood to move upward, but not downward.

The legs have two venous systems—superficial and deep. The superficial system involves the veins that can be seen running under the surface of the skin. Damage to these veins can produce superficial varicosities most familiar to people. Damage to the deep system of veins can lead to severe impairment. The deep system of veins cannot be seen on physical examination. Imaging techniques, such as Doppler ultrasound, can detect deep venous thrombosis (DVT) as can direct x-ray visualization of veins by venography. Also, an MRI can be used to see the deep veins. DVT can not only block venous blood flow and lead to venous insufficiency, but also carries the risk of pulmonary thromboembolism. Anticoagulation can prevent blood clots from forming and avoid this complication.

Although not stated by the listing, only one leg need be involved to allow a disability finding.

a. Listing Level Severity

For your condition to be severe enough to meet the listing, you must have chronic venous insufficiency of a lower extremity, with incompetency or obstruction of the deep venous system. Additionally you must satisfy part Ⓐ or Ⓑ, below.

Ⓐ Extensive brawny edema involving at least two-thirds of the leg between the ankle and knee or the distal one-third of the lower extremity between the ankle and hip.

Ⓑ Superficial varicosities, stasis dermatitis, and either recurrent ulceration or persistent ulceration that has not healed following at least three months of prescribed treatment.

b. Residual Functional Capacity

If your venous insufficiency is not severe enough to qualify under the listing, you could still be highly restricted on the basis of an RFC. The SSA should consider two key points.

1. **How long you can stand.** In all but the mildest cases of venous insufficiency, prolonged standing day after day will lead to aching discomfort in the legs and problems with increased swelling. Patients with venous insufficiency routinely wear thromboembolic stockings to help prevent swelling in the legs; these elastic stockings are very helpful in providing compression to keep fluid build-up down. But such stockings cannot permit standing six to eight hours daily, except in very modest cases of venous insufficiency. Inability to stand for prolonged periods will automatically reduce your RFC to sedentary work. People with venous insufficiency should also avoid prolonged continuous sitting, but this problem can be solved by standing and moving around every couple of hours. The SSA should probably not say you can do jobs that require continuous sitting for more than two hours at a time.
2. **Anticoagulation.** If you are taking anticoagulant drugs, you are at increased risk of bleeding from cuts or trauma. It is questionable whether handling heavy objects is safe, and restriction to no higher than medium work on your RFC might be appropriate. The SSA has no definite rules, and medical judgment must be used case by case, considering all evidence and your symptoms. In medical-vocational consideration of jobs you might be able to perform based on your RFC, jobs requiring close proximity to moving blades or other equipment that could cause significant trauma should also be avoided.

12. Listing 4.12: Peripheral Arterial Disease (Adults)

Much peripheral arterial disease is caused by the same type of atherosclerotic process that results in coronary artery disease—fatty plaques that block arterial blood flow to skin, muscles, and other tissues. This ischemia of muscles results in the pain of intermittent claudication. If you have intermittent claudication, take careful note of where the pain is,

what it feels like, what usually causes it, what relieves the pain, and how long it lasts. The SSA will ask for such a description—from your treating doctor's records or a consultative examination. You can save a lot of time if you make sure your doctor has written down your symptoms in detail. The SSA will not simply accept a diagnosis of intermittent claudication from your treating doctor.

On physical examination, abnormalities suggesting peripheral arterial disease are hair loss on the feet and toes, cold feet, thickening of the toenails, and difficulty feeling the pulses in the feet. Extremely advanced cases can include ulceration and even gangrene of feet and toes. Keep in mind, however, that failure to feel pulses in the feet or ankles can mean a number of things. Factors like obesity or swelling in the feet can make feeling pulses impossible. In some people, pulses are just difficult to feel.

a. Listing Level Severity

For your condition to be severe enough to meet the listing, you must first establish two things: symptoms of intermittent claudication and an appropriate imaging study that show the presence of peripheral arterial disease (PAD). The imaging study could be catheter-angiography done by a treating doctor since it is invasive and cannot be purchased by the SSA. In this case, a catheter is inserted into the aorta, contrast material injected, and x-ray images taken to show how well the blood flows into the large arteries of the lower extremity: iliac, common and deep femoral, popliteal, anterior, and posterior tibial arteries—among others. Technically, this is called "aortofemoral contrast angiography with runoff."

