

## Cardiovascular Disease: Hypertension , Congestive Heart Failure and Angina

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### High Blood Pressure (Hypertension)

#### Definition

Blood pressure is a measurement of the pressure your blood exerts against the artery walls.

#### Introduction

High blood pressure occurs when the pressure of your blood against the artery walls is higher than normal. As your heart pumps out oxygen rich blood, the pressure in your arteries rises. Between heartbeats, the pressure drops back down. The pressure when the heart contracts is called the systolic pressure; this is the first number in the blood pressure reading. The pressure between beats, when the heart relaxes, is called the diastolic pressure. This is the second number in the blood pressure reading. If your blood pressure is consistently 140/90 or higher, you have high blood pressure.

Most people with high blood pressure have no symptoms. Despite what a lot of people think, high blood pressure does not make you dizzy, nervous, or tense. Untreated high blood pressure can lead to stroke, heart disease or heart attack, or kidney failure.

High blood pressure is very common; more than half of all older people have high blood pressure. Other persons who may be at increased risk include people who smoke, African Americans, those who are overweight, and people with a family history of high blood pressure.

#### Diagnosis

The blood pressure is measured by putting a blood pressure cuff around the arm, inflating the cuff, and listening for the flow of blood as the cuff is deflated. The normal blood pressure readings are 135/ 85 or lower. If the blood pressure is over 140/90, the diagnosis of high blood pressure, or hypertension can be made.

The healthcare provider usually will make the diagnosis of high blood pressure when the blood pressure readings are consistently over 140/90; usually the criteria are high readings on three separate occasions. Your doctor may do lab tests to rule out treatable causes of high blood pressure.

Essential hypertension (or primary hypertension) refers to high blood pressure in which the physician is unable to identify a specific cause. This is the most common type of high blood pressure, occurring in up to 95% of patients.

Secondary hypertension has a recognizable cause-usually treatable or reversible, but these are rare causes, and your doctor will consider these in appropriate circumstances. These causes include kidney disease, thyroid problems, pregnancy, Cushing's syndrome(a rare problem in which the body has too much of a hormone called cortisol), coarctation of the aorta( a narrowing of the large blood vessel that carries blood out of the heart to the body), cirrhosis (liver disease), sleep apnea ([Link to sleep apnea](#)), and pheochromocytoma (a rare type of tumor the produces a chemical similar to adrenaline, causing high blood pressure). Certain medications, including birth control pills, decongestants and nonsteroidal anti-inflammatory pain medications can cause or contribute to hypertension.

## Treatment

Many types of medicines are available to treat high blood pressure; these are called antihypertensive medications. The ideal situation is to lower the blood pressure to less than 135/85 with medicine that is easy to take and with as few side effects as possible.

There are other things you can do to help lower your blood pressure besides medicines. Don't smoke; nicotine constricts the arteries and raises the blood pressure. Avoid cocaine and other drugs that can affect your heart. If you are overweight, losing weight will help lower your blood pressure; regular exercise is a good way to bring down the blood pressure, and exercise is beneficial in helping to lower the blood pressure on its own. Limit your alcohol consumption to no more than 1-2 drinks per day. In some people, alcohol can raise blood pressure; these people should avoid alcohol altogether. Not everyone is affected by sodium (salt), but sodium can increase blood pressure in some people. Most people who have high blood pressure should limit the sodium they eat each day to less than 2,300 mg. Don't add salt to your food. Check food labels for sodium.

If your blood pressure can only be controlled with medicine, you'll most likely need to take the medicine for the rest of your life. Don't stop taking the medicine without talking with your family doctor. If you do, you raise your risk of having a stroke or heart attack.

