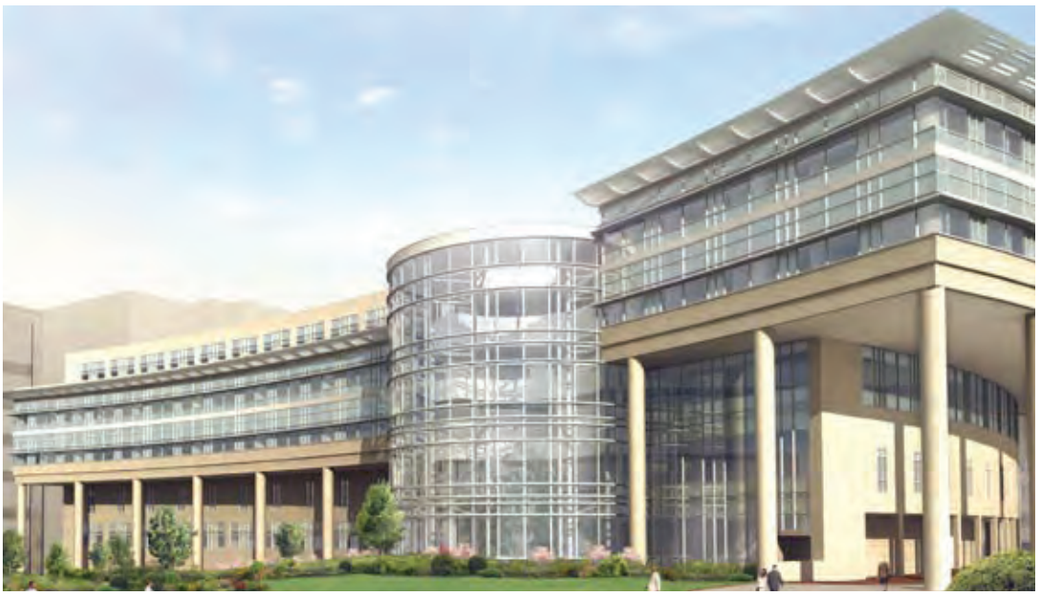


Heart Surgery Information for Patients and Their Families

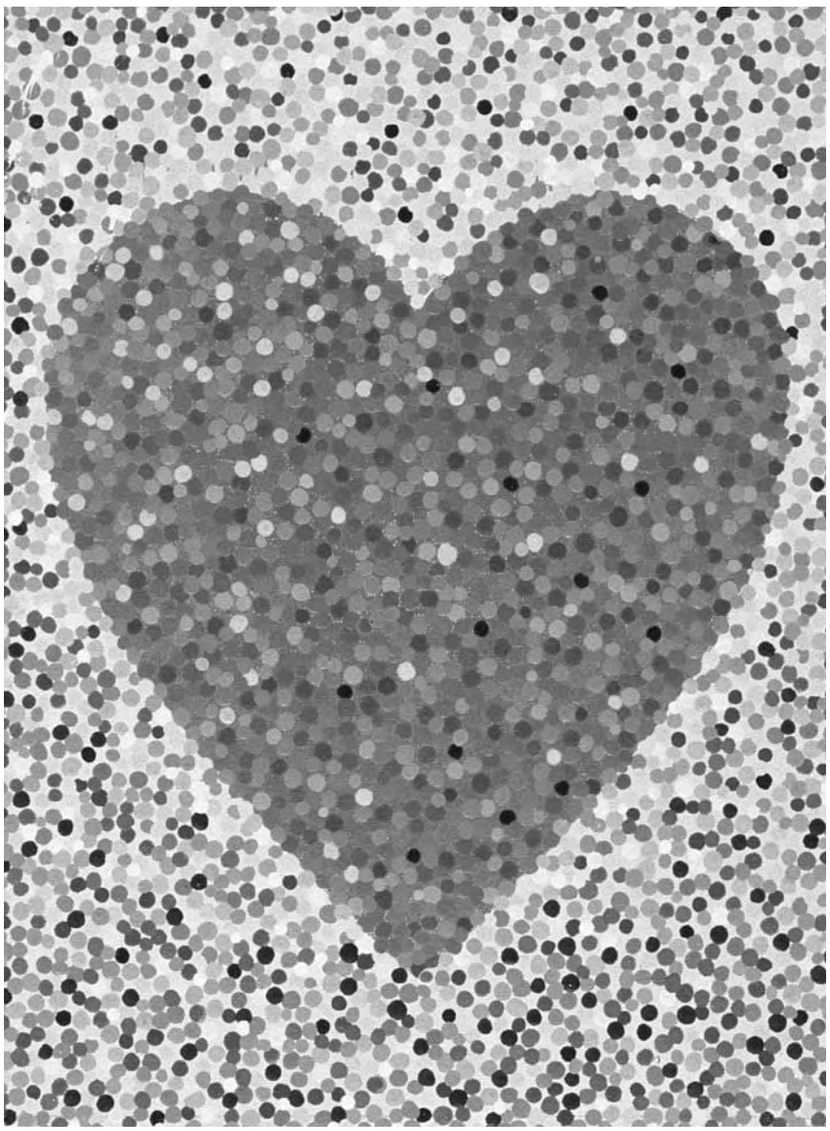
University of Michigan
Cardiovascular Center

Welcome to the University of Michigan Health System. As one of the nation's leading hospitals, we perform more than 1,000 heart operations annually. Our highly trained physicians, physician assistants, nurses, dietitians, physical therapists and other care-givers work together to offer the expertise and resources required to make your operation and hospital stay both comfortable and successful.

You are both a valued patient and a very important member of your health care team. We expect that you and your family will have many questions and concerns about your diagnosis and treatment. This booklet is designed to answer many of them. However, please ask us for further information or help at any time.

Table of Contents

Please read this booklet and bring it with you to the hospital.



Information About Your Operation

Your surgeon has given you a date and time for your operation. The date and time may occasionally change because of unexpected emergencies. If this happens, we will reschedule your operation as soon as we can. We apologize for any inconvenience this may cause.

How Your Heart Works

Your heart is a muscular pump about the size of your fist located slightly to the left and behind your breastbone. Its main function is to pump blood throughout your body. As your heart beats, the walls of the heart squeeze sending nearly 12 pints of blood throughout your body every minute. In a normal heart, it takes less than one minute for blood to travel from your heart to your big toe and back. In that minute, your heart will beat 60 to 80 times.

Your heart consists of two sides and four chambers. The right side receives blood from the body that is low in oxygen and sends it to the lungs where carbon dioxide, a waste product, is removed and oxygen is added. The left side receives blood rich in oxygen and pumps it back into the body. Blood circulates through a series of arteries to the tissues where cells receive the oxygen and nutrients they need to function.

The two top chambers of the heart (atria) act as reservoirs or holding places for blood coming back from the body and lungs through the veins. The two bottom chambers (ventricles) pump blood out of the heart into the arteries of the lungs and body. Blood flows from the upper to the lower chambers and then into the body and lungs through valves that normally allow blood to flow in only one direction.

Types of Heart Problems and Surgical Procedures

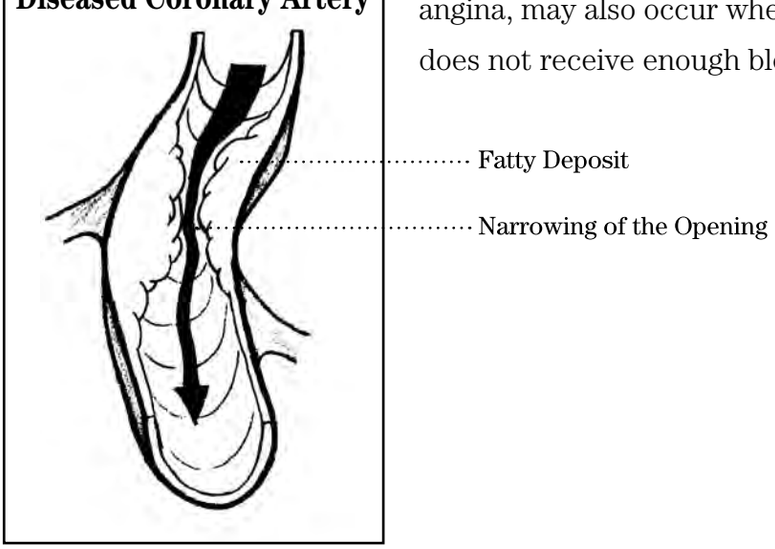
Several problems involving your heart and circulatory system can develop. The following are descriptions of some common heart problems and the surgical procedures used to correct them.

