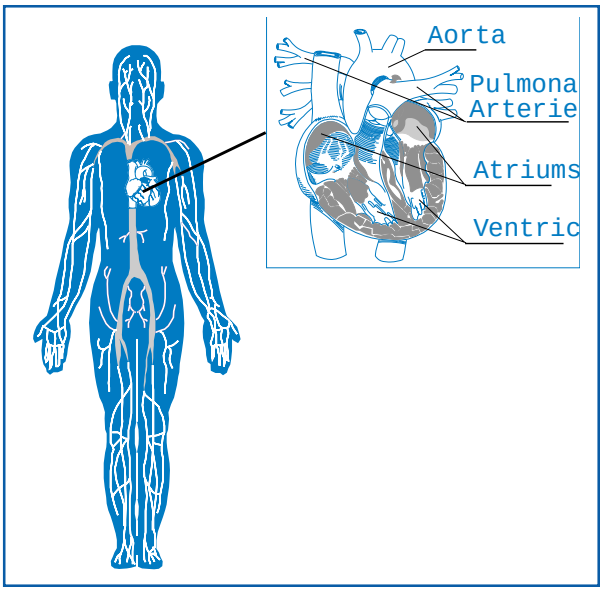
HEART AND BLOOD VESSELS

For many people, the heart symbolizes the emotions and virtues of love and courage. The truth is, the heart is simply a pump. In ancient times, the heart was thought to transport air through the body. It took approximately 2,000 years to discover that the heart pumps blood through two major circuits. One, to and from the lungs; and the other, around the entire body.

Diseases of the heart have always been the major cause of deaths. In the early 1900s the most common type of heart disease was valve damage caused by rheumatic fever in children and young adults. Today, in industrialized countries, coronary heart disease is the leading cause of death in people over 35 years of age. Well-established research has linked this disease with smoking, high cholesterol (from high fat diets), high blood pressure, and inadequate exercise. Treatments are available (eg, drugs, surgery, heart transplantation) but the key to help prevent heart disease is maintaining a healthy lifestyle.

HEART



Although the heart is approximately the size of a grapefruit, it is very powerful. It operates as two coordinated pumps that continuously send blood around the body, feeding oxygen and nutrients to organs and tissues, and removing harmful wastes. The heart has four chambers: two upper, (left and right atria) and two lower (left and right ventricle). A strong muscular wall (septum) divides the two sides of the heart, allowing the four heart valves to pass blood in and out of the heart chambers. Used blood from the body tissues enters the right side of the heart and is pumped into the lungs. As blood passes through the lungs (pulmonary circulation), it picks up the inhaled oxygen. The reoxygenated blood returns to the left side of the heart and is pumped out again to the body tissues (systemic circulation). This full circulation around the body and lungs takes approximately one minute.

The heart requires a generous supply of oxygen and blood. The blood that flows through the chambers of the heart cannot seep through to muscle cells, so the heart muscle has its own separate blood vessels called the "coronary system."

When functioning normally, the heart forces blood through the blood vessels. The actual power comes from the ventricles (bottom chambers of the heart). These chambers have thick, muscular walls that contract so the blood is forced into the arteries. This occurs with the regular beating of the heart. The beating of the heart consists of the contraction of the ventricles (systole), and the relaxing and refilling with blood (diastole). The systole and diastole are what is measured in a blood pressure check. The entire cycle takes about four-fifths of a second, but the speed increases a great deal with vigorous exercise or with stress.

BLOOD VESSELS

The blood vessels that carry the blood are referred to as the "vascular" or circulatory system. This system allows the blood to perform one of its many functions, such as transporting oxygen and nutrients to the cells, transporting waste products from the cells, and helping to regulate the body's water level, temperature, and acid-alkali balance. Special cells and proteins in the circulatory system protect the body from infection or blood loss after an injury.

HEART AND BLOOD VESSEL DISORDERS

Because of the constant activity of the heart and blood vessels, there is a wide range of potential problems, disorders, and diseases. The two most focused on are: coronary heart disease - the principal cause of a heart attack, and hypertension - when the blood pressure is higher than normal. Coronary heart disease is caused when the supply of blood to the heart muscles is restricted.

The following pages will discuss the major disorders, concerns, and treatment for heart disease.

ATHEROSCLEROSIS

Coronary heart disease is narrowing of the coronary arteries caused by atherosclerosis. Atherosclerosis is the buildup of cholesterol, fats, and other remains of the blood that become attached to the walls of the arteries. This causes the walls to become thick and hardened, and these deposits gradually increase in size. If this occurs in the heart, brain, or legs, it restricts the circulation to areas supplied by these arteries and can result in chest pain, heart attack, or other circulatory diseases. Pieces of the deposits can break away and travel with the blood to obstruct another artery. All of the causes are not known but atherosclerosis may begin with excess saturated fats in the diet, a genetic defect, diabetes, high blood pressure, being overweight, or may be caused by an injury.