For many years the only imaging study the SSA would accept was catheter-angiography because that was all that was available. Now there are less invasive techniques that allow blockages to be diagnosed with less discomfort and risk to the patient. For example, magnetic resonance imaging angiography (MRA) or digital subtraction angiography (DSA) can use injection of contrast material into a peripheral vein or artery rather than through a catheter inserted into the aorta.

Only one lower extremity need be involved to satisfy the listing. Once it has been demonstrated that PAD is present with imaging and that you have symptoms compatible with significantly decreased blood flow to your lower extremities, the listing offers several way in which the severity of blood flow decrease can be measured objectively. There are several ways this can be done, requiring that Ⓐ, Ⓑ, Ⓒ, or Ⓓ be satisfied.

The same testing criteria apply if you have had previous arterial bypass or graft surgery to restore blood flow in the lower extremity, and regardless of the severity of obstructions seen on imaging. If you have severe diabetes melitus or arterial calcification (calcific sclerosis), you should have toe pressure evaluation as under Ⓒ or Ⓓ. Many claimants have diabetes, which tends to affect small arteries more than large ones. Testing of the large arteries by Ⓐ or Ⓑ could miss small vessel disease, but such abnormalities should show up with toe pressure measurements.

Ⓐ Resting ankle/brachial systolic blood pressure ratio of less than 0.50. The systolic ankle blood pressure is measured in the posterior tibial artery just behind the inner ankle bone. If you gently place a fingertip there, you can probably feel the artery pulsating—it is one of your "peripheral pulses" that doctors should always check on any complete physical examination. Normally, this ankle artery pressure is higher than that in the arm, so the Doppler index should be higher than 1. For example, suppose the doctor puts the Doppler transducer over your ankle artery and measures the systolic pressure as 100 mm Hg. Then the pressure is measured in the brachial artery of your arm at 80 mm Hg. Such a result is normal, with an ankle/brachial (A/B) ratio, or Doppler index, of 100/80 = 1.25. But say your ankle pressure is 50 mm Hg, while that in your arm is 100 mm Hg. This would result in a DI of 50/100 = 0.5, which indicates a very severe restriction of blood flow to the leg involved and would be at listing-level severity.

Ⓑ Decrease in systolic blood pressure at the ankle of 50% or more of the value at the ankle before exercise, and requiring ten minutes or more to return to pre-exercise level. This exercise is not as strenuous as cardiac stress testing, but the same cautions apply—see the discussion of cardiac stress testing under "General Information" at the beginning of this chapter. Your ankle systolic pressures are measured before exercise, then

right after exercise and several more times. If exercise makes the pressure in either ankle artery drop to half or less of the pre-exercise value then the listing is satisfied, provided it takes at least ten minutes to return to its pre-exercise level. For example, if you had a pre-exercise systolic pressure of 70 mm Hg in your right ankle artery, it dropped to 35 mm Hg with exercise, and then took 15 minutes to return to 70 mm Hg, you would qualify.

The exercise involves walking on a treadmill at two miles per hour and 10% to 12% grade for five minutes. Even though you are not being tested for heart disease, your EKG should still be monitored to detect possible arrhythmias or ischemia associated with exercise, because a significant number of people with peripheral arterial disease also have coronary artery disease.

Some disorders, like diabetes, typically cause damage to arteries smaller than those measured by Doppler in part Ⓑ. If you have a disorder that affects the smaller vessels, the SSA should not rely on Doppler pressure measurements when they are not reliable.