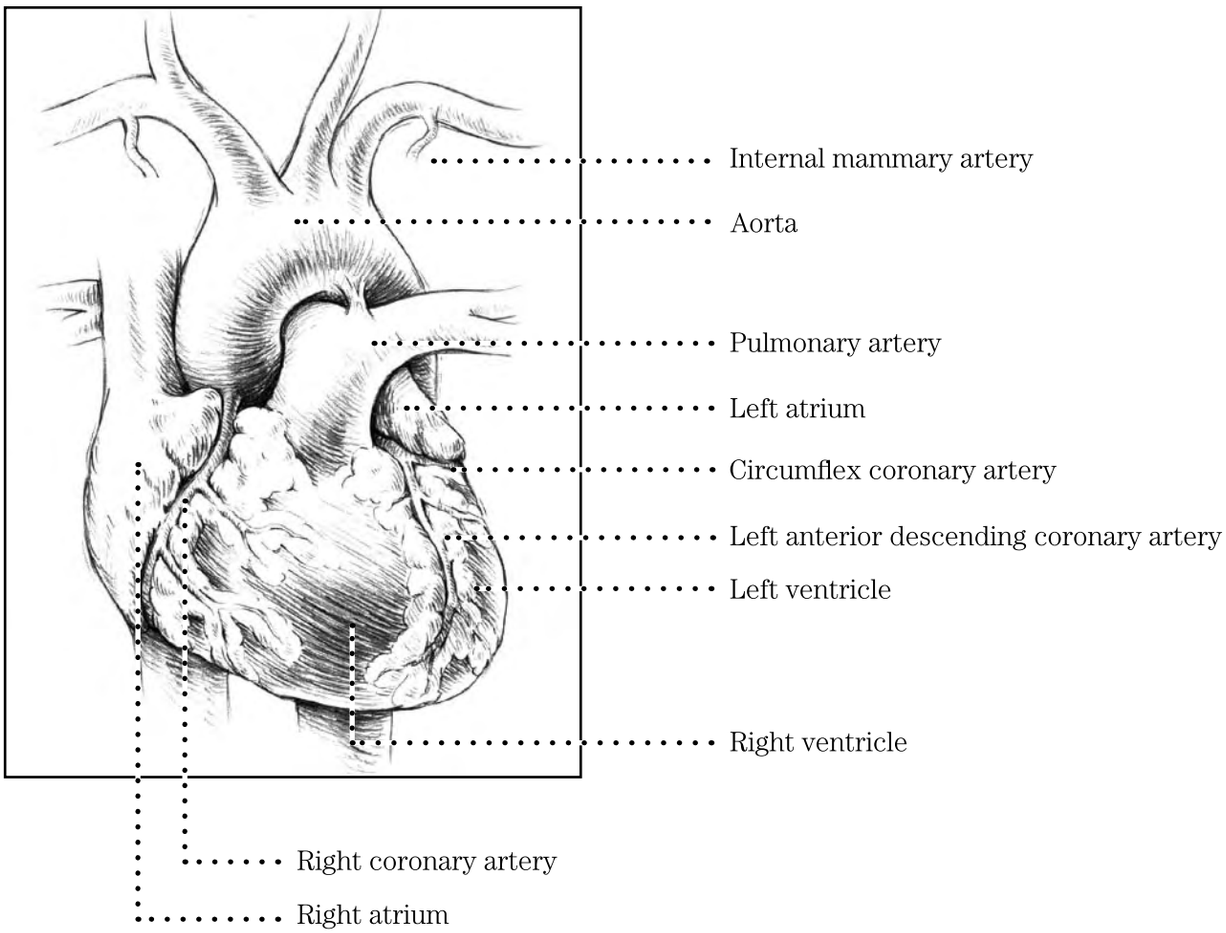
Atherosclerosis or Coronary Artery Disease

Coronary arteries are small vessels on the outside of the heart. These arteries are about the same size as a piece of thick spaghetti and supply blood to the heart muscle. If fatty deposits build up inside these arteries, they may narrow and lose their ability to expand when called upon to deliver blood. This condition is called atherosclerosis, hardening of the arteries, or coronary artery disease.

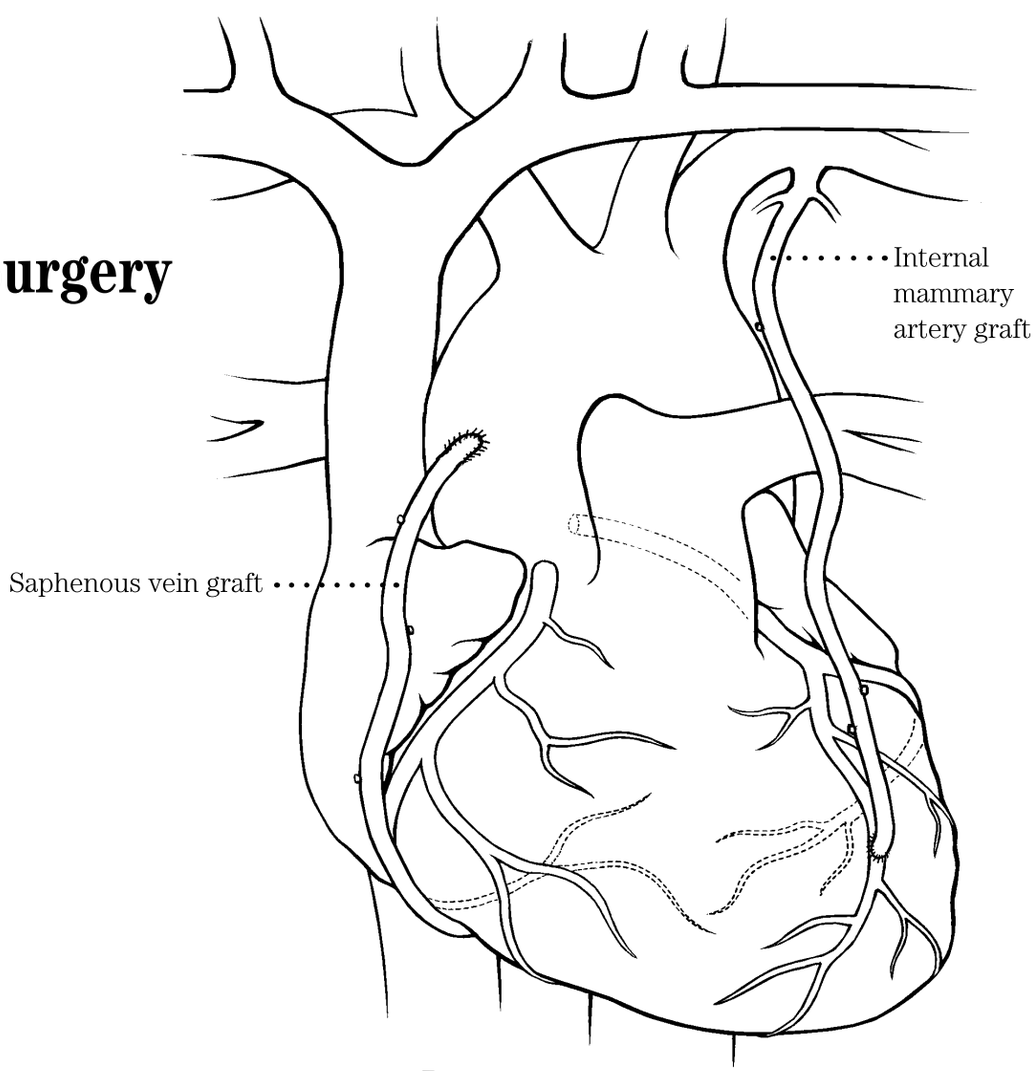
Your heart muscle needs blood to function. If the coronary arteries are blocked, the muscle beyond the blockage starves for blood (and therefore oxygen) and may die. If the muscle dies, the result is what we commonly refer to as a heart attack. Chest pain, or angina, may also occur when the heart muscle does not receive enough blood.