CHOLESTEROL

When a physician tells you that your cholesterol level is too high, it means you have an over abundance of fat-related substance circulating in your bloodstream. Cholesterol is a waxy substance in animal fats and the human body. It is found in the bloodstream, brain tissue, liver, kidneys, adrenal glands, and the fat around nerve fibers. The human body constantly produces cholesterol in the liver and kidneys and is transported in the blood by large particles known as lipoproteins. When cholesterol hardens in the gallbladder, it results in gallstones; if it builds up on the artery walls, it can clog the arteries and slow down the blood flow leading to hardening of the arteries, high blood pressure, chest pains, heart attack, or stroke. But, cholesterol is also vital to the body because it helps to absorb and move the fatty acids. It is also necessary in making vitamin D on the outer surface of the skin, building new cells, insulating nerves, and producing hormones. Cholesterol can be both vital and harmful. The various terms for cholesterol can be confusing (dietary, serum, HDL, and LDL). The following is a brief description of each:

DIETARY CHOLESTEROL	This is the cholesterol contained in food from animals, especially organ meats, cheese, and whole milk dairy products. The American Medical Association (AMA) recommends a daily intake to 300 mg only (one egg has 275 mg; an apple has none).
SERUM CHOLESTEROL	This refers to a test that measures the amount of cholesterol in your bloodstream. Under 200 mg is advisable.
LDL (low density lipoprotein)	This is known as the "bad" cholesterol. Traveling via the blood stream, LDL clogs the bloodstream by dropping excess cholesterol onto the artery walls, increasing the risk of a heart attack or stroke. The lower these levels are, the better off you are.
HDL	This is considered a "good" cholesterol because of its ability to (high density lipoprotein) clean and sweep up the LDL cholesterol and carry it back to the liver. The higher the level of HDL, the better off you are.

MEDICATIONS

In the 1980s, drug companies introduced a series of medications that seemed to attack high blood cholesterol and fight against heart disease. These drugs (Mevacor, Zocor) lowered cholesterol without uncomfortable side effects that previous drugs had caused. Today, more than eight million Americans take these drugs daily. Some scientists now feel these drugs pose a dangerous risk and are encouraging healthy people to hesitate taking them unless they are at high risk for coronary artery disease or already have elevated cholesterol resulting from a heart attack. For people who cannot lower their cholesterol in other ways, the benefits of these drugs still outweigh the known risks. Before you consider drug therapy, you need to understand the different types of cholesterol, the significance of their levels, and the options available to control it.

OBESITY

Approximately one in five American adults, or 34 million people, is 20 percent or more overweight. People who are seriously overweight are three times more likely to have coronary artery disease as people of normal weight. Maintenance of ideal weight could reduce the risk of heart disease by 35 to 55 percent.

DIABETES

Noninsulin dependent diabetes mellitus, the most common form of the disease, accelerates the development of other coronary risk factors. More than 80 percent of people with diabetes die of some form of heart or blood vessel disease.

People with diabetes are two to four times more likely to have heart disease and five times more likely to have strokes than people without diabetes.

LIFESTYLE

Regular physical activity reduces the risk of a heart attack by 35 to 55 percent. Also, psychological stress has been shown to trigger high blood pressure, rapid heart rate, arterial narrowing, cardiac chest pain, and activation of blood clots.

DRUG TREATMENT

Resins (bile acid sequestrants) cause the liver to increase the manufacturing of bile acids, which decreases the manufacturing of cholesterol.

Probucol (Lorelco) should be reserved for patients who have not tolerated or responded to other lipid-lowering agents.

Lescol, Pravachol, Mevacor, Zocor are new and effective at lower doses, however, full evaluation has not been determined. It acts directly to interfere with the manufacturing of cholesterol and seems promising.

Questran and Colestid have a higher capability of lowering LDL than niacin, but they can also lower HDL.

Lopid is most helpful in treating elevated triglycerides (fatty acids) and low HDL. The effects on LDL are minimal, but there are few side effects.

Hormone replacement therapy should be considered by postmenopausal women who have a high risk of heart disease. The therapy can raise HDL and lower LDL, which outweighs some of the side effects.

Some blood pressure medication has shown to lower cholesterol levels.

NUTRITIONAL TREATMENT

Some nutritional supplements can lower cholesterol, however, before increasing any nutrient, be sure to consult your doctor. The following are supplements that have shown positive results:

Niacin (nicotinic acid) This vitamin is the most effective cholesterol lowering drug and is available over the counter. High doses of Niacin can raise HDL and lower triglycerides (fatty acids) and LDL. It should be taken under medical supervision as its side effects can cause skin flushing, abnormal liver function, and increased blood sugar levels.

Vitamin C, vitamin E, and beta carotene are antioxidant nutrients that help the body fight the chemical compounds that create the fatty acids in LDL – a change that promotes atherosclerosis (leading to a heart attack).

Calcium (shown in two different studies) taken daily (at least 1 gram) lowered cholesterol in people with mildly high levels.

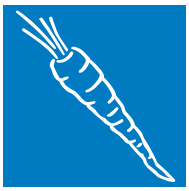
LIFESTYLE TIPS FOR LOWERING LDL CHOLESTEROL

WEIGHT

The more overweight you are the more cholesterol your body produces.

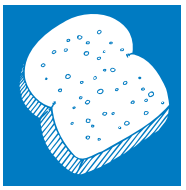
FAT

Saturated fat elevates blood cholesterol. Polyunsaturated fat lowers blood cholesterol.



CARROTS

Lowers cholesterol with their pectin content. Two carrots a day are recommended.



OAT BRAN

Oat bran appears to lower cholesterol. Several studies conducted by nutritionists claim that corn bran is as effective as beans and oat bran.

BEANS

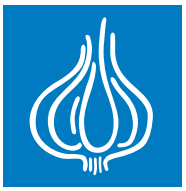
Lowers cholesterol with their pectin content. A cup of cooked beans per day adds six grams of soluble fiber to the diet.

EXERCISE

Exercise can raise your levels of protective HDL. To a lesser degree, it can also lower your LDL levels.