Ⓒ Resting toe systolic pressure of less than 30 mm Hg. The great toe is used. Pressures in the toes are most often measured indirectly by a technique called plethysmography that detects the change in volume of the toe when blood pulses into it. It is also possible to make measurement using a little cuff around the toe and a laser Doppler probe. Toe measurements associated with exercise testing are not useful, so there is no such thing as exercise toe pressure testing.

Ⓓ Resting toe/brachial systolic blood pressure ratio of less than 0.40. This toe/brachial index helps assess toe blood flow by comparing it to the blood flow present in the main artery of the arm. The reasoning is basically the same as that described in Ⓐ for the ankle/brachial Doppler Index except the toes is used instead.

b. Residual Functional Capacity

With aortofemoral bypass grafting, many people with large artery involvement can have blood flow restored to their legs. If the surgery is completely successful, there is no reason for significant restrictions. When Doppler indexes in both ankles are 0.8 or higher, whether or not surgery has been done, there is usually an absence of significant impairment. Because a Doppler index of 0.5 satisfies the listing and 0.8 or higher is not severe, values in between could be divided up to represent other RFC levels. For example, a resting Doppler index in the 0.7–0.8 range might receive an RFC for medium work, 0.6–0.7 for light work, and 0.5–0.6 sedentary work. The SSA has no such rigid rules, but this approach provides a framework that can be modified based on your individual medical condition, as well as symptoms.

The SSA may ask you to undergo exercise testing. The advantage is that you can be observed and ankle blood pressure readings made in relation to a known amount of exercise. A reasonable RFC can then be determined, based on how close you are to listing-level severity. For example, if your ankle systolic pressure fell to 60% of your pre-exercise reading, but returned to normal in eight minutes instead of ten minutes you probably couldn't do more than sedentary work. Medical judgment must be applied on a case-by-case basis, but remember, if you can't stand or walk six to eight hours daily without intermittent claudication, you should not receive an RFC for over sedentary work. Intermittent claudication would also prevent more than occasional use of leg controls, especially if much force has to be used.

13. Listing 104.13: Rheumatic Fever (Children)

Rheumatic fever is a collection of abnormalities associated with what are called Group A streptococcal bacterial infections. No tests definitely diagnose rheumatic fever, but a group of findings make the diagnosis likely. The diagnosis of rheumatic fever is usually done with what are called the revised Jones Criteria. The SSA specifically mentions such criteria in its regulations.

Some of the major findings in rheumatic fever are carditis, migratory polyarthritis, erythema marginatum, chorea, and subcutaneous nodules. The rheumatic fever usually begins one to three weeks after the streptococcal infection. Minor diagnostic criteria consisting of fever, arthralgia, elevated erythrocyte sedimentation rate (ESR) or C-reactive protein (CRP), a prolonged P-R interval, and a previous episode of rheumatic fever can help. After

establishing a prior Group A streptococcal infection, two major criteria or one major and two minor criteria make the diagnosis of rheumatic fever likely. If the child's medical records don't contain abnormalities that fit the Jones Criteria, it is unlikely that the SSA will accept the diagnosis of rheumatic fever.

It is rare for any child to be given an allowance under this listing.

a. Listing Level Severity

For the child's condition to be severe enough to meet the listings, the child must have chronic rheumatic fever with rheumatic heart disease. The child will be considered under a disability for 18 months from the established onset of the impairment, if the listing criteria are present.

The listing requires persistence of rheumatic fever activity for a consecutive six months or more, manifested by significant murmurs, cardiomegaly, ventricular dysfunction, and other abnormal laboratory findings such as an elevated sedimentation rate or EKG abnormalities.