Diseased Coronary Artery





Bypass Surgery



Coronary Artery Bypass Graft Surgery

Coronary artery bypass grafting (CABG) is performed to bring a new blood supply to the heart muscle. New grafts bring blood and nutrients to the muscle of the heart by directly bypassing the blockage. The grafts act like a highway detour, carrying traffic around a blocked road. To perform the operation, the heart may be stopped or "arrested" and you will be placed on circulatory support, commonly called cardiopulmonary bypass or the heart-lung machine. This support works in the place of your heart and lungs to circulate blood flow to your body and provide oxygen. In some patients coronary artery bypass grafting is performed on a beating heart. The heart is not stopped during the operation and the patient is not placed on cardiopulmonary bypass. This technique is not for all patients, so please discuss the options with your surgeon.

You may require one or more of your arteries to be bypassed. The grafts used to construct a bypass usually come from the greater saphenous vein (in the legs), the internal mammary artery (in the chest wall) or the radial artery (in the arms). The location and size of the blockage determines which graft is most appropriate.

There are several systems of veins in your legs. If the greater saphenous vein is used, the other systems take over to provide adequate blood return from the legs. Blood flow into the leg is not harmed by the removal of the vein. When used, one end of the removed vein is sewn onto the aorta and the other end is sewn or grafted onto the coronary artery below the blockage. If the mammary artery is used, one end remains attached at its origin and the other end is sewn onto the coronary artery below the blockage.

It is possible for the new bypass grafts to become blocked after bypass surgery. However, new blockages are less likely if a healthy lifestyle is followed after the operation. ***(See diagram on the previous page for the location of the coronary arteries.)***

Heart Valve Disease

One-way valves separate the filling and pumping chambers on each side of the heart and each pumping chamber has a one-way outflow valve. These four valves each have two or three tissue flaps called leaflets that act as doors that open and close to ensure that blood flows only in the proper direction. (**See diagram on page 11.**)

Left sided valves:

mitral valve: between the left atrium (filling chamber) and the left ventricle (pumping chamber)

aortic valve: between the left ventricle and the aorta (a large artery that takes blood to the rest of the body)

Right sided valves:

tricuspid valve: between the right atrium (filling chamber) and the right ventricle (pumping chamber)

pulmonic valve: between the right ventricle and the vessels leading to the lungs

Valve problems that exist from birth are called congenital malformations. Other valve deformities are not acquired until later in life when conditions, such as an infection, can invade or damage the valve leaflets or doors. The natural aging process may also weaken already damaged valve leaflets or harden normal valve tissue.

Valve problems produce many symptoms. Faulty heart valves can cause dizziness, shortness of breath, fatigue, irregular heartbeats, fluid buildup, strokes and heart attacks. Tests such as an echocardiogram or a cardiac catheterization can show if heart valves are not functioning properly.

Mitral Valve Disease

The mitral valve is located between the left-sided filling chamber (atrium) and the pumping chamber (ventricle). This valve consists of two leaflets that allow blood to flow from the lungs to the heart. The most common problems affecting the mitral valve are the inability of the valve to completely open (stenosis) or close (insufficiency). Injury to your mitral valve leaflets or chordae (small muscles that support the valve) can be caused by a heart attack, infection or illnesses such as rheumatic or scarlet fever. When blood flows backward through the mitral valve (regurgitation), it is pushed into the lungs, greatly increasing the workload of the heart and causing shortness of breath. (See diagram on page 11 for the location of the mitral valve)

Mitral Valve Surgery

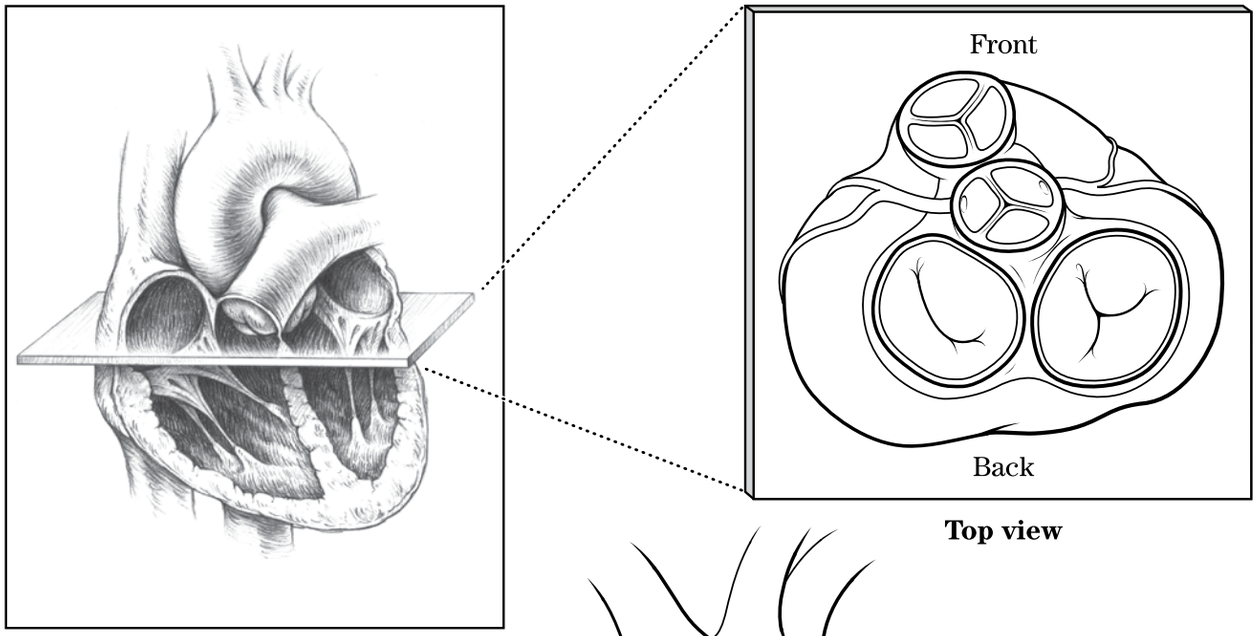
Your surgeon will determine whether your mitral valve should be repaired or replaced. A repair consists of reconstruction of the leaflets and/or the chordae. A reinforcing ring (2a) is placed around the edge of the valve to help it maintain proper size and shape while correcting the flow of blood. If the mitral valve cannot be repaired, the surgeon will replace your valve with an artificial one made from either synthetic mechanical (5a, 6a) or bioprosthetic (4a) tissue. Many factors, including your age, size and medical condition, determine the type of valve that will be used. (See diagrams on page 11 for the types of valves available)

Atrial Fibrillation Correction Surgery (Maze or Cox-Maze)

Atrial fibrillation is the most common irregular heart rhythm. This rhythm starts at the top chambers of the heart (atria) and instead of traveling through the heart in an orderly fashion, many impulses are sent causing an irregular heart beat.

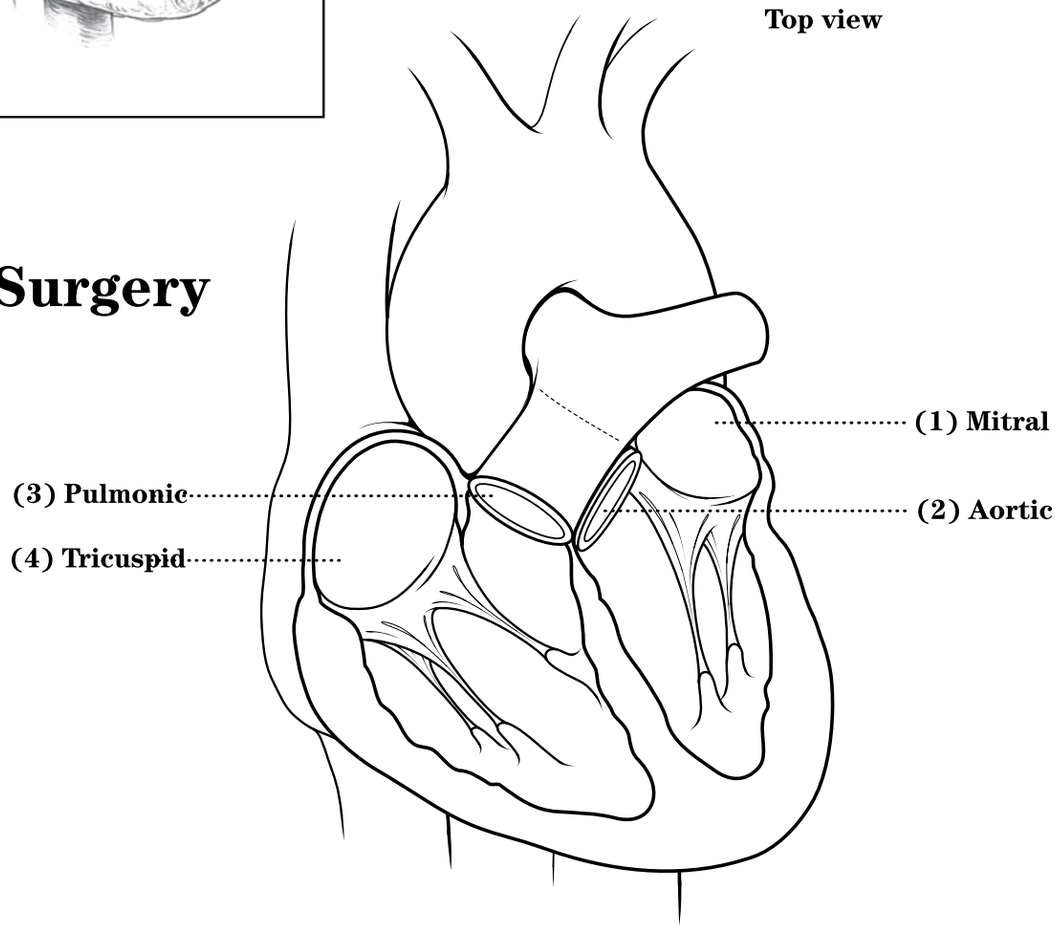
The Maze procedure can be done by itself or along with other open heart operations. During the operation, incisions or lesions are created in the top chamber or chambers of the heart to interrupt the conduction of abnormal impulses. This creates a “maze” which makes only one path for the impulse to travel.