FRUIT

Lowers cholesterol with their pectin content. Grapefruit seems to be the first choice, but apples, oranges and other fruits are all helpful.



LIQUID GARLIC

Large quantities of garlic seems to reduce harmful blood fats. Fortunately, there is an odor-modfied liquid garlic on the market.

EGGS

Lessen your egg intake. Two-thirds of the population can consume eggs without elevating their serum cholesterol.

DAIRY PRODUCTS

Stay with nonfat dairy products. They are all now available in nonfat form.

BEEF

Red meat, a high source of saturated fat, can be part of a healthy diet if it is lean, has all noticeable fat trimmed away, and is consumed moderately.

SMOKING

Do not smoke. Studies have shown that smoking causes a substantial increase in blood cholesterol. Additionally, smokers tend to have a low level of the "good" HDL cholesterol.

RAISING YOUR HDL LEVELS

No foods help to elevate the HDL levels, but moderate alcohol consumption can. Although this is no reason to start drinking, one or two alcoholic drinks each day may raise your HDL by 10 to 15 percent. Some studies suggest red wine is more effective, but this has been moderated by a recent study — the color of wine does not matter. This does not mean you can save up your two drinks per day for Saturday night – this could cause potential problems.

CONCLUSIONS

Your risk of heart disease can be predicted by your lipid profile. This is a test that measures the concentrations of total cholesterol, HDL cholesterol, and triglycerides (fatty acids). The LDL cholesterol can be calculated from those three figures. The blood test can be taken at your doctor's office. There are also tests for cholesterol that can be purchased at a drugstore but they measure only the total cholesterol. These home cholesterol tests are used more in screening large populations rather than those individuals who are at high risk for heart disease.

If your cholesterol is high, try a cholesterol-lowering diet and other lifestyle changes before you consider drug therapy. If you do need drugs to control your cholesterol, the treatment should be tailored to your lipid profile. Cholesterol reports have encouraged the need for lipid lowering agents that are long term effective, safe, and tolerable. Before making a final decision on controlling your cholesterol, discuss options with your doctor.

HYPERTENSION

Hypertension (high blood pressure) is the most prevalent disease in the United States. Nearly 50 million adults have blood pressure levels above normal limits or are taking medication to control blood pressure. Older persons are more at risk for the complications of hypertension such as heart attacks, strokes, and peripheral vascular disease.

Normal blood pressure has a reading of approximately 120/80. The blood pressure is determined by two factors: 1) the amount of blood your heart pumps, and 2) the resistance of the blood vessels. Some types of mild or moderate hypertension may have headaches, ringing in the ears, light-headedness, become easily tired, or have no symptoms.

■ PRIMARY HYPERTENSION

This is the most common kind of hypertension. It has no known cause but is increased with being overweight, a high sodium (salt) in the blood, high cholesterol, stress, and a family history of primary hypertension.

■ SECONDARY HYPERTENSION

This is associated with diseases of the lungs, kidneys, glands, and vessels, eg, pulmonary hypertension, which is a disease of the arteries and glands.

■ RENAL HYPERTENSION

This type of hypertension results from kidney diseases such as kidney stones or cancer of the kidney. It has also been associated with taking an excessive amount of painkillers, and side effects from certain drugs.

TREATMENT Lifestyle modifications that are proven to lower blood pressure include: weight loss, reduced dietary sodium, increased physical activity, and moderate alcohol intake. There is strong evidence that stress reduction and an ample intake of potassium from foods (eg, bananas, citrus fruits, tomatoes, potato skins) can lower blood pressure.

DRUG TREATMENT Many drugs are used for controlling hypertension such as diuretics, which, increases urine excretion (less water in the blood reduces the heart's load and lowers blood pressure), beta blockers, calcium channel blockers, ACE inhibitors, and direct vasodilators. The availability of this wide variety of drugs provides help for many diabetics. (See drug list in Coronary Artery Disease.)

■ MALIGNANT HYPERTENSION

This type can be life-threatening. It features very high blood pressure that can damage the heart, kidneys, brain, eye tissues, or lungs and may result in heart attack or stroke.

THOSE AT RISK

Studies show that people who get cardiovascular disease have certain characteristics (risk factors) in common and have shown to be reliable in predicting atherosclerosis or coronary artery disease — the beginning symptoms of a heart attack.

RISK FACTORS THAT CANNOT BE CHANGED

HEREDITY The risk of heart disease or atherosclerosis (hardening of the arteries) is hereditary.

GENDER Men have a greater risk of heart disease than women. However, when women reach menopause, it begins to equalize because a woman's body stops producing estrogen at menopause.

AGE Men older than 45 and women older than 55 have a higher risk of coronary heart disease (CHD). More than one-half of the people with heart attacks, and four out of five who die of a heart attack, are over the age of 65.

DIABETES Abnormal blood lipids, hypertension, and obesity are more common in people with diabetes. Diabetes is another yet-to-be explained reason for increasing the risk of CHD. Diabetes has been listed with the CHD risk factors that can be changed because the disease can be treated; however, lowering blood glucose levels with dietary and drug therapy does not appear to exclude the increased risk associated with diabetes. Noninsulin dependent diabetes mellitus, the most common form of the disease, accelerates the development of other coronary risk factors. More than 80 percent of people with diabetes die of some form of heart or blood vessel disease. People with diabetes are two to four times more likely to have heart disease and five times more likely to have strokes than people without diabetes.

POSTMENOPAUSAL WOMEN CHD is the major cause of death among women after menopause, when low levels of estrogen lead to an increase in LDL (bad cholesterol), and a drop in HDL (good cholesterol).