This listing establishes that active rheumatic fever significantly affects the child's heart function. Ventricular dysfunction is indicated by marked enlargement of the left ventricular cavity above established normal values for the child's age, or markedly reduced ejection fraction or shortening fraction by an appropriate imaging technique such as echocardiography. The ventricular enlargement can easily be detected using echocardiography to measure the left ventricular end diastolic diameter (LVEDD). An elevated sedimentation rate (ESR) is a finding that suggests ongoing inflammation; though non-specific for any particular medical disorder its elevation is expected if there is active rheumatic fever. Most importantly, if there were a normal ESR, that would be an argument against active rheumatic fever. There are also EKG abnormalities that are characteristic of active rheumatic fever, which can be identified by your doctor. It is rare for a child to have chronic rheumatic fever satisfying this listing; treatment is usually given long before the duration requirement can be satisfied.

D. Discontinued Listings

The following medical listings have been discontinued by the SSA, but may be useful for claimants who have already applied for or received benefits under one of these listings. Any claimant who has been allowed benefits under one of these listings in the past can have their benefits continued under the same listing if there is no medical improvement when a continuing disability review (CDR) is done, even though the SSA will not accept any new claims under these listings.

1. Listing 4.03: High Blood Pressure (Adults)
2. Listing 104.03: High Blood Pressure (Children)
3. Listing 4.07: Heart Valve Disease (Adults)
4. Listing 104.07: Heart Valve Disease (Children)
5. Listing 4.08: Cardiomyopathies (Adults)
6. Listing 104.08: Cardiomyopathies (Children)
7. Listing 104.14: Hyperlipidemia (Children)
8. Listing 104.15: Kawasaki Syndrome (Children)

1. Listing 4.03: High Blood Pressure (Adults)

In adults, high blood pressure (HBP), or systemic hypertension, is defined as a systolic pressure of 140 mm Hg or greater and a diastolic pressure of 90 mm Hg or greater—that is, 140/90 or more. The systolic pressure is the pressure inside an artery when the heart contracts, and the diastolic is the lower pressure between heart beats. HBP is usually a slow, silent killer that does not produce symptoms and damages the internal organs over a number of years. Depending on the type of organ damage, evaluation would be done under the appropriate listings. The heart, eyes (CD Part 2), kidneys (CD Part 6), and brain (CD Part 11) are particularly likely to be damaged by uncontrolled hypertension. Even small increases in blood pressure increase the risk of internal organ damage over a period of years, and extremely high pressures present an immediate danger that must be treated as an emergency.

Most HBP can be controlled if the proper treatment is given and received. Unfortunately, millions of people in the U.S. have uncontrolled HBP that will eventually cause them great harm.

a. Listing Level Severity

HPB is evaluated under Listing 4.02 or 4.04, or under the criteria for the affected body system. For example, eye damage would be evaluated under Listings 2.02, 2.03, and 2.04; kidney damage under Listing 6.02; and a stroke under Listing 11.04. (See CD Part 11.)

b. Residual Functional Capacity

HBP is rarely, in and of itself, a reason for the SSA to restrict the exertion you could do on an RFC. Rather, in determining your RFC, the SSA should consider whether organ damage caused by HBP affects your work capacity. For example, a common consequence of HBP is cardiomegaly, and such an enlarged heart could be a basis for restricting exertion. A CT ratio of 55% or more is usually sufficient for the SSA to restrict you to a medium work RFC.

People with only modest hypertension, such as 160/100, may not need any restriction on exertion. A claimant with a hypertensive response to exercise, however, may need a restriction. So might claimants with extremely high blood pressures at rest. For example, a claimant with a persistent systolic BP of about 180 or a diastolic BP of about 110 or higher should probably not receive an RFC higher than medium work. Persistent blood pressures of 210/120 should result in an RFC for sedentary work at most. These are not official SSA policies. Each case must be evaluated individually.

If you develop a dangerous HBP during exercise, as on a cardiac stress test, your RFC should correspond. For example, suppose your blood pressure went to 230/120 at the seven MET level of exercise on a treadmill. Your RFC should be restricted to no higher than light work—an RFC level below seven METS.