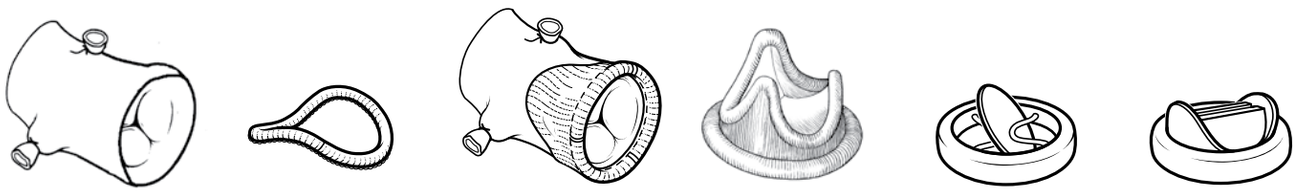
It can take up to 6 months for a patient to resume a normal rhythm after this operation. You may be on medication to help keep your heart regular.



Top view

Valve Surgery





Homograft (1a) | **Annuloplasty ring (2a)** | **Freestyle Bioprosthesis (3a)** | **Bioprosthetic Valve (4a)** | **Medtronic-Hall (5a)** | **St. Jude (6a)**

Aortic Valve Disease

The aortic valve is located between the left ventricle and the aorta. This valve allows blood to flow from the heart to the body and consists of three leaflets, which open and close with each heartbeat. The inabilities to close or open completely are the two major problems with this valve.

To compensate for aortic stenosis (restricted opening), the heart has to squeeze harder to support normal blood flow. Over time, this extra work causes the heart muscle to enlarge. Eventually, as the narrowing increases, the heart begins to fail. Symptoms of aortic stenosis are shortness of breath, fainting episodes due to a lack of blood flow to the brain, chest pain due to a lack of blood flow to the heart and sudden collapse due to irregular heart rhythms. Insufficiency occurs when the aortic valve does not completely close and blood flows back from the aorta into the heart. (See diagram on page 11 for the location of the aortic valve.)

Aortic Valve Replacement

Aortic valves are normally replaced because it is rare that they can be successfully repaired. Three types of replacement valves are available: human, bioprosthetic (tissue) and mechanical.

Human valves (1a) are obtained from donors after death. These valves are superior to both mechanical and bioprosthetic valves as they are most like the natural aortic valve. Blood thinners are not necessary with these valves. They have longevity of 10 to 15 years.

Bioprosthetic (3a, 4a) (animal) valves are sterilized for human use and do not require long term blood thinners. Stroke and bleeding problems rarely occur with this type of valve. However, the longevity of these valves (10 – 15 years), may be less than that of synthetic valves.

Mechanical valves, (5a, 6a), which last the longest, are synthetic and made of plastic, cloth and metal. The moving parts are coated to help prevent the formation of a blood clot on the valve. Blood thinners (Coumadin®) must also be taken to prevent clot formation. Stroke or bleeding problems may occur with mechanical valves, so strict follow up with a physician is needed to monitor blood-thinning medication.

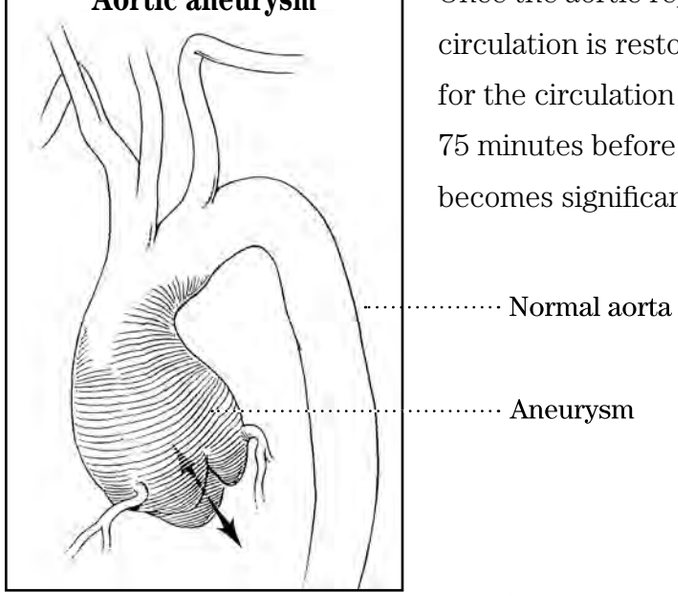
Aortic Aneurysm

The aorta is the largest artery in the body. All of the arteries that carry blood to the body branch off from the aorta. These branches carry blood to the head, neck, arms, legs and vital organs such as the kidneys, liver and brain.

An aneurysm is a weakening or ballooning of the wall of an artery. In an aortic aneurysm, the weakened area can rupture resulting in death. Aneurysm complications include rupture with severe bleeding, infection and clot formation with emboli (clots that have broken free and entered the bloodstream). Tearing and separating of the layers of the aorta (dissection) can block the blood supply to major organs causing damage to vital organs such as the brain, kidney or liver. An operation is needed to replace the damaged part of the aorta. A piece of synthetic material (Dacron®, Teflon® or Gortex®) or a piece of cryopreserved (freeze-dried) aorta from a human donor can be used for repairs.

For patients with dissection or aneurysm that extends into the aortic arch, hypothermic circulatory arrest may be used. During this procedure, the body temperature is lowered to 18°C (64°F) and all circulation is stopped. Blood is pumped to the brain through veins (rather than the arteries) to protect the patient from neurologic injury. Once the aortic repair is finished, circulation is restored. It is generally safe for the circulation to be stopped for up to 75 minutes before the risk of stroke becomes significant.

Aortic aneurysm

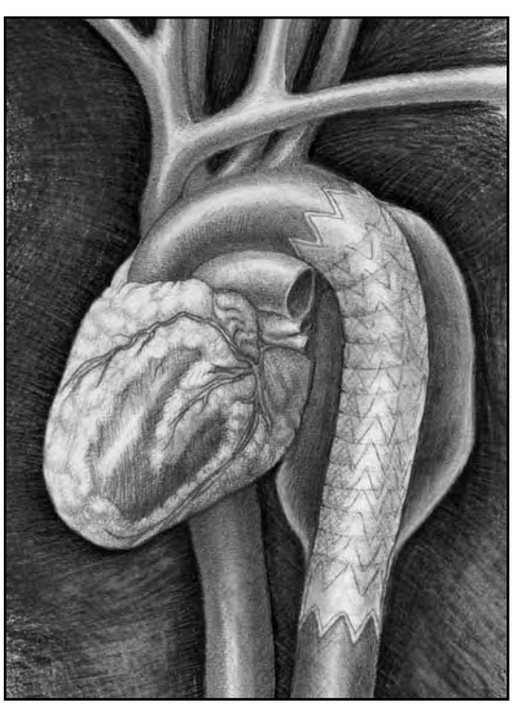


For some patients, having traditional open surgery to repair a damaged aorta may not be the best option. In these cases, your surgeon may suggest a relatively new procedure called “endograft placement” to treat your aortic aneurysm more safely.