BLOOD CLOTTING FACTORS The various clotting factors may effect risk factors, particularly the hyper-reactivity of the platelets. Aspirin, which has been proven to be an effective antiplatelet medication, is probably the best agent now available to prevent heart attacks in patients with CHD.

RISK FACTORS THAT CAN BE CHANGED

SMOKING

Cigarette smoking is the most potent risk factor for coronary artery disease and accounts for 21 percent of all coronary artery disease deaths (about 115,000 a year, with another 35,000 to 40,000 deaths attributable to secondhand smoke).

Women who smoke and use oral contraceptives are up to 39 times more likely to have a heart attack and up to 22 times more likely to have a stroke than women who do not smoke or use birth-control pills.

Former smokers achieve a 50 to 70 percent reduction in heart disease risk within five years of quitting.

HIGH BLOOD CHOLESTEROL

High blood cholesterol increases the risk of heart disease. Lowering total serum cholesterol by one percent is estimated to reduce heart disease risk by two to three percent.

HIGH BLOOD PRESSURE

One in four adult Americans has high blood pressure. Treatment of high blood pressure reduces cardiovascular risk by two to three percent for each decline of I mm in diastolic blood pressure.

PHYSICAL INACTIVITY

Coronary heart disease is 1.9 times more likely to develop in sedentary people than in active ones, regardless of other risk factors. Physical inactivity places more Americans at risk of heart disease than any other factor. The American Heart Association recommends 30 to 60 minutes of aerobic activity three to four times a week. Having a physically-active lifestyle reduces the risk of heart attack by 35 to 55 percent.

EXCESS WEIGHT

Approximately one in five adult Americans, or 34 million people, are 20 percent, or more, overweight. People who are seriously overweight are more than three times as likely to have coronary artery disease as people of normal weight. Maintaining your ideal weight could reduce the risk of coronary artery disease by 35 to 55 percent. Reducing dietary fat and cholesterol helps control weight and lower blood cholesterol levels. Polyunsaturated fats found in corn oil, safflower oil, and walnuts also lower both the LDL (bad) and the HDL (good) cholesterol, whereas monounsaturated fats only lower the LDL.

STRESS

There appears to be a relationship between mental stress and various aspects of CHD. Stress may be caused by physiological, emotional, and behavioral responses to the demands of difficult situations.

RISK PREVENTORS

Just as smoking and an inactive lifestyle increase the risk of heart disease, the following may offer some protection:

ASPIRIN Aspirin inhibits the formation of blood clots in the coronary arteries helping to prevent heart attacks. If you believe you are at risk, talk with your doctor about starting an aspirin regimen.

PHYSICAL ACTIVITY People who exercise regularly don't just avoid the risk factor of being inactive; exercise actually offers some protection against heart disease. Regular physical activity reduces the risk of heart disease by 35 to 50 percent.

ESTROGEN REPLACEMENT Until menopause, women have a much lower risk of heart disease than men because of their high levels of the hormone estrogen. To preserve this, postmenopausal women can depend on estrogen replacement therapy (ERT), which also lessens menopause symptoms and protects against the bone thinning disease, osteoporosis. ERT reduces the risk of heart disease by approximately 44 percent in postmenopausal women.

HIGH FIBER DIET There is good evidence that water soluble fiber lowers cholesterol. They are found in beans, peas, berries, pears, apples, prunes, carrots, barley, and oat bran. People who consume 25 grams of fiber in their daily diet, the amount recommended by nutrition experts, will reduce their chances of heart disease. Not only is most high fiber food low in fat and sodium, but one type of fiber, soluble fiber, has a direct blood cholesterol-lowering effect.

MILD TO MODERATE ALCOHOL Drinking the equivalent of two glasses of beer, two glasses of wine, or two mixed drinks per day reduces risk of heart disease. Because of the risks of heavier drinking, including an increased risk of death from heart disease, most doctors are cautious about recommending any level of alcohol consumption.

ANTIOXIDANTS Vitamin C, vitamin E, and beta carotene are antioxidant nutrients that help the body fight free radicals (chemical compounds that oxidize the fatty acids in LDL), which is a change that promotes atherosclerosis.

CORONARY ARTERY DISEASE

Any heart problem that is caused by a restricted blood supply to the heart muscle is called coronary artery disease or coronary heart disease (CHD). The arteries encircle the heart and send branches downward to the tip of the heart. In coronary artery disease, there is a buildup of cholesterol, scar tissue, calcium, and other substances in the lining of these arteries. This accumulation is called plaque and is the principal characteristic of atherosclerosis. As a result of this, the vessels are narrowed and/or a plaque dislodges and blocks the artery resulting in a myocardial infarction (heart attack).

The most current study in 1991 revealed more than 70 million Americans suffer from cardiovascular disease that effects the blood vessels of the heart, the brain, and extremities. Many more people are at risk of developing coronary heart disease. Only 18 percent of the population has no risk factors for CHD. Together, CHD and stroke account for nearly one-half of the deaths in this country.

The cause of CHD and most other cardiovascular disease is atherosclerosis, which begins with inflammation or injury to the arterial walls. High cholesterol levels, high blood pressure, and cigarette smoking are all capable of injuring the arteries. Lowering the cholesterol in the blood has shown to significantly reduce the risk of CHD. Some of the complications of coronary heart disease are:

■ ANGINA

An angina attack usually begins with a gripping or pressure-like pain behind the breastbone that sometimes radiates to the neck, jaw, and then down the arms. These chest pains can occur with exertion and is a warning sign that the cardiac muscle is not receiving enough blood for the effort being exerted. The pain should subside with rest. An upsetting or strong emotion, an unusually heavy meal, or exposure to cold can sometimes trigger an angina attack if the muscle is not receiving enough blood.

