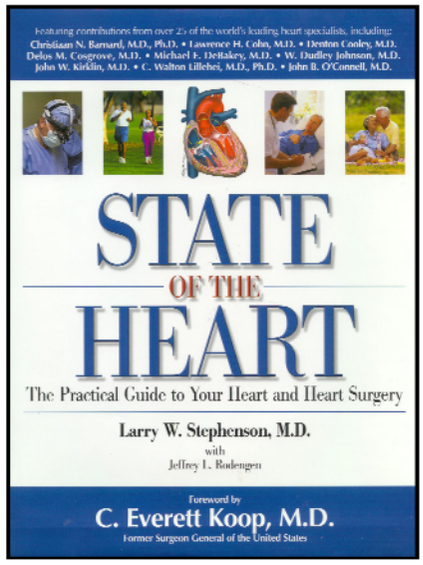






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Heart disease can often be identified through signs and symptoms that are detectable before a heart attack or other medical emergency.

CHAPTER FOUR

# SIGNS AND SYMPTOMS OF HEART PROBLEMS

HEART DISEASE, LIKE MOST DISeases, has symptoms and signs that can help you determine if you need to visit your doctor.

A symptom is something like pain or other discomfort. If you were walking barefooted, for instance, and stubbed your toe on a rock, it would hurt. This pain is a symptom. It is subjective and cannot be measured. Your toe may also turn red or black and blue as a result of the injury. This is a sign. You can see the change in the color and so can your doctor.

### History and Physical Exam

When you visit your doctor's office or go to the emergency room, the first question you will be asked is, "Why are you here?" He is asking you to talk about your symptoms to the best of your ability, such as, "My chest hurts," or "I am short of breath," or "My ankles are swollen," etc.

This information is recorded as the "chief complaint," or the main reason you sought medical help. The doctor will next ask how long you've had this problem and compile what is called a "history of the present illness."

Your general medical history will also be taken: what drugs you are consuming; if you have had allergic reactions to any medicines; any previous operations. You will be asked about problems related to your head and brain; your eyes, ears, nose, and throat; your lungs and your heart; your abdomen, gall bladder, and intestines; your urinary system and genitalia; your arms and legs; and so forth. That is called a "review of systems."

When the questioning is done, a physical examination will be performed to check the results of the review of systems. Each time you're admitted to the hospital, you will undergo a new history, review of systems, and physical examination.

### Chest Pain

When people think about heart disease, the first symptom that usually comes to mind is chest pain. However, chest pain can be caused by a number of conditions, only some of which are related to the heart. Following are some common causes of chest pain:

- ♥ gall bladder attack
- ♥ inflammation of the pericardium (pericarditis), which usually hurts more when you breathe

Chest pain, known as angina pectoris, is the classic symptom of coronary artery disease. Chest pain can, however, be caused by other factors.

- ♥ back problems
- ♥ conditions related to the aorta (sometimes the aorta begins to tear apart, called aortic dissection, and this can cause severe pain in the front of the chest or in the back)
- ♥ conditions in the esophagus and sometimes even a hiatal hernia
- ♥ inflammation of the lungs
- ♥ conditions in the upper abdomen

**Ischemia:**
A condition that occurs when a portion of the body, an organ or tissue, is not getting enough oxygenated blood. It is usually related to a blockage in one of the arteries delivering blood to that area.

### Angina Pectoris

The most common type of chest pain associated with the heart is a discomfort known as angina pectoris. This condition, related to **ischemia**, is caused when the heart muscle itself does not get enough oxygen through the coronary arteries. Sometimes called simply "angina," the condition is often described not so much as pain but as discomfort. It may be predictable, coming on with exercise and going away with rest, or it may be more unpredictable, coming on at rest and remaining. It can also be brought on by stress or extremely cold weather. However it presents itself, angina is an important warning mechanism. The body is signaling you to take it easy or a heart attack could develop.

There are several classic symptoms associated with angina, including:

- ♥ a tightness, heaviness, or pressure
- ♥ a burning, crushing, or squeezing feeling over a general area in the front portion of the chest
- ♥ the feeling that somebody has just piled heavy weights on your chest or that your chest is in a vise (it can sometimes almost take your breath away)
- ♥ a dull, aching pain, usually located just to the left of the breastbone or sternum over the heart
- ♥ discomfort that radiates from the chest to the back or the neck and even up to the jaw and teeth (sometimes there is only jaw pain that comes and goes with exertion, or sometimes the angina radiates from the chest over the heart, or down one arm or the other, usually the left arm)
- ♥ in some patients, angina will actually present as a pain or discomfort in the upper abdomen and even cause nausea. When this occurs, it can mimic gall bladder disease, esophageal disease, or stomach ulcers

Angina doesn't always mean pain. Sometimes it just appears as shortness of breath, which doctors refer to as "angina equivalent." In this case, there is usually no pressure or pain.