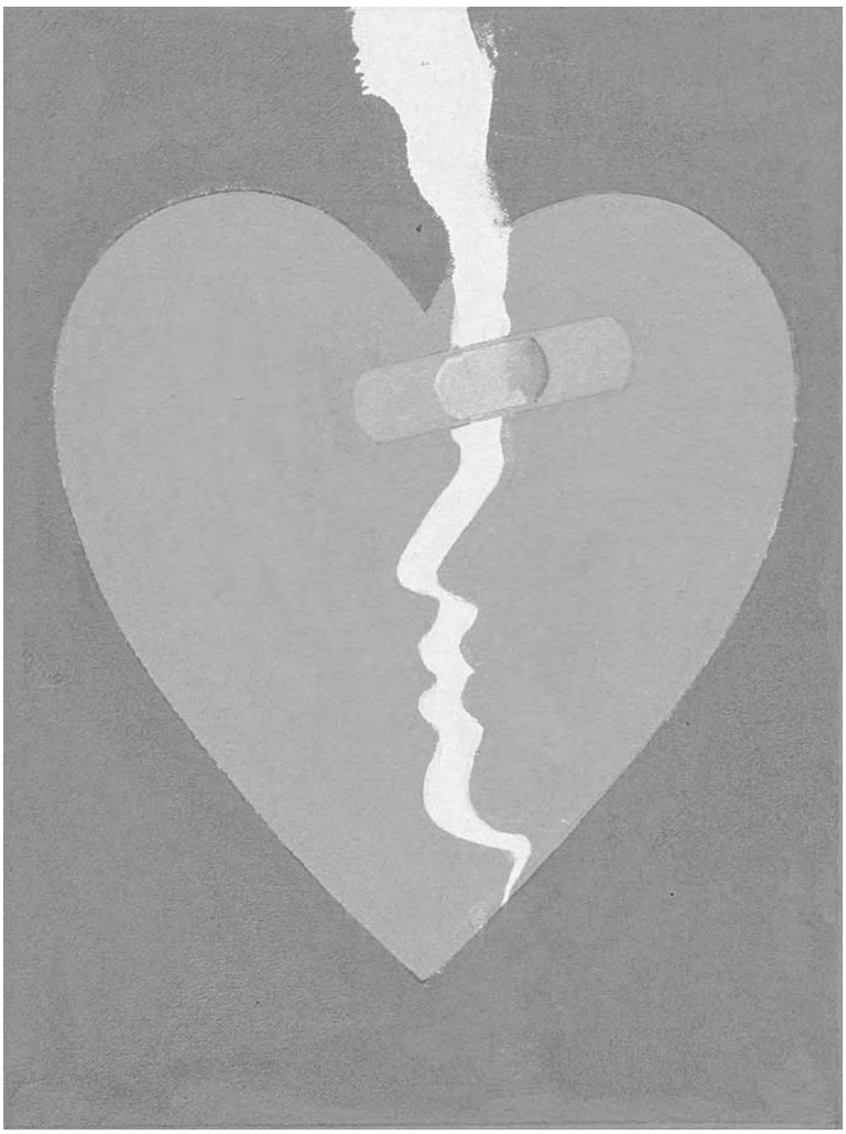
An endograft is a tube of strong synthetic material that is placed inside your aorta to strengthen and seal off the weak area, making a clear path for blood flow. Although this procedure is less invasive than traditional surgery, not all aortic aneurysms can be repaired this way. Factors that help your surgeon determine the best treatment options for you include the size and location of your aneurysm, and the overall state of your health.

To determine if you are a candidate for an endograft placement, you will first need a special CT scan of the aorta to precisely measure the size and location of your aneurysm. On your day of surgery, an endograft, specifically made to fit your aorta, will be inserted through a small incision in your groin or lower abdomen. The procedure is usually performed using general anesthesia, and patients typically go home in 3 to 5 days.

Although FDA approved, the long-term safety and benefit of endovascular repair has not yet been established. Patients may need to have additional treatments for complications related to this type of procedure. One complication, called an “endoleak”, occurs when blood continues to leak into the aneurysm. In addition, your remaining aorta could develop another aneurysm in the future, requiring additional treatment. Your surgeon will work with you to determine the best treatment option for your situation.



Wendy Baker © 2007



Preparing for Your Operation

Between Now and Your Operation

Keeping in mind that every surgical patient's experience will be slightly different, the following are the general guidelines that will most likely be set by your doctor.

- **DO NOT SMOKE** for at least four weeks before your operation.
- **MEDICATION**
  - If you are taking any aspirin or aspirin containing products, please contact your surgeon's office to determine ***if*** and when you should discontinue this medication.
  - Do not take Plavix or Persantine for 7 – 10 days before your operation unless otherwise instructed.
  - Do not take any nonsteroidal antiinflammatory products (Advil, Ibuprofen, Nuprin, Aleve) for 2 weeks before your operation.
  - **DO NOT TAKE** any Coumadin® for 5 days before your operation unless otherwise instructed.
  - **IF YOU HAVE ANY QUESTIONS ABOUT YOUR MEDICATIONS PLEASE CALL YOUR SURGEON'S OFFICE.**
- **DO NOT DRINK ANY ALCOHOLIC BEVERAGES** for at least 48 hours before your operation.
- You may be asked to see a dentist prior to your operation if you have not seen one recently or have any problems. This is important to prevent any infection after the operation. You may also need to take antibiotics before the dental appointment. Ask the nurse if you have any questions.
- Contact your **INSURANCE** company to see if **PRE-CERTIFICATION** or a second surgical opinion is required prior to your operation. You must bring the appropriate paperwork with you to the hospital prior to the operation.

Blood Transfusion Options

Arranging for Donations

Patients scheduled for an operation at the University of Michigan Health System can donate and/or collect a limited amount of blood to be set aside specifically for use during their procedure. Arrangements can be made through your local American Red Cross.

The University of Michigan Health System will accept autologous (self donated) and directed donor (donors you choose) blood from Red Cross and community blood centers across the nation that are licensed to ship blood interstate. Notify the Blood Bank at the University of Michigan Health System of your request so that shipping arrangements can be made. To do this, the patient MUST have a University of Michigan registration number and the units must be labeled with this number.

A Final Consideration

The costs of these options vary and most of these costs are passed on to the patient. The cost of processing autologous and directed donor blood as well as freezing blood can be costly and is not covered by most health insurance policies.

It may be beneficial to discuss these options with your doctor or the Blood Bank at the University of Michigan Health System, as well as your insurance provider.

Pre-Operation Exercise

Practicing your exercises before and after your operation is important and will help you to be active in your recovery. Remember, no one can breathe or cough for you. Doing the exercises is important in getting yourself well and home. Practice these exercises several times each day.

Breathing exercises help prevent pneumonia. They keep your lungs open and clear of mucus. Start once you are comfortable, relaxed, and able to focus. Place your hand on your abdomen (tummy) or ribs, so that you expand the right area.

Using the Breathing Machine (Incentive Spirometer)

Before your operation, you will receive an incentive spirometer. You should practice with your breathing machine (incentive spirometer) several times each day. Your breaths should be slow and deep.

- Do not compare your results to those of other people. Many factors can change the volume a person can achieve on this machine.
- Have your incentive spirometer at your bedside immediately after your operation so that you can use it as soon as you wake up.
- When you are discharged, take the incentive spirometer home and use it until you return to clinic.

Coughing

- Take two deep breaths in through your nose and out through your mouth.
- On the third breath, breathe in deeply and then give two or three sharp coughs before taking another breath.
- You should feel your abdominal muscles tighten each time you cough. Be sure to spit out any mucus your cough produces.
- When coughing, support your incision with your hands or a folded blanket.

Leg Exercises

In addition to your breathing exercises, it is important to maintain muscle tone and promote good circulation in your legs. After your operation, the following exercises should be performed many times daily until you are walking frequently.

- Pump your ankles up and down, with your legs resting flat on the bed. Do this every hour you are awake.
- Tighten the muscle on the front of your thigh as you push your knee down into the bed. Hold for a count of three. Relax. Repeat, alternating legs. Do this every hour you are awake until you are walking several times per day.