DRUG TREATMENT	Drugs are used to treat angina by widening the coronary arteries to improve blood flow. These drugs also lower blood pressure and slow the heart rate to reduce the work of the heart muscle.
Nitrates	These drugs can dilate both arteries and veins. Dilation of the coronary arteries increases blood flow to the heart.
Beta Blockers	These drugs control angina by slowing the heart rate and the force of contraction, thereby decreasing the heart's work load and oxygen consumption. They are often prescribed to help prevent a second heart attack.
Calcium Channel Blockers	Like nitrates and beta blockers, calcium channel blockers reduce the work load of the heart, allow more blood to flow through the coronary arteries, and decrease the oxygen requirements of the heart muscle.

Resins	Resins cause the liver to increase the manufacturing of bile acids that decrease cholesterol production.
Nicotinic Acid (Niacin)	This is one of the B complex vitamins. When taken in therapeutic amounts, it has a favorable effect on triglycerides, HDL cholesterol, and total cholesterol.
Gemfibrozil (Lopid)	This is a medication which is more convenient to take and has a favorable effect on all three types of blood triglycerides.
Probucol (Lorelco)	This should be reserved for patients who have not tolerated or responded to other lipid-lowering agents.
	HMG-CoA Inhibitors (Lescol, Pravachol, Mevacor, Zocor) are new and very effective at lower doses because they act directly to interfere with the manufacturing of cholesterol.

STICKING WITH DRUG TREATMENT

If you have trouble following the drug regimen that is best for your treatment, the following tips may be worth considering:

- Take your medication at the same time every day.
- Keep a record on a "medication calendar" (available from your pharmacist).
- Ask for a once a day dosage drug, if available.
- Ask a family member or friend to remind you to take your medication.
- Do not alter drug dosages according to blood pressure readings taken at home.
- If you experience bothersome side effects, tell your doctor.
- If side effects are not severe, allow your body time to adjust.
- Make the lifestyle changes recommended by your doctor.
- If medication cost is a problem, ask if there is a generic or less expensive alternative.
- If you forget to take a dose or two, do not make up for the missed doses. Take your medication at the next scheduled time and get back on track from there.

HEART ATTACK

A heart attack, or myocardial infarction, usually happens suddenly. The chest pain may resemble angina but is usually more severe and is not always brought on by exertion, or relieved by rest. A person having a heart attack may sweat, feel weak, or lose consciousness. If the attack causes the heart to completely stop (cardiac arrest), death usually follows. When a coronary artery becomes blocked by deposits of plaque or a blood clot, and stays blocked, the heart muscle it supplies could die. The severity of the heart attack depends on how much of the muscle is affected and the condition of the other arteries.

DRUG TREATMENT

A number of drugs can be prescribed to help keep the blood flowing freely. Thrombolytic drugs break down recent clots, and antiplatelet drugs and anticoagulants are useful in preventing clots.

SURGICAL TREATMENT

Coronary heart disease can also be treated by surgically clearing or bypassing the blockage. A coronary artery bypass requires a temporary use of a heart-lung machine, which allows the surgeon to actually stop the heart from beating on its own and rely on the heart-lung machine while the surgery is performed. There are also balloon techniques that use an inflatable catheter to widen the artery, and with this procedure, the heart-lung machine is not needed.

Balloon Angioplasty This form of treatment is normally used when only one artery is narrowed or blocked. It is recommended for patients with an associated lung disease in order to avoid general anesthesia. The catheter is inserted into the artery through a guide wire that has been placed through the patient's arm or leg. The catheter reaches the place of blockage and is inflated to widen the channel. The operation is usually brief and the recovery quick. However, these obstructions do recur in more than one-third of the patients.

Coronary Angiogram Angiography shows the outline of the arteries through the use of a radiopaque dye that is inserted through a catheter into the coronary arteries. A series of x-rays are then taken to record the dye's progression. This process is sometimes used to reveal the effectiveness of a balloon angioplasty.

Coronary Artery Bypass Bypass surgery is the most common procedure used to treat critical narrowing or blockage of coronary arteries that are caused by angina or a heart attack. The surgery creates a new route for blood around the blocked part of each vessel, usually consisting of healthy veins taken from the legs or arms of the patient during surgery. This procedure requires the use of a heart-lung machine that keeps the blood pumping during the procedure.

For risk factors that can and cannot be changed, refer to the Hypertension chapter.

WHAT TO DO IN CASE OF HEART ATTACK SYMPTOMS

- Not all of the warning signs occur in every heart attack. If you, or someone you are with, experience signs of a heart attack and the symptoms last more than a minute or two, seek help immediately.
- Call, or have someone you are with, call an ambulance (dial 911 in most areas of the country).
- If an ambulance is not immediately available, the patient should be driven to the nearest emergency room. Under no circumstances should the person experiencing the symptoms drive to the hospital.
- The person suffering the symptoms should immediately chew an aspirin. This may help to dissolve a blood clot before stronger drugs can be administered. Be sure to tell the emergency room personnel that this has been done.
- It is essential to get immediate medical help when symptoms suggest a heart attack. One-half of the deaths from heart attack occur within the first hour, before the victim gets to a hospital, where the chances of survival are greatly improved.