In fact, some patients experience no symptoms when their heart is not getting enough blood. They may not even have any angina in the midst of a heart attack. This is referred to as a "defective anginal warning system." It is more common in diabetic patients, particularly those who have long-standing diabetes and are being treated with insulin.

Angina that occurs for no particular reason while the patient is resting is re-

ferred to as "rest angina." It usually indicates a more severe degree of coronary artery disease. Severe rest angina may even wake up a sleeping person. Usually it can be relieved by putting nitroglycerin tablets under the tongue.

### Heart Attack (Myocardial Infarction)

Although angina doesn't necessarily mean you are about to have a heart attack, any change in your condition should be acted upon quickly. Typical signals of an impending heart attack include angina that is more severe or lasts longer than a few minutes.

The chest discomfort associated with a heart attack, or myocardial infarction, may last for several hours (longer than a usual angina episode) and may not respond to nitroglycerin tablets, or even intravenous nitroglycerin at the hospital. Heart attack victims may require intravenous morphine or other drugs to relieve the pain.

Although heart attack symptoms are usually clear, heart attack victims may not experience any angina and may "just not feel well." In some cases, patients report a sudden onset of heartburn and shortness of breath. These are often explained away as merely indigestion and only later will the actual cause become clear. Sometimes heart attacks are even discovered long after they have occurred, and, in retrospect, patients recall no symptoms at all.

### Difficulty Breathing

The medical term for shortness of breath is **dyspnea**. It is often described as a hunger for air. It can be the symptom of an underlying problem, such as lung disease or anemia, or simply the normal result of exertion, such as vigorous exercise.

There are certain types of dyspnea that occur at night and are usually related to heart failure. A person may suddenly wake up very short of breath and have to sit up in bed. A window may have to be opened for fresh air. After sitting upright for a while, the person is finally able to resume a normal breathing pattern. This is called paroxysmal nocturnal dyspnea. Some people must have their head and chest elevated to avoid shortness of breath while sleeping. Some can only sleep sitting up in a chair. This type of dyspnea is called orthopnea.

Dyspnea can be caused by many conditions. In patients with defective heart valves, blood may leak backwards into the lungs. This excess fluid in the lungs causes the lung tissues to swell, resulting in shortness of breath. Other patients may suffer from heart muscle problems, called **cardiomyopathy**. This can cause the blood to back up into the heart and lungs, also resulting in dyspnea.

Shortness of breath associated with heart disease can cause coughing and wheezing, although coughing and wheezing are frequently due to other problems as well, such as lung disease. Smokers often suffer from both heart and lung disease.

Of the most severe forms of heart failure, one type of advanced shortness of breath is called pulmonary edema. In this condition, the lungs literally fill with fluid. Patients are treated with powerful diuretics, which eliminate some excess fluid through the kidneys. They may also be given drugs to help the heart contract more forcefully. In most cases, pulmonary edema can be treated with medicines, but it can be so severe the patient may have to be connected to a mechanical ventilator. If a ventilator is needed, most patients can be removed from it in a day or two. In other patients, depending upon the underlying cause, further intervention may be necessary.

Patients who are short of breath tend to breathe more rapidly. This rapid breathing is known as **tachypnea**. It can be associated with heart failure but isn't always. **Hyperventilation** is a somewhat dif-

**Cardiomyopathy:**
A condition in which the heart muscle is not able to contract or function properly.

**Dyspnea:**
The sensation of being short of breath.

**Tachypnea:**
Abnormal rapid breathing.

**Hyperventilation:**
Breathing fast in such a manner that the carbon dioxide level in the blood falls to an abnormal level.

ferent type of rapid breathing. If you're hyperventilating, it feels as if you can't catch your breath, and you breathe rapidly. The cause may actually be an anxiety attack unrelated to heart disease. Often a physician is needed to distinguish between tachypnea and hyperventilation.

### Coughing Up Blood (Hemoptysis)

Coughing up blood is occasionally related to heart disease but is more commonly associated with lung disease and other respiratory problems. When it is associated with heart disease, it may occur during acute pulmonary edema, or swelling of the lung tissues. One of the classic causes of pulmonary edema and hemoptysis is a narrowing of the mitral valve, called mitral valve stenosis. This narrowing is a late consequence of rheumatic fever.

### Fatigue

Fatigue, or feeling tired or weak, can be caused by a number of different conditions, including heart failure, depression, a low red-blood-cell count (anemia), or hypothyroidism, meaning your blood is deficient in thyroid hormone. It can also be caused by some drugs used to treat heart disease, like metoprolol, a beta blocker, or verapamil, a calcium blocker. These drugs cause the heart muscle to contract less forcefully. When contracting with less force, the heart muscle does not need as much oxygen and is able to function satisfactorily even when some of the coronary arteries are blocked. On the other hand, because the heart is not pumping as much blood, the patient may feel fatigued, tired, or weak. Sometimes doctors need to adjust drug treatment to reduce fatigue.