Types of antihypertensive drugs:

- Diuretics- help your body to get rid of extra sodium and fluid so your blood vessels don't have to hold so much fluid.
- Vasodilators-expand the blood vessels.
- Beta blockers- these drugs block the effects of adrenaline, which eases the force of the heart's pumping action, slows the pulse (heart) rate and decreases the tension in the arterial walls.
- Alpha blockers-relax the blood vessels to help them stay open.
- Calcium channel blockers-prevent the blood vessels from constricting by blocking calcium from entering your cells.
- ACE inhibitors-decrease the production of angiotensin II, a chemical produced in the body that causes the blood vessels to constrict.
- Angiotensin receptor blockers-These drugs prevent the action of angiotensin II by blocking the angiotensin II from entering the cells.

## Emergency Situations – What can go wrong?

### Hypertensive Crisis

High blood pressure becomes an emergency when it is causing damage to the affected organs of the body. (i.e., brain, heart, kidneys). A person who has a severely elevated blood pressure (more than 200/120) whether they have signs of organ damage or not, requires urgent treatment of their high blood pressure, but not usually admission to the hospital. The decision to admit a patient to the hospital is not always based on the blood pressure reading, but the body's response to the elevated blood pressure. A person who has a sudden increase in blood pressure may not tolerate the rise, whereas a person with chronically high blood pressure may be able to tolerate a very high blood pressure.

Symptoms of hypertensive crisis can include headache, dizziness, blurred vision, chest pain, heart palpitations (a feeling of fluttering or rapid heart beat), or shortness of breath. The health care provider will evaluate a patient with very high blood pressure reading or symptoms of hypertensive crisis for any signs of damage to the brain, heart or kidneys.

## **Emergencies Caused by the Long Term Effects of High Blood Pressure**

### **Aneurysm/ stroke**

If hypertension is not detected and treated, life- threatening complications can develop over a course of years. High pressure, over time can make the arteries more vulnerable to build up of fatty deposits, and cause a condition called atherosclerosis. This condition in an artery in the brain can cause a stroke.

Weakened portions of an artery wall can balloon out, and form an aneurysm. If an aneurysm ruptures, internal bleeding will occur. If this happens to an artery in the brain, stroke can occur. (link to stroke) Aneurysms and atherosclerosis can affect other parts of the body as well.

### **Aortic Aneurysm**

An aneurysm that develops in the large artery that carries blood out of the heart, the aorta, can rupture, or pop, causing severe internal bleeding, and death. Symptoms of aortic aneurysm rupture depend on the part of the aorta that is bleeding. Excruciating pain in the front part of the chest if the upper part of the aorta is bleeding, or pain in the abdomen that migrates to the back if the lower part of the aorta is bleeding. If the top portion of the aorta is affected, pain can be in the neck, jaw or teeth. Sometimes the pain is described as much worse with each heartbeat.

### **Heart Failure**

The heart has to work harder to pump against high pressure, causing the heart to become enlarged. An enlarged heart is not very good at pumping blood around the body, and this can lead to heart failure.

### **Conclusion**

High blood pressure is a serious disease, usually with no symptoms. It is called the silent killer. If high blood pressure is not detected and treated, long-term damage can result, leading to deadly complications. High blood pressure can cause heart disease, eye disease, aneurysms, stroke, and kidney failure. With proper treatment, these complications can be prevented.

## **Congestive Heart Failure**

### **Definition**

Blood pressure is a measurement of the pressure your blood exerts against the artery walls.

### **Introduction**

Congestive Heart Failure does not mean that the heart has completely failed, but that the heart is not able to pump as strongly as it needs to, in order to keep up with the body's need for oxygen and nutrients. When the heart has been damaged by heart disease, long standing high blood pressure, complications of diabetes, disease of the heart valves or heart attack, it no longer pumps effectively. The reduction in the ability to pump blood to the body has a predictable effect on the body. There are three types of heart failure, depending on which side of the heart is weak: left-sided heart failure, right –sided heart failure, and biventricular failure (both left and right sides are weak.)