The Day Before Your Operation

- Notify the nurse or surgeon's office of the telephone number where you can be reached the night before your operation. In the rare situation when your operation may need to be rescheduled, a contact number is important.

- **DO NOT DRINK OR EAT ANYTHING** after midnight. This includes water, coffee, milk, juice, gum, hard candy or food of any kind. You may have sips of water up to 2 hours before arrival time.

- Take a shower the evening before or the morning of the operation.

- Report any symptoms of flu, cold or infections to your surgeon. It is important that you be in optimal health for this operation.

- Do not bring any valuables to the hospital (money, credit cards or jewelry).

- Practice the exercises and use the breathing machine several times a day.

Your Hospital Stay

As you prepare for your operation, please feel free to ask any member of your health care team about any last minute questions or concerns. Your health and comfort remain our top priorities. We will do whatever we can to reduce your worries and make your stay a positive experience.

Things to do the Day of the Operation

Please carefully review each of the following:

- Bring your breathing machine (incentive spirometer) and this booklet with you to the hospital. Your family should give the breathing machine to the intensive care unit nurse.
- If you did not shower the previous evening, please do so before coming to the hospital.
- Do not eat or drink anything. You may have sips of water up to 2 hours before arrival time.
- Take the medications (with just a few sips of water) that the clinic nurse told you to take.
- Brush your teeth.
- Remove all jewelry and leave it at home.
- Do not wear any make-up.
- Remove all types of contact lenses. Bring your glasses and contact case with you to the hospital.
- Remove dentures and/or wigs. Give them to your family.

When You Get to the Hospital

After you have checked into the hospital, you will be directed to the preoperative holding area where you will change into a hospital gown and have your chest and legs shaved. You will meet your anesthesiologist, who will review your medical records, paying special attention to past anesthetic experiences. He or she will also thoroughly review all tests or studies performed up to that point. The anesthesiologist will then examine you and discuss the plan for your anesthesia in detail. The anesthesiologist will place IVs and/or tubes needed to perform your operation. You may be given a mild sedative that will make you feel quite drowsy and comfortable. After these lines are placed, you will be taken to the operating room. Here you will notice many complex pieces of equipment. The room is often quite cool. At this point, preparations will be made to deliver the anesthetic that will allow you to tolerate your heart operation in a safe and comfortable manner.

EKG stickers, a blood pressure cuff, and an oxygen sensing finger clip will be placed and you will be asked to breathe oxygen by a mask. You will then be made completely unconscious and pain-free for the duration of your operation. A breathing tube and urinary catheter will be placed after you have been deeply anesthetized. At the conclusion of the operation, you will be asleep and will be transferred to an intensive care unit. A machine will breathe for you through the breathing tube until you are breathing on your own (possibly overnight) and your vital signs are stable (usually 4 – 6 hours). By the time you have awakened from your anesthetic, the breathing tube will usually be gone. You cannot talk when this tube is in place and you may have a scratchy throat for a few days after its removal.

After Your Heart Operation

Following your operation, you will be taken to the cardiovascular intensive care unit (CVICU), an area specifically designed for patients who have undergone open-heart surgery. Your family can visit you while you are in the ICU. Specific opportunities for visiting will be given to your family after your surgery. They will need to check with the nurses' desk prior to visiting you in the ICU.

When you wake up, you may notice the following:

- Various tubes will be in place. These tubes are necessary to monitor and support you throughout your recovery.
- Different noises such as alarms and people talking. While these noises may be bothersome, they are quite normal for an ICU.
- Your wrists may be restrained (loosely tied to the bed) until you are fully awake. This may be necessary to prevent you from accidentally pulling out your tubes.

When your family comes to visit you for the first time, they may notice the following:

- Your skin color may look pale.
- Your skin temperature may be very cool to the touch.
- Your body, especially your neck, may appear puffy or swollen.
- You may remain under the effects of anesthesia and may not be awake for a few hours or longer. You and your family should not be alarmed by these variations. Every patient is affected by anesthesia differently.
- Your bed will be surrounded by equipment to monitor your status.

Tubes and Equipment in the ICU and Step-Down

After your operation, you will awaken to a team of health care professionals and an array of equipment. In addition, many tubes will remain connected to you immediately after the operation. Following is a brief description of some of these tubes and what you can expect upon awakening.

Endotracheal Tube (breathing tube) and Ventilator (breathing machine)

This tube will be inserted through your mouth into your trachea and connected to a ventilator. The ventilator is the machine next to your bed that will breathe for you while you are still under the effects of anesthesia. There are many alarms that may sound while you are on the ventilator. The respiratory therapist or the ICU nurse answers these alarms. While the alarms may be distracting, they do not always mean that something is wrong.

Nasogastric Tube

The nasogastric tube (N.G. tube) is a long flexible plastic tube that is inserted either through your nose or mouth, down into the stomach. This tube keeps your stomach empty while you are on the ventilator and is usually removed at the same time as the endotracheal (breathing) tube.

Chest Tubes

After your operation, it is normal for some blood to drain from your chest into the area around your heart and lungs. Chest tubes will drain any excess blood or fluid that may accumulate. The tubes are removed when all bleeding or accumulation of fluid has decreased – the specific time will vary person to person. (It is typically 1 – 2 days.)

Urinary Catheter

The urinary catheter drains urine from your bladder. The catheter is inserted after you have been put to sleep in the operating room and is typically removed one or two days after the operation.

Heart Monitor

Following your operation, a heart monitor will be attached to you for several days to provide a continuous record of your heart rhythm and rate. Monitors will be located at your bedside and at the nurses' station. If an alarm sounds, it does not necessarily mean there is a problem with your heart.

Pacemaker

Most patients will have temporary pacemaker wires that exit the body through the skin and are attached to a pacemaker box after the operation. It is often necessary to speed up your heart for a few hours or days after the operation or until your heart's natural rhythm returns. The pacemaker wires are usually removed the day before your discharge, but again, this may vary.

Pulmonary Artery Catheter (sometimes called Swan Ganz-monitoring catheter)

The catheter is inserted into a large vein in your neck, providing a way to monitor your heart's function and to deliver medications quickly to your bloodstream. It is usually removed one to two days after the operation.

Intravenous Catheters (I.V.)

You probably will have at least two intravenous catheters in your arms to provide fluid, nutrients and medications. These catheters usually stay in until you are ready to be discharged.

Arterial Line

The arterial line is inserted into an artery, usually in your wrist or groin. It provides a means to record your blood pressure on the monitor and access to blood samples without repeated needle sticks. It will be removed before you are transferred from the intensive care unit.

Intra-Aortic Balloon Pump (IABP)

While very rarely needed, this device is sometimes inserted into the aorta through an artery in your groin. The pump decreases the workload of the heart, giving it time to rest and recover. If you require this device, you will remain on strict bed rest until your surgeon determines that the IABP is no longer needed. This device also changes the time frame for removal of other equipment and progression of your activity levels.

Support Stockings

Support stockings (sometimes referred to as TEDS) will be applied to both of your legs the day after your operation. These stockings are prescribed during the recovery period to prevent blood clots from forming in your legs. Do not cross your legs, as this can cause blood clots. The stockings should be worn for four to six weeks following your operation.

Incisions

There are two types of incisions that are used. The chest incision is located along the entire length of your breastbone (sternum). The sternum is divided, or opened, in order to expose the heart. After the operation, the bone is permanently wired together. You may feel a slight clicking or popping sensation in the breastbone when you move. The sternum, much like any other broken bone, will take eight to twelve weeks to heal. The clicking sensation will disappear shortly after discharge. The other incision is called a thoracotomy incision and is on either the right or the left side of the chest, between the ribs. After coronary artery bypass surgery, you may also have a leg incision extending along part (or the entire length) of both legs or an arm incision extending between the elbow and the wrist. Please elevate your legs so your toes are above the level of your heart. This will help to decrease leg swelling.

Women need to wear a loose fitting front closure bra beginning on the second day after your operation. This will provide support and reduce the stress on your chest incision. At times, you may also hear your heart pounding loudly. This is normal. The sac that surrounds your heart normally contains fluid. During the operation it is opened in order to gain access to the heart. Once this area heals the rubbing or pounding noise will go away.