Fatigue can also be a symptom of heart failure because the heart is not pumping as much blood.

### Swelling (Edema)

The medical term for swelling, in which tissues become engorged with excess fluid, is referred to as edema. Edema can be caused by a number of

Fatigue is but one of many symptoms that can alert the individual that medical diagnosis and/or treatment is in order.

different problems and tends to occur in parts of the body affected by gravity. Swelling may start in the feet and ankles and, as it gets more severe, may involve the entire leg. In certain severe cases it may extend to the abdomen.

Edema can occur in the legs as a result of problems like kidney failure, liver failure, blood clots in the veins in the legs, and local infections in the legs. Sometimes mild swelling in the feet and ankles is related to nothing more than sitting in a chair for a long time, such as in an airline seat during a long flight. It can also be caused by having your legs crossed for extended periods.

If edema involves the lungs, it is usually due to heart failure. The lungs become swollen or edematous, and this is typically what causes the shortness of breath associated with heart failure.

Edema caused by heart failure may first show itself in swollen feet and ankles. The usual treatment is diuretic drugs, which will cause you to eliminate fluid through your kidneys. Heart failure may also be treated with drugs that dilate the vessels, or with a drug like digitalis (also called digoxin or Lanoxin), which has a number of effects but is also believed to cause the heart to contract more vigorously and thereby relieve the heart failure to some degree, thus relieving the swelling also.

A severe form of swelling is called **anasarca**. This swelling extends throughout the body but affects the legs and abdomen more than the chest and the face. It can be caused by severe heart failure. It can also be caused by other problems such as liver failure or kidney failure, and in severe forms of anasarca, one may accumulate extra fluid inside the abdominal cavity, which is called **ascites**.

Edema, anasarca, and ascites, when caused by heart failure, result because the failing heart is no longer able to pump the appropriate amount of blood. As a result, the blood backs up, blood pressure rises in the lungs, and blood is pushed further backwards to the liver and other abdominal organs. This causes the fluid in the blood to leak out through the blood vessels into the tissues.

### Pleural Effusion (Fluid in the Chest)

Pleura are the thin membranes that line the inner wall of the chest cavity and the surface of the lung. Normally, the pleura of the chest cavity come in contact with the pleura of the lung. Pleural means "related to the pleura," and effusion in this case refers to fluid that has escaped from blood vessels or other small vessels called lymphatics.

Therefore, a pleural effusion is fluid that abnormally collects in the chest cavity between the inside chest wall and the lung. The fluid is not inside the lung. Sometimes, several quarts of fluid can accumulate. When a large volume of fluid accumulates in either the right or left chest cavity, it can interfere with lung function because the lungs cannot fully expand, and this can cause shortness of breath. Pleural fluid usually either is clear or has a slight yellowish straw color. In many cases, it is quite similar to the serum or plasma of the blood, without the red and white blood cells.

There are many causes of pleural effusions. They could develop as a result of heart failure, liver failure, or kidney failure or be related to a tumor in the chest. Sometimes, fluid can accumulate in the chest cavity for other reasons, such as an infection. In this case, the material may be pus. Sometimes the fluid is bloody, and when related to trauma, the fluid may actually be blood.

The treatment of pleural effusion depends on its cause. The simplest and most immediate way to treat a pleural effusion is to do a procedure called a **pleurocentesis**, or "chest tap," in which a small spot of skin on the chest is anesthetized, a needle is inserted through

**Anasarca:**
A generalized swelling of body tissues due to excessive fluid, usually from failure of an organ like the heart, kidney, or liver.

**Ascites:**
An abnormal accumulation of serum-like fluid in the abdomen.

**Pleurocentesis:**
Also referred to as a 'chest tap'. A procedure in which a hollow tube is inserted through the skin into the chest cavity. This is usually done by attaching a needle to a syringe so fluid that is abnormally present in the space between the inner chest wall and lung can be removed.

the chest wall into the chest cavity, and the fluid is drained off. Sometimes, if it recurs or if the pleural fluid is rather thick and won't come through the needle, a small incision is made in the side of the chest and a plastic tube about the diameter of a finger is inserted into the chest cavity to drain this fluid. Rarely, a major surgical procedure is necessary to remove this fluid and treat the underlying cause.

If this fluid is present because of heart failure, it can frequently be treated by medicine that addresses the heart failure. Diuretic drugs cause the patient to excrete excess fluid through the kidneys, and this will help the pleura to reabsorb this excess fluid in the chest cavity.

Small pleural effusions are frequently present after heart operations and usually are reabsorbed naturally during the first few weeks after the surgery. Occasionally, pleurocentesis is necessary to draw off this fluid, and sometimes a second pleurocentesis may be necessary. Sometimes a chest tube has to be placed to remove this fluid. Usually, once it has been treated after heart surgery, pleural effusion does not recur.