The left side of the heart pumps blood containing oxygen taken from the lungs to the cells of the body. When the body has used the oxygen in the blood, it returns to the heart. The right side of the heart then pumps the oxygen poor blood to the lungs to get a fresh load of oxygen. This process is going on continually, and there is a finely tuned balance between the heart, lungs and kidneys to keep this process working well.

### **Left-sided heart failure**

When the left side of the heart is damaged, the heart is no longer able to pump all the blood that is returning from the lungs to the rest of the body, so the blood begins to back up into the lungs. Left sided failure causes symptoms like shortness of breath (dyspnea), trouble breathing when lying down flat (orthopnea), and waking up during the night with a sense of breathlessness or feeling of suffocation (paroxysmal nocturnal dyspnea). Patients often describe the need to sleep on several pillows or the need to wake up during the night to walk around; being upright allows the back up of fluid in the lungs to go down, so the breathlessness subsides. Other symptoms include wheezing, a hacking nonproductive cough that is present when lying down and relieved by sitting up, low energy and tiredness. The reason for these symptoms is because the lungs are filling with fluid that the heart would normally be pumping to the rest of the body.

### **Right-Sided Heart Failure**

When the right side of the heart is damaged, the heart is no longer able to pump the blood from the body to the lungs. Blood and fluid begins to back up into the body, causing swelling of the feet and ankles, swollen neck veins, fatigue and lethargy, and constant pain under the ribs on the right side from swelling in the liver. Advanced right sided heart failure can cause loss of appetite (anorexia), weight loss and malnutrition ("cardiac cachexia"). The most common cause for right-sided heart failure in this country is left-sided heart failure. The next most common cause is chronic lung disease from tobacco (cigarette) abuse.

### **Bi-Ventricular Failure (Both Sides of the Heart)**

When both sides of the heart are affected, the signs and symptoms include a combination of all the above symptoms.

### **Diagnosis**

The diagnosis of congestive heart failure is made based on physical exam signs of right heart failure listed above, and/or the presence of the symptoms of left sided heart failure listed above, in combination with classic chest x-ray findings. An echocardiogram is a very helpful test that uses ultrasound to see the heart's size, motion and structure. It is useful in figuring out the cause of CHF. Sometimes, a cardiologist (heart specialist) will recommend a cardiac catheterization to further assess the health of the heart; this is a useful test for people who may be candidates for surgery or other procedures. The doctor may order tests to look at lung function (Pulmonary Function Tests or PFT's). Routine blood work is part of a complete evaluation, and should include kidney and liver function tests, blood sugar and electrolytes, blood count, and thyroid testing.

### **Treatment**

The treatment of congestive heart failure includes three general principles. First, the underlying cause should be found and corrected if possible. Next, the doctor looks for any problems in the body that can aggravate heart failure, and correct these problems. Heart failure is typically a chronic condition, and if symptoms get suddenly worse, it is not due to a worsening of the heart condition, but to a stress such as thyroid problems, untreated high blood pressure, anemia, infection, fever, or eating/drinking too much salt, fluid or alcohol. The third thing the physician will do is try to treat the heart failure itself, by giving medication to strengthen the pumping action of the heart, reduce the amount of work the heart has to do, and reduce the amount of salt and fluid the body holds onto. Some medications used to treat heart failure include digitalis or cardiac glycosides (Digoxin), which help the heart pump more effectively. Another type of drug commonly used to treat heart failure are the diuretics, which help the body get rid of excess water and salt. Blood pressure medications that relax the blood vessels help reduce the amount of work the heart has to do. (ACE inhibitors or vasodilators) link to hypertension

Things you can do at home to control congestive heart failure include the following:

- Stop smoking.
- Cut back on salt to limit water retention.
- Drink less fluid if swelling is present, but do not drink less than five 8-ounce cups per day unless your doctor tells you to do so.
- Avoid alcoholic beverages and caffeine.
- Elevate swollen feet and ankles above the level of your heart with pillows.
- Sleep propped up on pillows or in a comfortable chair to make breathing easier at night.
- Avoid exercise that causes you to breathe hard or become very short of breath. Stretching and walking at a moderate pace are often fine. Ask your doctor about the appropriate amount of exercise for you.
- Review all prescription and over the counter drugs you take with your doctor. Some medications may make your body retain more fluid, which further strains your heart.