ON THE HORIZON

Genes designed to tell blood vessels when and where to grow may allow thousands of Americans to avoid coronary bypass surgery. News of this therapy is expected in about three years.

HEART STRUCTURE DISORDERS

Heart structure disorders are quite common and can occur at any age. It could be congenital (present from birth), the result of an infection that could damage the heart muscle, rheumatic fever, or endocarditis (the inflammation in the lining of the heart). Heart disorders could result from infections or a heart attack.

CONGENITAL DEFECTS

A congenital defect can be the result of a mother contracting a viral infection, particularly the measles, during early pregnancy preventing the fetal heart from developing normally. These defects can also occur if the mother has diabetes that is not well-controlled, or the baby has Down's syndrome (mental retardation with various physical defects). Today, ultrasound screening has made it possible to detect some heart defects and make it possible to plan for necessary treatment before birth. Other defects are:

ATRIAL SEPTAL DEFECT

A hole in the septum separating the atria allows too much blood into the lungs. This is often seen in children with Down syndrome. Surgery is an option at age four or five.

COARCTATION OF THE AORTA

A narrowed aorta results in reduced blood flow to the lower body.

TETRALOGY OF FALLOT

This is an inborn heart problem made up of four structural defects: lung narrowing, heart wall defect of the lower chamber, malpositioned aorta, and enlarged right atria. The skin has a bluish cast accompanied with a heart murmur. Surgery for this condition has been successful and beneficial.

VENTRICULAR SEPTAL DEFECT

A hole in the septum separates the ventricles, which could allow the blood from the left ventricle to pump into the right ventricle. This allows too much blood to be pumped into the lungs. Occasionally, a small hole may close as the child grows, but larger holes require surgery.

HEART MURMURS

A heart murmur is an abnormal heart sound that commonly results when the blood flows through a defective heart valve. Some heart murmurs occur in children, or during an increased heart rate in a patient who is anemic or pregnant. These are usually short term and fainter than the murmurs caused by an abnormality in the structure of the valves.

TREATMENT In most cases, strenuous activity should be avoided but reasonable physical activity is usually encouraged.

SURGICAL TREATMENT Artificial valves and microsurgical techniques are used to repair severe valve disorders.

Valvotomy This procedure involves cutting into the valve defect so the valve can open and close properly. Prior to surgery, a catheter is inserted into the heart through a vein in the arm, allowing access to the valve.

Valve Replacement If the valve cannot be repaired, it may be removed and replaced with an artificial valve. This is done under a general anesthetic and has proven to be very successful. Because the heart-lung machine is used during this surgery, general recovery will take longer and be monitored closely. Replacement valves are made from metal and plastic, or from animal or human tissue.

HEART VALVE DEFECTS

The heart also has four valves. Two of the valves control the blood flow from the upper chambers (atria) to the lower chambers (ventricles, or pumping chamber). The other two valves control the blood flow out of the ventricles for circulation to other parts of the body. There are two types of disorders that can effect the heart valves. One is referred to as stenosis (narrow valve outlet), which could result from rheumatic fever, a congenital defect, or even aging.

The second is referred to as "incompetence," which is caused when the valves are not functioning normally or are insufficient. Because of this insufficiency, the divided sections of the valves fail to close properly. This could result from an infection, heart disease, or a prolapsed valve (falling or sinking from its normal position).

HEART RATE AND RHYTHM DISORDERS

A normal heart beats approximately 60 to 100 times per minute (not including periods of exercise or stress). If the heart rate becomes noticeably slow or fast (arrhythmia), it can be the result of a common heart disorder or thyroid problem. An irregular rate sometimes causes chest pain, breathing difficulties, palpitations, dizziness, or fainting.

DIAGNOSING AND TREATING THE CAUSE

ELECTROCARDIOGRAM (ECG) This is often used to detect the site and the type of arrhythmia. Electrodes (small electric recording devices) are placed on the chest, wrists, and ankles. These are connected by wires to the machine that traces the heartbeat. The ECG is done over a short time period and intermittent arrhythmia may not be detected.

HOLTER MONITOR A patient may be asked to wear a Holter monitor that can be attached to a belt around the waist. This is worn and monitored over a 24 hour period with any noticeable dizziness or pain recorded. An arrhythmia is either a "tachycardia" (heart beats more than 100 times per minute), or a "bradycardia" (heart beats below 60 times per minute). The patterns are also classified by rhythm (regular or irregular), the originating location in the heart, and the part of the heart that is affected.

DRUG TREATMENT Calcium-channel blockers slow down the impulses through the heart muscle and help correct some arrhythmias. Although these drugs stop the flow of calcium into the heart muscle fibers to improve the arrhythmia, they do not provide a cure.

Cardiac glycosides come from a plant and are most commonly called digitalis drugs. They reduce the heart rate by slowing the nerve impulses through the heart muscle. They can also make the contractions of the ventricles much stronger and increase the output of blood per heartbeat.

SURGICAL TREATMENT A surgical option is the insertion of a pacemaker — a battery-operated device that sends electrical impulses to the heart to promote regular contractions. One end of the pacemaker is inserted inside the right atrium and the other end is connected to a generator that is placed between the chest muscle and the skin. Some of these pacemakers are activated only when the heart beats abnormally while others are programmed to a constant and predetermined rate.

In the case of a life-threatening tachycardia, an implantable defibrillation device with three wires may be used. The generator is inserted under the skin of the abdomen, a wire is connected to the lower left side of the heart, and the wires are fed into the right atrium and ventricle to send electrical impulses to the heart for regular contractions.