### Loss of Consciousness, Fainting, Blackouts (Syncope), and Lightheadedness (Near Syncope)

Losing consciousness, fainting, passing out, or blacking out are medically known as syncope. It is usually caused when the brain does not get enough blood, and it can be related to heart disease and other conditions.

**Vagus Nerve:** A nerve running from the base of the skull into the abdomen. It gives off branches to various structures, and its main effect on the heart is to slow heart rate.

Pilots flying fighter jets like the F-16 can get lightheaded or black out when they make a very tight turn, such as a 9G (nine times the force of gravity) turn, during which blood pools in their legs and not enough of it gets to their head. This problem can be avoided with a special suit that inflates during a tight turn and compresses the legs, abdomen, and chest to keep more blood in the head.

Syncope can be related to disease in the arteries that go from the aorta to the brain. If these become narrow or blocked, the result may be a syncopal episode. In the worst-case scenario, tiny pieces of atherosclerotic material may break off from the artery wall and go to the brain, which can cause a stroke.

A relatively common problem with the aortic valve is aortic stenosis, in which this heart valve becomes blocked and not enough blood gets through. When a person with aortic stenosis is exercising, not enough blood may be getting to the brain. The person may become lightheaded and feel as if they are going to pass out. They may even pass out. It is usually just for a few seconds, but it can be very frightening and even dangerous.

Syncope can also be caused by other heart problems. For example, if your heart beats in an abnormal rhythm called an arrhythmia, your heart rhythm may become very slow, or even miss a few beats or several beats in a row. This causes lightheadedness or even unconsciousness that passes after the heart begins beating again. You may also develop syncope as a result of very fast heart rhythms; so fast, in fact — in the range of 180 to 250 beats per minute — that the heart is no longer able to effectively pump blood. In this case, not enough blood gets to the brain.

### Vasovagal Fainting and Dizziness

Vasovagal fainting (neurocardiogenic syncope) is believed to be the most common type of syncope. It is estimated that 3 percent of emergency room visits in the United States are for this type of fainting. Vasovagal technically refers to the effect the **vagus nerve** has on the blood vessels, but in a broader sense it refers to the effects various nerves have on the heart and blood vessels.

The two types of nerves that affect the heart and blood vessels are called sympathetic nerves and parasympathetic nerves (like the vagus nerve). If these nerves are too sensitive, they can cause episodes of low blood pressure or slow heart rate or both. This may temporarily starve the brain of blood.

One test used to determine if a vasovagal reaction is the cause of fainting is called the tilt-table test. The patient lies flat on the back on a special table and is connected to an electrocardiogram machine. Under close observation by a physician, the table rotates to an upright position that may cause a vasovagal reaction or other neurologically related type of fainting.

Several medications can effectively treat these types of problems. Occasionally these patients may need a heart pacemaker.

Dizziness is different from lightheadedness in that a person feels uncomfortable, as if the room is spinning, but usually does not feel as if he or she is about to pass out. A good example is the feeling that occurs after getting off a ride such as a roller coaster at an amusement park. Dizzy spells can also be caused by ear disorders or other problems. In many cases, people misinterpret their dizziness as a cardiac problem, although it is not related to their heart.

During an electrocardiogram, or ECG, the heart's electrical rhythm is recorded. This is a useful test for detecting many cardiac abnormalities.

### Palpitations

A palpitation occurs when you can actually feel your heart beating. It may be just one heartbeat that seems stronger than the others or a series of heartbeats — and it can be uncomfortable. Palpitations are sometimes felt when your heart switches into a different rhythm, beats extra beats, or misses beats. Sometimes palpitations are more noticeable at night when you're lying still in bed. They can be felt in your chest, up in your neck, or even in your ear. You may even be able to hear your heart pulsating.

Palpitations can be purely normal, but not always. An abnormal palpitation occurs when you can feel your heart beating very rapidly or skipping beats or there seem to be extra heartbeats. This problem should be brought to your doctor's attention.

Patients who have recently undergone heart surgery frequently complain they can feel their heart beating at night, particularly when they lie on their left side. It's noticed after they are home for a few weeks and have recovered to the point that many of their aches and pains are gone. This type of palpitation is often caused by adhesions or fibrous connective bands forming around the heart due to the heart surgery. One experiences this feeling because the heart pulls on these adhesions as it beats. Usually this is nothing to worry about, and it typically subsides with time.

Your doctor can determine if any palpitation is an abnormal heart rhythm or just the result of one of these other bothersome but less important causes. However, in general, people with heart disease and recent heart surgery also tend to be more sensitive to their symptoms than other people might be. This is understandable.