Pain

You will experience soreness and muscle aching in your chest, back, shoulders and legs. Your physician will order pain medication for you to take at prescribed intervals. While you are in the ICU, nurses will closely monitor your need for pain medication. As you heal and become more independent, the nurses will remind you to take your pain medication. **However, it will be necessary to request pain medication when you need it.**

You may experience an increased aching feeling when you begin to move around. Along with pain medications, walking and physical therapy exercises will decrease your discomfort. In a few weeks your discomfort will gradually disappear. For further information on pain control after your operation see the insert on pain control in the back pocket of this booklet.

Coughing and Deep Breathing

You will be expected to use your breathing machine (incentive spirometer) and to cough and breathe deeply every one to two hours after your operation. This allows your lungs to clear secretions and to fully expand. It will hurt to cough but it is extremely important for you to do so. These activities will help you to get home more quickly. Splinting your chest incision with a blanket or pillow will help to ease the discomfort. It will be necessary to continue coughing and using your incentive spirometer throughout your hospital stay and for the first few weeks at home.

Diet

Once the breathing and stomach tubes are removed, you will be placed on a liquid diet. The nurses will gradually advance your diet to regular solid food as your condition allows. It will be necessary for the nursing staff to keep track of your intake and output after your operation. You may find that your sense of taste and smell are somewhat impaired for a few weeks. Loss of appetite is not uncommon. However, it is important for you to eat to improve the healing process. It is fine for your family to bring food from home. Please be aware, however, that the food should be low in sodium (salt) and low to moderate in fat.

It is important to eat enough protein to heal after your operation. Foods that are high in protein and low in salt, saturated fat, and trans fats include fresh skinless chicken (not injected with salt or broth), fresh or frozen fish, lean beef, pork or lamb, skim milk, and fat-free yogurt. Cultured foods like yogurt also contain "probiotics," which help restart your digestive tract after your operation.

Eating a wide variety of fruits and vegetables will provide vitamins and minerals that enhance healing.

Progressive Care in the Hospital

The day after your operation, most patients are transferred from the ICU to the step-down unit. The hospital has private and semi-private rooms available but private rooms are limited. If you prefer one, ask the ICU desk clerk to put your name on the availability list. Some patients will be given preference for these rooms based upon their medical condition.

After Operation Activity and Exercises

You will be helped out of bed as early as possible following your operation. Most patients will be up in a chair the evening of their operation or the next morning. Getting out of bed will increase your strength and decrease your chance of getting pneumonia.

Walking

Walking will help decrease the muscle tension caused from bed rest and the soreness from the operation. You will be helped to move about in your room, and then in the hallway, at least four times a day until you are walking independently. We expect you to time your walks in the hall and gradually increase the amount of time you are walking each day.

At home, begin by walking two to three times daily to build strength. Walk inside or outside at a comfortable pace. It is normal, and expected, that you will be tired and mildly short of breath after walking. Start by walking the same number of minutes you were walking in the hospital and add a minute to your walk each day. When you reach 30 minutes per walk, begin increasing your pace.

Make walking your lifetime fitness habit. Remember to walk either before eating or two hours after eating. If outside weather becomes too hot or too cold, find a place to walk indoors. Your local shopping mall is an excellent place.

After Operation Exercises

In addition to the breathing exercises introduced earlier, you should add the following exercises to your daily routine for at least four weeks after discharge. Then ask your cardiologist when you can start a cardiac rehabilitation program.

These exercises are designed to:

- Relax the muscles that may be tense following the operation
- Increase the motion in your shoulders so you regain mobility
- Increase the flexibility in your trunk so you can fully expand your chest
- Increase the strength in the muscles around your incision

You may begin these exercises in the ICU. Unless otherwise stated, perform the exercises in a sitting position. Make sure you are relaxed and rested before starting. They are not intended to be a strenuous workout for your heart, so perform them smoothly and slowly in a controlled manner. Repeat each exercise three to ten times. Exercise at least twice a day for 10 to 15 minutes per session.

Mobility Exercises

- Chin Tuck – Sitting in a relaxed position with your back erect, move your head straight backward as far as possible. Don't look up or down, look straight ahead, and make a "double chin." Hold for three seconds. Relax. Repeat.
- Shoulder Shrugs and Circles – Shrug your shoulders up toward your ears then relax your shoulders down. Repeat. Now roll your shoulders in smooth motion up, back and down. Repeat.
- Head Turns – Keep your chin tucked as you slowly turn your head to the right and then to the left. Repeat.
- Trunk Twists – Slowly turn your trunk to the right, twisting at the waist. Then turn to the left. Repeat.
- Trunk Side Bending – With arms relaxed at your sides, lean to the right. Reach toward the floor near the back leg of the chair (don't lean forward). Return to sitting straight and then repeat to the left. Repeat, alternating sides.

- Pectoral/Chest Stretch – Place your hands behind your head. Keep your head erect. Move your elbows apart and back as far as they will go. Stretch slowly, then relax your elbows forward. Repeat.
- Forward Arm Raise – Raise your right arm forward over your head. Keep your elbow straight and bring your elbow close to the top of your head. Lower your arm forward and down. Repeat, alternating arms.
- Out, Up and Over – Raise your right arm out to the side and up over your head. Reach with your right hand for the left side of your head or your left shoulder. Remember to keep your head and neck straight. Return your arm out to the side and down. Repeat, alternating arms.
- Chest Muscle Strengthening – Lie on your back. With your right arm, reach out to the side. Keep your elbow straight. Raise your arm until you are reaching straight for the ceiling, then slowly lower your arm out to the side. Repeat, alternating arms.

Strengthening Exercises

After you have regained full motion in your shoulders, the arm exercises should be progressed to strengthening exercises by performing them with a weight. Start by using an object weighing one to two pounds and progress to five pounds as your strength increases. Many objects around the house can be used as weights – a can of soup, tools, or a small plastic bottle filled with pennies, rice, water, nuts and bolts or sand.

Posture Hints

Stand in front of a full-length mirror and check that your head and chin are tall and back. Your shoulders should be back and level with each other. **DO NOT** hunch your shoulders forward.

Important Note

The exercises described in this section should be continued until you no longer feel tight, stiff or weak in your muscles – until you have fully regained the mobility in your shoulders and trunk, have eliminated any posture faults as described above and you are taking a thirty minute walk each day. Once you have achieved these goals, ask your doctor if it is acceptable for you to participate in a regular aerobic exercise program or a cardiac rehabilitation program.

Going Home-
Your Hospital
Discharge

Following your heart operation and the inpatient recovery process, it will be time to go home and complete your rehabilitation program. Prior to leaving the hospital, there are several important items to be addressed.

Day of Discharge

Please try to make your arrangements for transportation at least one or two days before going home. **On the day of discharge, we request that you be ready to leave the hospital by 9:30 a.m**. Your family member should come to the nursing unit to pick you up. A transporter can be arranged if you need help with your belongings. After you have received your prescriptions, scheduled return appointments, and met with the discharge nurse, you may leave.

Two days before your discharge, your family should bring comfortable clothing for you to wear home. It would be helpful if your family took home flowers and plants the day before discharge. Also discuss with your nurse where you will be filling prescriptions. If you wish to fill them at the hospital, this should be done the day before discharge.

Restrictions and Activities

The following information is important to your recovery. These restrictions and activities will help you recover.

During the next four weeks:

NO driving

NO pushing or pulling

NO lifting of any object over ten pounds

You may experience:

Difficulty sleeping

Lack of appetite

Feelings of depression or mood changes

Lack of energy and increased fatigue

Activities you can and should do:

- Wash your incision with your usual bath soap and water every day. If any Steri-Strips® are still present two weeks after your discharge, please remove them.
- Shower or sponge bathe—**NO tub bathing**.
- Cough and deep breath—use your breathing machine four times per day (ten breaths each time).
- Ride in a car—short trips are best at first (wear your seat belt).
- Walk every day (inside a shopping mall during bad weather).
- Wear your support stockings during the day. You may remove them at night. You may stop wearing them four to six weeks after your operation.
- Climb stairs—limit the number of times until you are feeling well.
- Elevate your feet as high as possible when sitting (toes higher than nose).
- Report any signs of infection to your surgeon (redness, warmth, body temperature in excess of 100°F recorded more than twice in one day, or any wound drainage).
- Weigh yourself daily and report weight gain of more than five pounds in three days or weight loss of seven pounds or more before your first follow up clinic visit.
- Continue mobility exercises.

Important: If you have any questions or concerns after you are home, please call the clinic nurse. If you do not get a response from the clinic within three hours, call your surgeon's office.