HEART MUSCLE DISEASE AND HEART FAILURE

Heart muscle disease is most often caused by other heart disorders, but sometimes the muscle itself, or the sac surrounding the heart, can contract a disease.

ALCOHOLIC HEART DISEASE

Consuming large quantities of alcohol for many years may cause the heart muscle to malfunction. If the problem has not advanced to the point of heart failure, avoiding alcohol consumption would definitely change the progression of the disease.

DILATED CARDIOMYOPATHY

Due to the widening of the ventricles, the heart is weakened and does not pump forcefully. As a result, less blood is pumped and not enough oxygen reaches the body tissues. This may produce symptoms of congestive heart failure, breathlessness, and water retention resulting in swelling, mostly in the feet and ankles. In some cases, because of the enlarged ventricles, blood clots may form and travel to other parts of the body.

HEART FAILURE

Heart failure is the inability of the heart to pump the amount of blood required by the lungs and body tissues. Symptoms include cough, fatigue, edema (swelling), and breathlessness.

DRUG TREATMENT	There are several drugs that act to widen blood vessels, prevent fluid buildup, and strengthen the heart contractions. Heart failure can be right-sided or left-sided and depending on this, different symptoms will occur.
SURGICAL TREATMENT	Heart transplantation is usually performed on people under 60 years of age whose progressive heart failure has not responded to medication or past surgeries. The risks include infections and rejection of the donated heart. Before surgery, immunosuppressant drugs that help stop rejection of the organ are given and must continue to be taken for the rest of the patient's life.

HYPERTROPHIC CARDIOMYOPATHY

This disorder is usually inherited and is where the muscular walls of the left ventricle (main pumping chamber) become thick and stiff from an overgrowth of heart muscle. This impairs the flow of blood into the heart and the ejection of blood out of the heart.

DRUG TREATMENT	Calcium blockers, eg, verapamil, pain medication for chest pain. Electrocardiotherapy is used for abnormal heart beat.
SURGICAL TREATMENT	Surgery may be necessary for those who do not respond to drug treatment.

MYOCARDITIS

Acute myocarditis is an inflammation of the heart muscle and usually occurs as a complication during or after an infectious disease (polio, influenza, measles), rheumatic fever, or exposure to radiation or chemical irritants. Myocarditis can be very serious and the outcome depends on the type of infection. Severe cases can lead to cardiac failure and death, but in most cases, the inflammation will clear and good health will be fully restored.

DRUG TREATMENT	Oxygen, painkillers, anti-inflammatory drugs and rest will help to prevent heart failure or shock.

PERICARDITIS

The sac surrounding the heart is called the pericardium. Inflammation of this sac is commonly due to a viral infection or heart attack. Complications from rheumatic fever, cancer, tuberculosis, kidney failure, an autoimmune disease, or an injury from a penetrating wound could also result in pericarditis. The onset usually shows symptoms of fever, chest pain that moves to the neck or shoulder, a dry cough, and breathing difficulties.

DRUG TREATMENT	Treatment may include analgesics to relieve the pain. If swelling is present, diuretic drugs may also be given. If the underlying cause is a bacterial infection or other similar disease, antibiotics may be prescribed to treat that cause.
SURGICAL TREATMENT	Surgery may be required to take out the portions of the pericardium that have grown stiff and are limiting the work of the heart. The procedure is called pericardiectomy. Although the pericardium serves various purposes, the heart should continue to function normally even if the entire pericardial sac is removed.

CIRCULATORY DISORDERS

As the blood flows through the arteries and veins, it may be blocked. This is called a circulatory disorder. Blood flows in response to exercise, digestion, and changes in temperature. Structural defects such as weakened or thick arterial walls, or abnormal valve function, as well as blood clots or fatty plaques on the artery walls, can be responsible for this condition.

■ ACROCYANOSIS

Another related disorder, acrocyanosis, involves persistent coldness of the fingers, toes, or other affected tissues. Unlike Raynaud's disease, the affected areas are almost always cold. Excessive perspiration often accompanies the feeling of cold. For most people, treatment is rarely necessary but precautions can be taken. Avoid over the counter cold remedies and diet pills containing the drug phenylpropanolamine. If you use birth control pills, switch to another method of contraception because these drugs effect your circulation and make you more susceptible to attacks.

■ ANEURYSM

An aneurysm is a bulging in the wall of a blood vessel and is normally the result of hypertension (high blood pressure) or atherosclerosis (thickening and hardening of the artery walls). An aneurysm can occur in any part of the body but is most common in the large artery (aorta) of the heart. It can be the result of an infection, an injury, or it could be an inherited weakness. In older people, an aortic aneurysm normally occurs immediately below the kidneys, just above the abdominal aorta and arteries that supply the legs with blood.

■ ABDOMINAL ANEURYSM

Thought to be the result of atherosclerosis or hypertension, this aneurysm ordinarily has an accumulation of cholesterol, calcium, and even small blood clots. The weakened muscle fibers of the artery wall flake off and are replaced by scar tissue. Abdominal aortic aneurysms are more common in people over 60 years of age. Symptoms rarely occur at the onset but as it enlarges, it can cause pain in the abdomen and lower back. If the aneurysm ruptures, shock, loss of consciousness, and even death may be the result. If discovered in time, however, (through routine exams and x-rays) there are effective surgical procedures available to treat this disorder.

■ COMMON ANEURYSM

A common aneurysm forms when the muscle fibers in an artery are weak. Blood flows through this weakened area, the wall bulges, and it may rupture.