### Skin Color

Changes in skin color may sometimes be associated with heart disease but can also be due to many other causes. Children's skin may have a bluish tint due to heart abnormalities they were born with in which unoxygenated blood is pumped out to the body. The lips and the fingernails may also be a bluish color. This is referred to as cyanosis.

Adult patients can have cyanosis for other reasons. Lack of oxygen in the blood can be related to heart conditions or other causes such as lung disease.

Interestingly, there is a condition called argyria or argyrosis. *Argenti* is the Latin word for silver. Prior to World War II, there were some antibiotic-type substances that contained silver and were used to treat infection. Over time, the silver accumulated in the skin, turning it a silver blue color. It is a rare condition today. I have seen only one man with this condition and it was very noticeable because his skin was a bright silver blue.

Pale or almost white skin, fingernails and lips are generally not caused by a heart condition but rather by a low red blood cell count, or anemia. In people with darker skin colors, one can look at the color of the tissue beneath the fingernails and toenails to check for cyanosis or anemia.

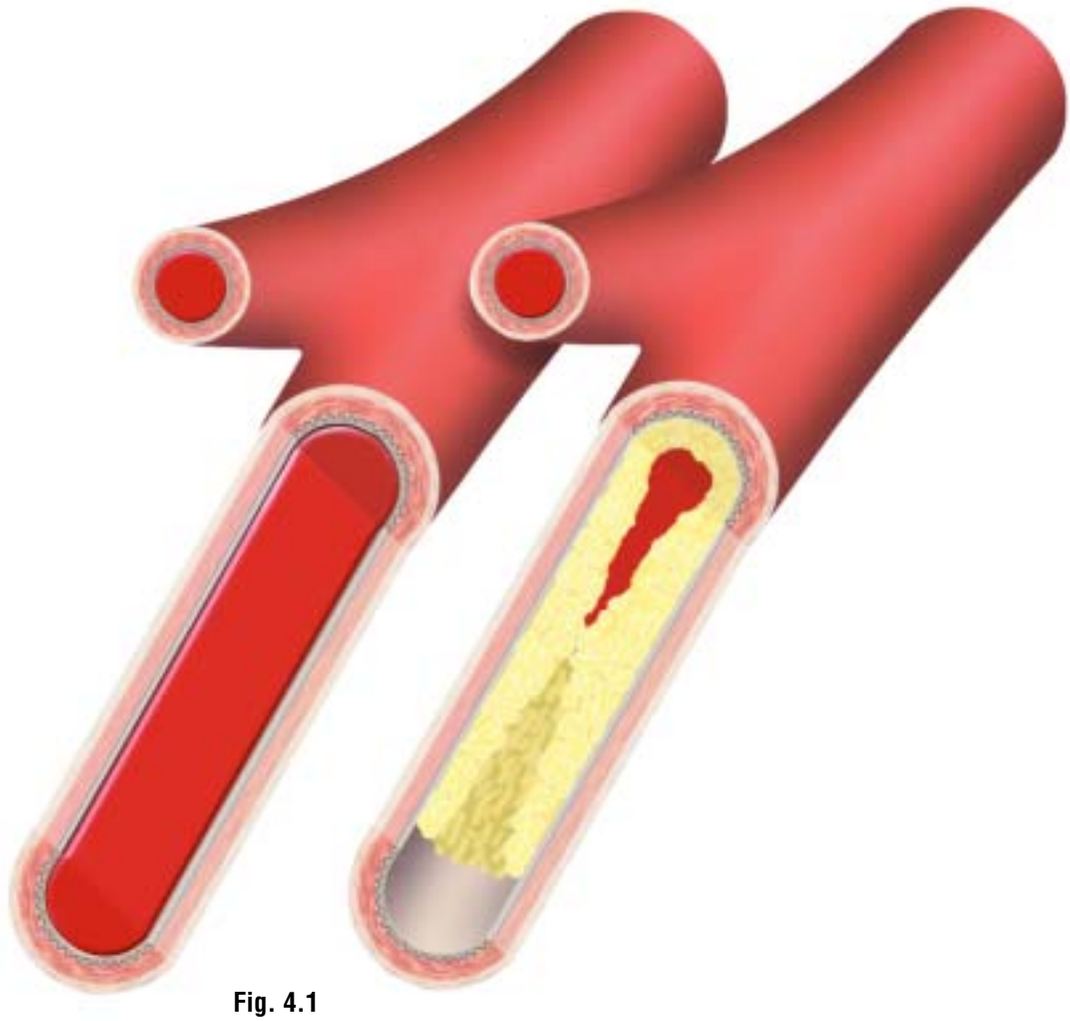

**Fig. 4.1**

**Fig. 4.1:** The artery on the left is normal, or open, in contrast with the occluded, or blocked, artery on the right. Blocked arteries can lead to heart attack or stroke by shutting off blood supply to organs like the heart or brain.