2. Listing 104.03: High Blood Pressure (Children)

The age of a child determines what is considered normal blood pressure.

This listing for HBP requires that a child have a BP equal to or exceeding the applicable rate in Table III. In addition, the child's condition must qualify under another listing—106.02 kidney failure (CD Part 6), 111.06 neurological damage (CD Part 11), or 104.02 heart failure. A child who qualifies under one of these listings can do so without any reference to blood pressure, making a consideration under Table III unnecessary. In fact, requiring the child to meet both the other listing and the blood pressure rate in Table III could deprive an otherwise deserving child of disability benefits.

It is unknown why the SSA keeps this listing. Obviously, if the child has HBP, use whatever listing is most appropriate to the type of organ damage done and ignore this listing.

a. Listing Level Severity

The child must have HBP with persistently elevated blood pressure equal to or greater than the applicable value in Table III. Additionally, the child's condition must satisfy Ⓐ, Ⓑ, or Ⓒ, below.

Table III—Elevated Blood Pressure

Age	Systolic Over (mm Hg)	Diastolic Over (mm Hg)
under 1 month	95	
1 month–2 years	112	74
3–5 years	116	76
6–9 years	122	78
10–12 years	126	82
13–15 years	136	86
16–18 years	142	92

Ⓐ Impaired kidney function, as described in Listing 106.02 (CD Part 6).

Ⓑ Cerebrovascular damage, as described in Listing 111.06 (CD Part 11).

Ⓒ Chronic heart failure, as described in Listing 104.02.

3. Listing 4.07: Heart Valve Disease (Adults)

The four heart valves inside the heart are the aortic, pulmonary, mitral, and tricuspid. Valves have leaflets that open in one direction only when the heart contracts to squeeze blood through them. When the heart relaxes between beats, the valve leaflets close to stop blood from flowing back in the direction from

which it was pumped. Stenotic valves resist blood flow through their narrowed openings. Valves that are insufficient do not close firmly. In congenital heart disease, valves may be missing or malformed.

Degenerative diseases or infection can damage heart valves. Valve disease may have serious sudden effects on the heart's function or may slowly progress over many years. For example, aortic stenosis may be present for decades, slowly getting worse; individuals are often over 70 years of age before the symptoms become severe. On the other hand, a severely narrowed aortic valve at birth would require immediate surgical repair. Sudden severe mitral insufficiency can precipitate acute heart failure. Most cases of mitral stenosis result from heart valve calcification and damage from rheumatic fever as a child. People with a disorder called Ebstein's anomaly of the tricuspid valve often die from heart failure or arrhythmias of the heart by their mid-20s. All valve disorder cases are not the same—the causes, treatment, and prognoses are considerably different.

Replacement of defective valves with prosthetic valves is commonplace. Replacement valves can be mechanical or derived from animals. Mechanical valves require long-term anticoagulation to prevent the formation of blood clots within the heart, so individuals with these valves are at increased risk of bleeding. Pig valve replacements (porcine valves) do not require long-term anticoagulation. Possible problems with prosthetic valves in general include infection, coming unseated from the heart, and breaking.

After valve surgery, a doctor needs three months to evaluate the results. Surgery doesn't necessarily involve an artificial valve. A diseased valve may be surgically repaired (valvuloplasty), such as when a balloon-tipped catheter is inserted into a stenosed valve and inflated to increase the size of the valve (balloon valvuloplasty). A stenosed valve might be widened by an incision into the valve (valvotomy). A loose valve can sometimes be tightened down with an annuloplasty.