DISSECTING ANEURYSM

The aneurysm is caused by a division of the layers in the inner lining of the aorta, which allows blood to separate the middle and outer wall of the artery. As the walls thin from this process the artery may burst.

TREATMENT Because drugs are of no value in treating aneurysms, the treatment depends on the status of the aneurysm. If it is small and stable, watching it carefully with regular ultrasound examinations may be recommended.

SURGICAL TREATMENT Surgery on an emergency basis or preventative procedures are available to replace the diseased portion of the aorta with an artificial artery. The operation is relatively safe when performed prior to a rupture. Less than one-half survive in those operated on after a rupture.

BUERGER'S DISEASE

Buerger's disease is a rare disorder in which the blood vessels of the hands and feet become diseased and tender. Over time, pain, ulcers, or moist gangrene may develop and eventually amputation is needed. This occurs because of the blockages in the blood vessels that supply the extremities. The disease characteristically strikes men between ages 20 and 40.

TREATMENT Absolute and continued abstinence from all types of tobacco is extremely important. Avoid the use of the affected limb, extreme temperatures, drugs that diminish the blood supply to the extremities, possible traumas, or infections. Patient should walk for at least 30 minutes twice a day UNLESS gangrene, pain, or ulceration is present — this requires complete bed rest. For nerve spasms, there are various injections for blocking the nervous system.

EMBOLISM

An embolism is a defect where a blood clot travels through the bloodstream and becomes impacted in a blood vessel.

Pulmonary Embolism An embolus may travel from the veins of the leg or pelvis and through the heart to a pulmonary lung artery. If it is blocked by a foreign matter such as fat, air, tumor, or a blood clot, the obstruction would deprive the lung of required oxygen and could be life-threatening.

Thrombus Embolism This is a formation of platelets (smallest cells in the blood) attached to the inside wall of an artery or vein. A formation can take place in the deep leg veins due to slowed blood flow from a surgery or from being immobile for a long period of time.

DRUG TREATMENT	Blood thinning medications are used.
SURGERY TREATMENT	If thinners are not successful, surgery is sometimes necessary to remove the embolism.

FROSTBITE

When your skin and the underlying tissues freeze, the condition is called frostbite. The areas of the body most often affected are the hands, feet, nose, and ears. Frostbite occurs when exposed to extremely cold temperatures for a sustained period of time (several hours or more), but people with circulatory problems, such as atherosclerosis, are at greater risk. In some cases, the blood vessels have been damaged and immediate treatment can reverse this damage. However, in some instances, amputation of the frostbitten area is required.

TREATMENT	Wearing proper clothing in cold conditions can prevent most episodes of frostbite. Be sure to protect your hands, feet, nose, and ears. Avoid consuming large amounts of alcohol when you are exposed to prolonged cold. If your fingers or other areas are frostbitten, seek professional medical treatment immediately. NEVER immerse the affected body part in hot water. In severe cases with infection, antibiotics may be necessary. Bed rest and physical therapy may be appropriate. Do not smoke during the recovery.

RAYNAUD'S DISEASE

Raynaud's disease results from changes in circulation in the hands and the feet when exposed to the cold. It is a normal reflex mechanism for the blood vessels in the extremities to narrow when exposed to cold. However, for unknown reasons in Raynaud's disease, this response is exaggerated resulting in a stinging pain and turning the fingers or toes white upon exposure to cold; the nose and ears may also be affected. The skin may even turn blue or red before it recovers. Fortunately, the changes are reversible and can be more of a nuisance than a disability. Only rarely are there any long term serious consequences such as gangrene or ulcers of the fingertips. Women are four to five times more likely to develop the problem as men.

TREATMENT

Protection from the cold is essential. Dress warmly when exposed to cold, making sure to protect the entire body including the head, hands, and feet. Do not smoke -- the nicotine in tobacco decreases blood flow in your skin. Use insulated glasses for cold drinks and keep a pair of mittens or gloves by the freezer to use when handling cold containers. Run your car heater for a few minutes before driving in cold weather. Vasodilators sometimes help.

THROMBOSIS

Thrombosis is an abnormal blood condition causing a blood clot to form in a normal blood vessel, artery, or vein that is inflamed. It causes pain and damages the tissue that depends on that vessel. A coronary thrombosis can cause heart attack and death.

DRUG TREATMENT

Anticoagulants (warfarin and heparin) are given to patients whose blood has a tendency to clot, especially for those who have just had surgery. Although these drugs do not dissolve clots, they do prevent new clots from forming.

VARICOSE VEINS

Varicose veins are abnormal veins which range in size from tiny spider veins to large, bulging veins which can be up to an inch in diameter. Although the exact cause is unknown, heredity is a major contributing factor. Other know factors for varicose veins are obesity, prolonged periods of sitting or standing and pregnancy. These veins are caused when defective valves cause the blood to back up and collect in the superficial veins that are closest to the surface of the skin, and can cause a multitude of symptoms such as swelling, cramping, pain, throbbing, achiness an exhaustion.

TREATMENT	For varicose veins that are under 2mm in size, there are several treatment options.
	Sclerotherapy consists of an injection of a solution into the vein which eventually shrinks and destroys it.
	Laser destruction of the vein.
	Combination of both sclerotherapy and laser treatments for severe varicose veins.
SURGICAL TREATMENT	The procedure generally used is removal (stripping) of the veins
HOME TREATMENT	Elevating your legs and wearing support or elastic hose, avoiding sitting or standing for long periods, and watching your weight will alleviate some of the symptoms.