## **Emergency Situations – What can go wrong?**

### **Acute Pulmonary Edema**

When a person with congestive heart failure undergoes some type of stress, their CHF can change from compensated to decompensated, meaning they are no longer able to balance between the weakened state of the heart and the rest of the body's responses. When the body begins to decompensate, fluid can quickly build up in the lungs, literally drowning the individual. This is a medical emergency requiring oxygen and intravenous medications to get rid of excess fluid and help the heart pump more effectively. Symptoms of acute pulmonary edema include severe shortness of breath, and coughing up pink foamy phlegm, sweating, pale color, and chest pain.

### **Heart attack**

Part of the heart muscle can die from receiving too little oxygen. Some people with congestive heart failure are at a higher risk for heart attack if they have blockage in the coronary arteries that supply oxygen carrying blood to the heart muscle. Some people with CHF are also at a higher risk of sudden death from serious problems with the rhythm of the heart. Symptoms of heart attack include chest pain (crushing, squeezing pain or tightness in the chest), difficulty breathing, shortness of breath, sweating, nausea, vomiting, and loss of consciousness. ([Link to angina](#))

### **Digitalis Toxicity**

Persons taking Digoxin or related medicines can develop toxic (dangerous) levels of digitalis, which can cause serious heart rhythm problems. Early symptoms of digitalis toxicity can include nausea, vomiting, loss of appetite, headache, fatigue, disorientation, confusion. A blood test can measure the levels of digoxin in the blood.

### **Conclusion**

Congestive heart failure is a complicated condition that can be treated with a combination of medications, diet, and rest to keep the person comfortable and able to function. It requires close monitoring and regular follow up with the medical provider. Most persons with congestive heart failure can lead full, productive lives as long as they take their medications and follow their doctor's advice.

### **Angina**

#### **Definition**

Angina is chest discomfort that happens when the heart is not getting enough oxygen.

## **Introduction**

The heart is a hollow organ made of muscle. It has four chambers that work together. Two left-sided chambers pump oxygen rich blood to the body; after the body uses the oxygen, the blood returns to the right side of the heart where it is then pumped to the lungs to get more oxygen. Although the heart fills with blood with each beat, it cannot use the blood it pumps to get its own oxygen supply. The heart gets its oxygen from a network of arteries, called the coronary arteries. Sometimes these small coronary arteries can become clogged, either with fatty deposits (cholesterol plaques), or a blood clot that sticks to a damaged or narrowed coronary artery. This can limit the amount of oxygen the heart receives, causing angina.

Angina is chest pain caused by poor circulation to the heart muscle. The symptoms of angina are chest discomfort often described as a feeling of tightness, pain or pressure under the breastbone or across the middle of the chest. Sometimes the pain spreads to the arms or the jaw. Angina is brought on by some sort of stress on the heart muscle when the blood supply is unable to keep up with the increase in the need for extra oxygen. Usual stressors can include physical exercise, a big meal, or sudden emotional upset. The average attack lasts a few minutes to half an hour, and the pain is usually relieved by rest. It can be aggravated by cold weather, so the same amount of exercise easily tolerated in the summertime, may bring on pain in the winter.

Angina can also be caused by health conditions that stress the heart, such as thyroid disease, heart arrhythmias, heart valve disease, or severe anemia (a low number of red blood cells). Some types of drugs can also make the heart work harder; certain illegal drugs such as cocaine and certain over the counter medications such as decongestants have been known to contribute to angina. Some prescription drugs may contribute to angina, so be sure your doctor and pharmacist know if you have been diagnosed with angina.