Valvular heart disease must be documented by appropriate imaging techniques, such as echocardiography, MRI, or x-rays obtained at cardiac catheterization. The possible complications of valve disorders are heart failure (Listing 4.02), ischemia (Listing 4.04), arrhythmias (Listing 4.05), and strokes (Listing 11.04 in CD Part 11). The risk of stroke arises from blood clots formed in the heart from abnormal valve function that can then be pumped into the arteries of the brain.

a. Listing Level Severity

You must have valvular heart disease, as documented by appropriate imaging techniques. The impairment is evaluated under the criteria of Listings 4.02, 4.04, 4.05, or 11.04 (see CD Part 11) as appropriate.

b. Residual Functional Capacity

In the absence of evidence of normal exercise ability, the SSA will generally accept an RFC restricted to medium work if you have a prosthetic heart valve. If you have two separate prosthetic heart valves, you might be restricted to no more than light work. If you have other heart problems that did not improve with valve replacement, your RFC could be even lower. If you are taking anticoagulant drugs because of having a mechanical heart valve replacement, you are at increased risk of bleeding from cuts or trauma—your RFC might limit you from handling heavy objects. The SSA has no definite rules and medical judgment should be used case by case, considering all of the objective evidence as well as your symptoms.

4. Listing 104.07: Heart Valve Disease (Children)

The comments under Listing 4.07 apply here.

a. Listing Level Severity

The child's condition must satisfy part Ⓐ or Ⓑ, below.

Ⓐ Valvular heart disease as documented by appropriate imaging techniques. The impairment is evaluated under the criteria of Listings 104.02, 104.05, 111.06, or the adult listing 11.04 as appropriate (see CD Part 11).

Ⓑ Critical (life-threatening) aortic stenosis in a newborn.

5. Listing 4.08: Cardiomyopathies (Adults)

The prognosis for cardiomyopathies depends to a large extent on how well the underlying cause can be treated. For example, ischemic heart disease may be improved considerably by restoration of blood supply

to the heart muscle, as with coronary artery bypass grafting. Scarred heart muscle as a result of heart attacks, however, cannot be restored to function. Alcoholic cardiomyopathy, which the SSA frequently sees, may be reversible to some degree by abstention from alcohol. Viral infections of the heart sometimes resolve, but can lead to heart failure and death. Connective tissue diseases like progressive systemic sclerosis and systemic lupus can cause permanent heart damage. Genetic disorders of heart muscle, such as hypertrophic cardiomyopathy, has no cure. These are only a few examples of some common types of cardiomyopathy.

Cardiomyopathy must be documented by appropriate imaging techniques such as echocardiography, MRI, or x-rays obtained at cardiac catheterization. The possible abnormalities associated with cardiomyopathies are heart failure (Listing 4.02), ischemia (Listing 4.04), arrhythmias (Listing 4.05), and strokes (Listing 11.04 in CD Part 11).

a. Listing Level Severity

You must have cardiomyopathy documented by appropriate imaging techniques. The impairment is evaluated under the criteria of Listings 104.02, 104.04, 4.05, or 11.04 (see CD Part 11) as appropriate.

b. Residual Functional Capacity

The discussion of RFC under Listing 4.02 regarding congestive heart failure applies here. If you have arrhythmias, the discussion of RFC under Listing 4.05 would also apply.

6. Listing 104.08: Cardiomyopathies (Children)

The comments under Listing 4.08 apply here. An additional difficulty in evaluating this condition in children is that heart size depends on age. The required left ventricular ejection fraction of 50% or less is not extremely low, but is abnormal enough to indicate cardiomyopathy. Similarly, a significant enlargement of the inside of the left ventricle—the left ventricular end diastolic diameter (LVEDD)—is to be expected if the cardiomyopathy is more than slight in severity. Marked enlargement is not required. The LVEDD can easily be measured by echocardiography and other imaging techniques.

a. Listing Level Severity

For the child's condition to be severe enough to meet this listing, the child must have cardiomyopathies, documented by appropriate imaging techniques. The child must have a left ventricular ejection fraction of 50% or less and significant enlargement of the left ventricular chamber. Then the condition is evaluated under the criteria of Listings 104.02, 104.05, or 111.06 (see CD Part 11).