### Shock

Shock can be caused by a number of different abnormalities and is typically accompanied by very low blood pressure. When shock is related to the heart, we refer to it as **cardiogenic shock**. Cardiogenic shock may be caused by a heart attack in which a large portion of the heart muscle suddenly dies. It may be due to one of the heart valves rupturing, or it may be caused when part of the heart muscle between the left and right ventricles (the septum) ruptures. Another cause may be **cardiac tamponade**, or a buildup of fluid between the heart and the pericardium.

During cardiogenic shock, the amount of blood pumped by the heart cannot keep the blood pressure in a normal range. The pulse is usually very weak and sometimes described as "thready." The skin is usually cool and clammy. Because of the decreased amount of blood getting to the brain, the person's mental condition may be very impaired, even to the point that the person is barely responsive. Breathing may be shallow. Pulmonary edema may be present because the blood is backing up into the lungs, causing the lung tissues to become swollen. Urine output is minimal. If this condition is not treated quickly, the person may die.

### Sudden Changes in Vision, Strength, Coordination, Speech or Sensation

If a person develops sudden changes in vision, strength, coordination, speech, or sensation, this could be due to a stroke. If these signs and symptoms last for only several minutes or less, it is called a transient ischemic attack (TIA). However, if these symptoms persist beyond twenty-four hours, this is called a stroke or sometimes a CVA, which stands for cerebral vascular accident.

Strokes can result from many different causes. They can be caused by a blood clot breaking loose from the heart or arteries and traveling to the brain. This is called an embolic stroke. An **embolus** is something, usually a blood clot or atherosclerotic material, that breaks loose and travels through the blood vessels. An embolism could occur as the result of an infected heart valve from which a clump of infected tissue breaks off and travels to the brain. Another common type of embolism occurs when a piece of cholesterol breaks off from plaque in an artery and travels elsewhere (Fig. 4.1).

Strokes also occur as a result of a problem in the brain itself, such as blocked blood vessels, the rupture of an aneurysm, or other types of bleeding. Strokes can affect the function of your arms or legs, vision, speech, and swallowing, ability to think, and sometimes other bodily functions. Stroke victims can even go into a coma or die.

### Leg Pain (Claudication)

Leg pain caused by a lack of oxygenated blood getting to the leg muscles is referred to as claudication. This typically results from the same atherosclerotic process that blocks coronary arteries. As you exercise your legs, by walking for example, they feel tired and start to ache. Resting causes the aching and tiredness to go away, and you can get up and walk further. The claudication may occur in various portions of the leg, including the calf, thigh, or buttocks, depending on where the artery is blocked. However, tiredness in the legs or leg pain can also be due to other causes, including disc problems in the lower back.

**Cardiogenic Shock:**
A serious condition in which the heart is unable to pump enough oxygenated blood to adequately supply the body's tissues.

**Cardiac Tamponade:**
A process in which fluid or blood clots build up between the heart and the pericardium. It interferes with heart function and may cause the heart to fail and even cause death.

**Embolism:**
The partial or complete blocking of a blood vessel by an object traveling through the bloodstream (usually a blood clot).

# Your Visit to the Cardiologist

By
John B. O'Connell, M.D.
Cardiologist
Professor and Chairman
Department of Internal Medicine
Wayne State University School of Medicine
Detroit, Michigan

Physician-in-Chief
Detroit Medical Center

A CARDIOLOGIST IS A PHYsician who has graduated from an accredited medical school and completed three years of internal medicine residency training followed by three or four years of cardiology training. Most cardiologists are part of a larger group, which is sometimes contained within a broader group of medical specialists including primary care physicians. Besides general cardiologists, there are many different subspecialties in cardiology. Those with added knowledge in interpretation of diagnostics are called noninvasive cardiologists. Those with special certification in the use of radioisotopes are called nuclear cardiologists. Cardiologists may also specialize in interventional cardiology, meaning they are experts in the use of angioplasty and stenting. Additionally, cardiologists may specialize in electrophysiology, which is the study of rhythm disturbances or problems with the electrical conduction system of the heart. These cardiologists may prescribe highly specific drugs to treat irregularities in the heart rhythm or use devices (like implantable cardioverter defibrillators and pacemakers) designed to regulate the heart rhythm or trigger the heartbeat. Other cardiologists have specialized in treatment of advanced heart failure and heart transplantation.

**Why See a Cardiologist?**

Most people see a cardiologist because of a referral from their primary care physician for chest pain. In some cases, the cause of the chest pain is known to be coronary artery disease, and the referral is made for more advanced diagnostic testing and treatment; in other cases, the cause of the chest pain is unknown. Other common reasons for referral include shortness of breath, congestive heart failure not responsive to standard medical treatment, irregularities in the heart rhythm, blackout episodes (syncope), or palpitations.

In the past, almost all cardiologists accepted referrals only from physicians. However, a welcomed change is the self-referral, i.e., the patient feels they should see a cardiologist. More cardiologists are welcoming this source of patients.