Certain risk factors make a person more likely to develop coronary artery disease, which is the most common cause of angina. These include high blood pressure, high cholesterol, diabetes, a family history of premature heart disease, smoking, and obesity.

## **Types of Angina**

### **Stable Angina**

People with stable angina usually have predictable patterns of their chest pain, often brought on by exercise or emotional stress. The discomfort is relieved by rest or a medication called nitroglycerine. Stable angina is sometimes called exertional angina, because it is brought on by activities that make the heart work harder. These activities can include exercise, a large meal, emotional excitement, or exposure to the cold.

### **Unstable Angina**

People with unstable angina have chest pain that is unexpected, and the pain usually occurs at rest. The pain may be more severe, or may last longer than a person's usual symptoms of angina; or it may be the first time a person has angina. Angina in a person who hasn't had it before, or angina that comes on while a person is resting, or pain that doesn't go away with rest or medication is a danger sign. Unstable angina may be the first sign of a heart attack. A person who is having these symptoms should be taken to the emergency room.

### **Prinzmetal's Angina**

There is a less common type of angina caused by a spasm of the coronary artery, called coronary artery vasospasm or Prinzmetal's angina. This type of angina usually happens without exertion or emotional upset and happens typically in the early morning, wakening the person from sleep.

How do I know if this is Angina or a Heart Attack?

Once you are diagnosed with angina, it is important to know how to tell the difference between angina and a heart attack. Angina comes on with activity and quickly gets better with rest. Angina lasts only a few minutes, while heart attack pain may last an hour or more, or until relieved by medications. Angina is relieved with a prescribed dose of nitroglycerin, while the pain of a heart attack is not completely gone after taking the nitroglycerin. The pain of angina is not typically accompanied by nausea, vomiting, severe sweating or shortness of breath; these symptoms are the classic symptoms of heart attack.

Can Angina happen in people with no Coronary Artery Disease?

Sometimes, a person may have a heart valve problem called aortic stenosis, which limits the amount of blood that can get to the heart muscle. People with severe anemia (low number of red blood cells) can be at higher risk of angina because their blood cannot carry enough oxygen. A person with an enlarged heart or a thickened heart muscle may also be at higher risk of angina because the heart needs more oxygen than the blood can carry to it.

### **Diagnosis**

Angina is sometimes hard to diagnose. The discomfort can vary from a vague, troublesome ache, to an intense crushing pain. Sharp, stabbing pains that can be localized with one or two finger tips are unlikely to be angina.

An EKG (heart tracing of the heart's electrical activity) may look completely normal between episodes. The doctor may order a stress test in which the heart tracing is recorded before, during and after exercising the heart. The heart can be stressed in a controlled way by exercise on a treadmill or by injecting a medication that makes it beat harder. The doctor may perform an imaging study such as an ultrasound or a type of x-ray called radioisotope study to see if the heart has any areas that are already damaged or may be at higher risk of damage from decreased blood flow.

Coronary angiography is a test in which the cardiologist (heart specialist) injects dye into the blood vessels that supply the heart muscle. This test shows the doctor if there is a narrowing or blockage in one or more of the blood vessels.

### **Treatment**

#### **Surgical Treatments**

If there is a blockage identified, this can often be treated by opening the vessel with a small balloon (angioplasty). Sometimes the doctor will place a stent, which is like a tiny tube to hold the artery open so blood can pass through more easily.

If there is more than one blockage, open heart surgery may be recommended; this surgery takes healthy unblocked blood vessels from another part of the body, like the leg, and makes new pathways for blood flow in the heart (coronary artery bypass). Treating the blockage will help prevent the angina symptoms from progressing to a heart attack.

#### **Medical Treatment**

Healthy lifestyle changes, like a healthy diet that is low in fat, maintaining a healthy weight, regular exercise, and no smoking. Your doctor can help you to figure out the right amount of exercise after looking at the results of the stress test.