7. Listing 104.14: Hyperlipidemia (Children)

This listing requires a homozygous form of inherited hyperlipidemia, meaning the child has received abnormal genes for the production of high blood fats from both parents. The disorder required by the listing is called Type II homozygous familial hyperlipidemia, and is associated with extremely high levels of blood cholesterol. Hypercholesterolemia is so severe that children with this disorder may have coronary artery disease from fatty blockages by age ten and be dead before age 30.

There is a heterozygous form of the disorder, which means the child inherited abnormal genes from only one parent. Such children do not have as severe a disease; the listing applies only to the homozygous form.

Few children are granted benefits under this listing because the disorder is extremely rare, occurring in about one in a million children.

a. Listing Level Severity

In the listing that follows, the SSA states that the concentration of blood cholesterol must be "500 mg/ml or greater" (500 milligrams of cholesterol per milliliter of blood serum), which is impossibly high. In actuality, children with the disorder in this listing have blood cholesterol levels of 500–1,000 mg/100 ml. The listing has the required value 50 to 100 times too high, probably because of a typographical error that the SSA has never fixed. The "500 mg/ml" should instead be read as 500 mg/100 ml. On a laboratory report this would be the same as 500 mg/dl or 500 mg%.

Documented Type II homozygous hyperlipidemia with repeated plasma cholesterol levels of 500 mg/ml or greater.

The child must also satisfy Ⓐ, Ⓑ, Ⓒ, or Ⓓ.

Ⓐ Cardiac ischemia as described in adult Listings 4.04Ⓑ or 4.04Ⓒ.

Ⓑ Significant aortic stenosis documented by Doppler echocardiography or cardiac catheterization. Significant means more than mild narrowing of the aortic valve compared to the size expected for the child's age. If the child's treating doctor has done a cardiac catheterization, it should be made available to the SSA. Doppler echocardiography can determine heart valve size by the velocity of blood through the valve; it is a harmless, painless, noninvasive test. The more narrowed the aortic valve, the faster the blood will move through it.

Ⓒ Major disruption of normal life activities by repeated hospitalizations for plasmapheresis or other prescribed therapies, including liver transplant.

Ⓓ Recurrent pancreatitis complicating hyperlipidemia. The SSA does not define recurrent. Medical judgment must be applied on an individual basis, depending on how much the episodes affect the child's ability to function as a normal child. The more severe the pancreatitis and associated symptoms, the fewer episodes it would take to be disabling.

8. Listing 104.15: Kawasaki Syndrome (Children)

The Kawasaki syndrome is a disorder of unknown cause, usually occurring in children under five years of age. This disorder causes vasculitis of the coronary arteries. It is possible for children to have heart attacks with Kawasaki syndrome resulting from the formation of blood clots in coronary arteries—something that usually happens only to adults. Aneurysms of coronary arteries may also be present, as well as myocarditis.

The disorder may involve organs other than the heart. For example, the child may have meningitis, pericarditis, lymphadenopathy, iridocyclitis, arthralgia, skin rashes, abdominal pain, and involvement of the nervous system.

There are no diagnostic tests for Kawasaki syndrome, but imaging of the heart as with two-dimensional (2-D) echocardiography and nonspecific tests for inflammation such as the erythrocyte sedimentation rate (ESR) can be helpful.

The worst manifestations of the Kawasaki syndrome involve the heart and that is the concern of this listing. Other manifestations should be considered under the appropriate listing.

a. Listing Level Severity

For the child's condition to be severe enough to meet the listings, the child must have Kawasaki syndrome that satisfies the requirements of Ⓐ or Ⓑ.

Ⓐ Major coronary artery aneurysms—that is, the left main, circumflex, left anterior descending, or right coronary arteries. This kind of information would be obtained from cardiac catheterization, the results of which would have to be requested from the treating doctor or hospital where the catheterization was performed.

Ⓑ Chronic heart failure, as described in Listing 104.02. ■