Sometimes, there is little choice of cardiology referral. This is often the case when your insurance carrier or health maintenance organization (HMO) mandates the specific reason for the referral (requiring extensive documentation by the primary care physician), and the cardiologist

is willing to agree to the insurance company's financial arrangements and care plans. This method of referral is the least acceptable to patients and physicians alike.

### How Is a Cardiologist Chosen?

If there is flexibility in referral and the referral is through your primary care physician, that physician will commonly choose a cardiologist with whom they have a close relationship. Communication between the primary care physician and the cardiologist is critical to a successful diagnostic and treatment plan. Your primary care physician knows the most about you and will presumably have a close relationship with you. Consequently, they will be able to interpret the complexities of the visit to a cardiologist. Typically, the cardiologist they choose will be in close proximity and often practice in the same hospital environment and sometimes even in the same professional building or practice group.

Cardiologists are highly visible subspecialists, and, as a result, reputation is another common reason for referral. It is appropriate to ask your physician what other patients may have been referred to this cardiologist or to ask members of your social group or church about that cardiologist.

If you have the option of choosing your own cardiologist, you will probably choose one based on local reputation. However, some standards for academic excellence have been established. Board certification is increasingly a requirement for hospital staff privileges in cardiovascular disease. A cardiologist is certified by the American Board of Internal Medicine in cardiovascular diseases.

Your local medical society has a roster of physicians in your community and their board certification status. Additionally, internet sites such as WebMD's at **www.webmd.com** have a directory of most physicians. The major professional organization for cardiologists is the American College of Cardiology, which also lists cardiologists, including board certification and fellowship (FACC) status, on its website, **www.acc.org**.

Board certification should not be the only criterion because many practicing cardiologists are board certified. Other public databases may list mortality for invasive procedures by each physician.

However, do not be fooled by simple mortality statistics. For example, a cardiologist who is willing to perform highly technical procedures on patients at high risk may have a higher mortality than a physician who routinely selects only the low risk candidates. Physicians who perform high-volume procedures on sick patients are most qualified to care for most problems.

Another major issue relates to the relationship between cardiologists and cardiac surgeons. Many of the diagnostic studies may lead to coronary bypass surgery or valve replacement or repair. The close working relationship between the cardiologist and the cardiac surgeon is part of the equation that should be used in choosing the specialist. Therefore, local reputation, access, and understanding the quality of the cardiac surgical program should be considered in the decision. Finally, the reputation of the hospital as a cardiovascular medicine and surgical center is also part of the equation because those centers with national reputations for the quality of their cardiovascular medical and surgical teams are highly selective about the physicians on their staff.

### What Will Happen during My First Visit to the Cardiologist?

A typical cardiologist's office has the capability for many diagnostic tests. The cardiologist's staff is familiar with cardiac problems and trained in cardiopulmonary resuscitation.

Before you see the cardiologist, a nurse or staff member will usually review your history, make sure your prior medical records are available, and perform an electrocardiogram (EKG or ECG). This is considered an extension of the cardiac examination. Although many tests provide more specific information, an electrocardiogram remains a major screening tool for rhythm abnormality, evidence of blood vessel disease, and damage to the heart, or heart muscle problems.

However, the ability of an electrocardiogram to give specific diagnoses is very limited. A cardiologist will complete a standard history and physical, and you will be asked to rehash information that you have already given to another physician. This is because of the very specific probing questions to which cardiologists will seek answers in an effort to home in on your problem.

During the initial visit, the cardiologist will probably only obtain tests to help diagnose the problem. Very typically, these will be noninvasive tests (no tubes or instruments inserted into your blood vessels other than perhaps an intravenous line). After these tests, the cardiologist will inform you of the results.

Once the results of the initial tests have been evaluated, further testing may be needed, and an invasive test (in which instruments or tubes are threaded through your blood vessels) may be prescribed. In some cases, you may be referred to a cardiology subspecialist.

During the course of this testing, the cardiologist will communicate directly with your primary care physician. Do not be intimidated if you are self-referred; physicians widely recognize the importance of second opinions, and your self-referral should not place a wedge between you and your primary care physician.

### Typical Diagnostic Tests

*Noninvasive Testing*

Frequently, noninvasive tests may be used as screening tools before more complicated invasive testing. The most common noninvasive diagnostic tests include those designed to assess the probability of coronary artery disease and review heart muscle function.

The test often used to detect coronary artery disease is the treadmill exercise stress test. In some cases, a simple exercise test is performed in which the patient is monitored by an electrocardiogram during a walk on a treadmill that will increase its speed and slope until either a target heart rate is reached or a symptom or electrocardiographic finding worthy of discontinuation of the test results. In more complicated situations, including an abnormal resting electrocardiogram or poor specificity of treadmill testing in a subgroup population (such as in women, for whom the test is not as accurate), a nuclear or echocardiographic study may be added.