Most people with angina need to take medications as well. The main three types of medicine prescribed for angina are nitrates, beta blockers and calcium channel blockers.

**Nitrates** Nitrates are medications that dilate or open up the arteries so more blood can flow through them. The most commonly used nitrate is nitroglycerine. This is often placed under the tongue during an attack of angina. A common side effect of nitroglycerine is a headache.

**Beta Blockers** Beta blockers are medications that lower the blood pressure, slow the heart rate, and by doing this, lessen the amount of work your heart has to do to get the blood to the body. This cuts down on the amount of oxygen your heart requires.

**Calcium Channel Blockers** Calcium channel blockers help decrease coronary artery spasms and some of them also slow down the heart rate.

**Anticoagulant Medications** An anticoagulant is a drug that "thins the blood", or keeps it from clotting too easily. Blood clots can suddenly block a narrowed artery, and lead to unstable angina or a heart attack. When a person is diagnosed with angina, they are usually told to take one aspirin a day. This helps keep the blood from clotting too easily. A person with severe unstable angina or a heart attack may need to be placed on an anticoagulant medicine like heparin, while the doctor gets them ready for surgical treatment of their blocked arteries. (These medicines do not actually make the blood less viscous (thick), but only decrease the likelihood of clot formation.)

Neither medical treatment nor angioplasty, stent, or coronary artery bypass surgery treats the process that led to the buildup of plaques in the artery. Therefore it is important that the patient takes the responsibility to control the modifiable risk factors with the help of their healthcare professional. (Diet and exercise, stop smoking, control weight, treat diabetes and blood pressure appropriately.)

## **Emergency Situations – What can go wrong?**

### **Heart attack**

Part of the heart muscle can die from receiving too little oxygen. This is a heart attack, also called a myocardial infarction, or MI. People with angina are at higher risk of a heart attack, because they have narrowing of the arteries that supply the heart with blood. Symptoms of heart attack include chest pain (crushing, squeezing pain or tightness in the chest), chest pain that spreads to the neck, jaw or one or both arms, difficulty breathing, shortness of breath, sweating, nausea, vomiting, fast or irregular heartbeat and loss of consciousness.

### **Unstable Angina**

Unstable angina may mean that a narrowed artery is getting worse, or that a plaque in the artery wall is becoming injured and could be at risk of developing a clot and causing a heart attack. If you have coronary artery disease that has been diagnosed by a doctor, and the symptoms are not going away with the home treatment plan your doctor prescribed, (such as nitroglycerin), you should be evaluated by emergency personnel. A person who is having angina for the first time, or a person with angina that is now more severe or lasts longer, or a change in the usual pattern of angina needs to be seen in the emergency room.

If a person is having symptoms of unstable angina or a heart attack, they should be seen in the emergency room. Call 911 or other emergency services. If the person is alert, and is not allergic to aspirin, and has no other reason that they should not take aspirin, they should chew and swallow one aspirin while waiting for the ambulance to arrive.

### **Conclusion**

Heart disease is the number one killer of American men and women. Angina is a symptom of coronary artery disease, and needs to be evaluated by a medical provider. If a person with angina has predictable symptoms, and can control the symptoms with the medications and treatment plan prescribed by their doctor, this is considered stable

angina. If a person has never had angina before, or if the pattern of previously stable angina begins to change, this could be a warning that the angina may progress to a heart attack.

People with angina should be under a medical provider's care to be sure they are managing their heart disease the best way to prevent a heart attack. The person with angina should maintain a healthy weight, keep their cholesterol and blood pressure under control, eat a healthy diet, and not smoke. Regular exercise is also important, but should be done under a doctor's guidance.

### **References**

Healthwise Handbook –A Self Care Manual For You, 13th Edition

MSN Health

American Academy of Family Practice (AAFP)

American Heart Association

Merck Manual 13th edition

Clinical Evidence June 2001

Cecil Textbook of Medicine 19th edition