In the case of a nuclear study, a radioisotope, usually either thallium or Sestamibi (Cardiolyte), is injected into your vein during peak exercise, and your heart is imaged. You will be asked to return four to six hours after the initial imaging for a second scan. This image will give the cardiologist a view of what blood flow to your heart is like during rest, and the first image will show coronary blood flow during exercise. If coronary blood flow is abnormal during exercise but normal during rest, coronary artery disease is likely, and the cardiologist may request a catheterization.

In the case of stress testing with ultrasonic techniques, an echocardiogram will be performed at successively harder levels of exercise. If segments of the heart muscle contract less vigorously during exercise than they do at rest, there is evidence for blood vessel disease, and cardiac catheterization in all likelihood will be recommended. In some highly specialized centers, measurements of coronary blood flow may include very sophisticated technology such as magnetic resonance imaging (MRI) or positron emission tomography (PET scanning).

If you are unable to exercise or walk on a treadmill, there are drugs that may be given (dipyridamole, adenosine, or dobutamine) that will enhance abnormalities in coronary blood flow so that they can be imaged with nuclear or echocardiographic techniques.

If your problem relates to congestive heart failure, abnormalities of your heart valves, or increased thickness of your heart muscle, an echocardiogram, or an ultrasound scan of your heart, gives the cardiologist much information. Sometimes the abnormalities in the back of your heart or your chest do not conduct sound waves well. The cardiologist may then suggest a transesophageal echocardiogram (TEE), during which the probe is swallowed and your heart is seen from your esophagus. If you have abnormalities in blood vessels other than in your heart, a Duplex scan utilizing ultrasonic/Doppler techniques to determine flow may be applied.

If your abnormality includes your heart rhythm, a Holter monitor is quite valuable. This is a small device the size of a transistor radio that records your ECG for a day or two while you record any symptoms you may have in a diary. If the palpitations or lightheaded episodes that bring you to the cardiologist occur only once in a while, an event monitor may be utilized. You can take this monitor home and call a station where heart rhythm detection occurs through a telephone monitor.

*Invasive Testing*

If a noninvasive test indicates you have serious problems with your heart rhythm or possible blood vessel disease, an invasive test may be ordered.

Cardiac catheterization with coronary angiography is the most common invasive test. During this test, pressures within the heart are measured, dye may be injected into the left ventricle, and dye is injected into each of the blood vessels that supplies blood to the heart. An x-ray movie of the heart is then made.

If the obstruction to blood flow is localized, it can be repaired by balloon angioplasty and/or stenting (see Chapter Six). That procedure may be done at the same time as the cardiac catheterization. A simple diagnostic catheterization may require only a few hours at the hospital. An interventional procedure may take longer in the hospital, but generally less than one day.

Your cardiologist will discuss the result of your tests. If your problem is not a blood vessel in your heart but one of your other major vessels such as a blood vessel to your legs, the cardiologist may dilate those blood vessels as in coronary angioplasty.

If the problem is a rhythm disturbance, an electrophysiologist can perform an electrophysiologic study, in which your heart is stimulated and the heartbeat measured. Essentially, this is a very sophisticated and highly sensitive electrocardiogram. As a result of this procedure, a recommendation may be made for a pacemaker or for an implantable cardioverter defibrillator. This placement is generally performed by the same electrophysiologist.

**When Does a Cardiologist Refer Patients to a Cardiac Surgeon?**

In the event of coronary artery disease, for example, a cardiologist will refer you to a heart surgeon when blood vessel disease affects multiple vessels and angioplasty is not practical. The cardiac surgeon will then review the angiogram and consult with the cardiologist regarding the best surgical approach for coronary artery bypass grafting.

Once the referral to a surgeon is made, your cardiologist will continue to see you immediately before and immediately after surgery. After hospitalization, which is generally less than one week, the cardiologist and surgeon will both see you in follow-up until your surgical wound is healed, at which time the surgeon will typically send you back to the cardiologist for care.

If your postoperative course was not complicated, your cardiologist will typically refer you to the primary care physician but will see you at regularly scheduled intervals: three months, six months, and one year after surgery.

Typically, an exercise stress test will be performed either three or six months after surgery and annually thereafter. Measurement of cholesterol level will occur within six weeks of surgery, and the cardiologist and primary care physician will confer about "secondary prevention," i.e., treatment measures designed to reduce and reverse the blood vessel disease (atherosclerosis) that caused your visit.

Cardiologists work in concert with primary care physicians and cardiac surgeons. They are part of a team of physicians that are directing their efforts toward the well-being of your heart and blood vessels.

However, the ultimate determinant of the success of cardiovascular care is the patient, because you are the fourth member of the team. As a team member, it is your responsibility to ask all the questions you may have.