When You Get Home

The first 48 hours after coming home are the toughest. You will be tired and may need frequent naps. It is best, however, if you make the effort to get dressed each day. Be patient and try to walk around the house. Many factors influence your rate of recovery, including any recent heart attacks, age, diabetes and your general physical condition. Depending on your state of health, anticipate at least one to three months of recuperation.

Emotions

The surgical and recovery process uses emotional and physical energy. As your recovery progresses, you may feel emotionally down. The "blue" days could occur as early as three to five days after your operation. This is very normal and many patients report these feelings up to three months after their operation. Crying and irritability may come easily and without warning. As you resume your normal activities, you will notice gradual improvement. In addition, you may want to talk to friends, family, your doctor or healthcare team member about your feelings. Continuing the exercise program described by your medical team may help to lessen the emotional ups and downs.

Caring for Your Incisions

Clean your incisions with a mild soap and water every day. You may shower, but avoid extremely hot water that can cause blood vessels to dilate and lead to dizziness. **DO NOT** soak in a bathtub or get into a swimming pool for the next four weeks. After your staples are removed, tiny Steri-Strips® are placed on the incisions. It is very important for you to wash over the Steri-Strips®. You may remove the Steri-Strips® as they begin to fall off. Report any signs of infection to your surgeon, including increased redness, warmth or drainage.

Constipation

Constipation is common after your operation. This is caused by decreased activity and pain medication. Increasing your activity and eating more fresh fruits, vegetables and high fiber foods may help. You should continue to take a stool softener while taking pain medication.

Sleeping

Many people have a difficult time sleeping when they get home. Some people find it uncomfortable to lie in a flat bed. If so, you should try sleeping on a couch or chair. You may also find that you wake up often and cannot sleep through the night. This is common and is something that will improve over time.

Other Restrictions

For the next four weeks, follow these guidelines to allow your sternum to heal. Your sternum is wired together with a stainless steel wire. This wire will not rust and will remain in your body for the rest of your life. It will not limit normal functions or set off the airport metal detectors.

- Do not drive until your surgeon tells you that you can. You can ride in the car as much as you can tolerate. Start with short trips. Please wear your seatbelt. You may use a towel or small blanket for padding.
- Do not lift anything that weighs more than 10 pounds. (For example, a gallon of milk weighs 9 pounds)
- Do not push or pull anything (e.g., a vacuum cleaner or lawn mower)

Visiting

During the first two weeks following discharge, limit visits from family and friends according to how you feel. Remember to pace yourself and to increase your socializing only as you feel ready.

Household Chores

During the first four weeks following your operation, you are encouraged to do light household activities. These activities include dusting, meal preparation, washing clothes with an automatic washer and dryer (avoid lifting a heavy laundry basket) and washing dishes. Pace yourself and gradually increase the amount of activity as your energy builds.

Sexual Activity

It is normal for both partners to be worried about resuming sexual activity after a heart operation. Most people worry about sexual intercourse because they are afraid it may cause discomfort and/or strain the heart. The exertion needed to perform sexual intercourse is similar to climbing stairs or walking around the block at a brisk pace. If these activities are not difficult for you, you may resume sexual activities whenever you feel ready. Your best indicator is how you feel – both physically and mentally. Some medications may interfere with sexual functioning. If you have any problems you should discuss them with your surgeon or nurse.

Some general guidelines to help you resume sexual relations include:

- For the first eight weeks, avoid positions that cause pressure on your breastbone or tension in your arms and chest
- Pick a time when you are content, relaxed and happy
- Wait two hours after eating a full meal or drinking alcohol

Remember that it is normal for your breathing and heart rate to increase during sex and that these should return to normal shortly afterward. If you experience shortness of breath, chest pain and/or palpitations, stop and rest. Let your physician know if you experience any abnormal symptoms.

Returning to Work and Everyday Activities

At your first clinic appointment following your discharge from the hospital, your surgeon will be able to approximate a date for your return to work. Everyone recovers from an operation at a different pace. Your first priority is to take care of yourself and recover completely.

Precautions for Heart Valve Surgery Patients

If you have an artificial (prosthetic) heart valve replacement, repair or prosthetic graft material, you must be protected from infection for the rest of your life. You need to take an antibiotic prior to any medical or dental procedure. This includes dental work, all operations, obstetrical / gynecological and urological procedures.

You should contact your physician one week before any medical or dental procedure to obtain the appropriate prescription. If you have any known allergies to medications, inform your physician when you call.

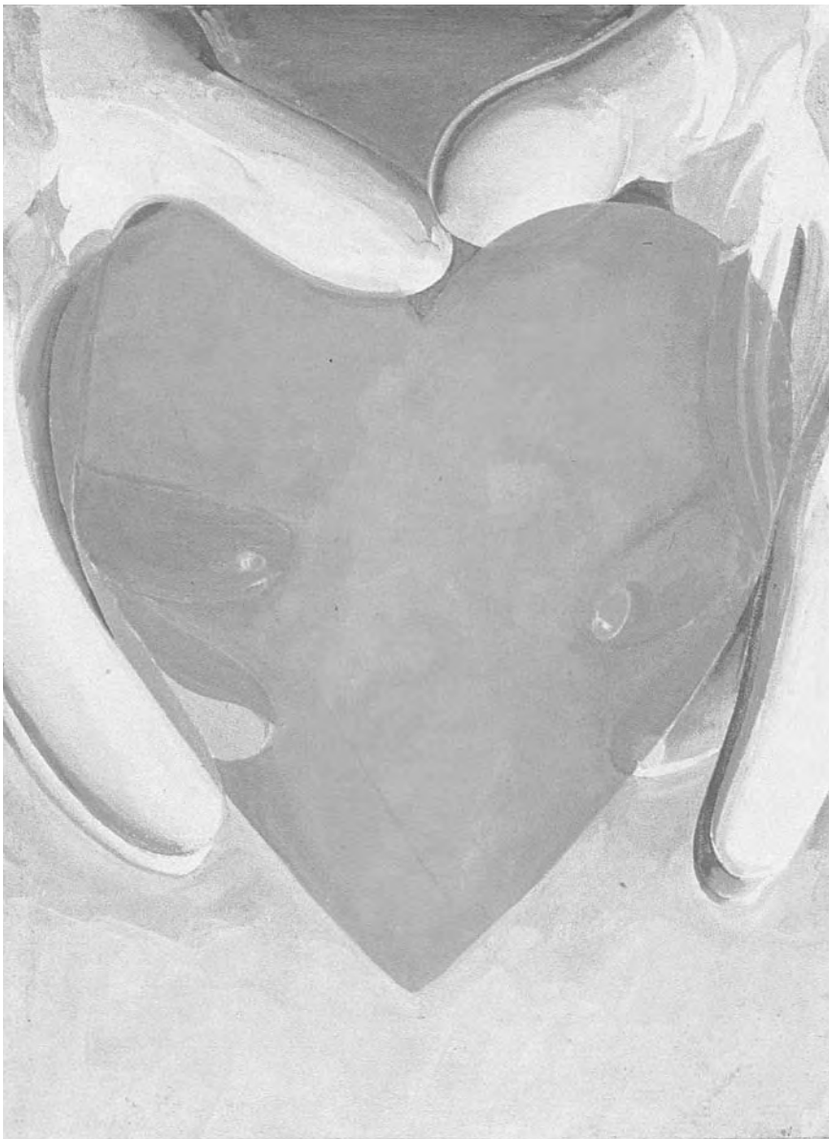
Report any signs or symptoms of infection to your physician immediately. Do not wait for these symptoms to disappear. You can have an infection even if you are taking an antibiotic. The signs and symptoms of infection include: temperature over 100°F, chills, night sweats, joint aches, redness, warmth or drainage containing pus from a wound. If an infection is present, your physician will likely prescribe antibiotics and or hospitalization.

Medications

The day you are discharged from the hospital you will be given a list of medications to take and the necessary prescription forms. **TAKE ONLY WHAT IS PRESCRIBED FOR YOU**. Do not take other medications that you may have been taking before your operation. This includes herbal

supplements or other non-prescription drugs. Medications are prescribed on an individual basis. Some medications will be necessary through the immediate recovery period and others will be needed indefinitely. Your surgeon will send a letter to your cardiologist and family doctor advising them of your medications. It would not be uncommon for your local cardiologist to adjust or discontinue medications that were started in the hospital.

Your prescriptions can be filled by your home pharmacy or by the University of Michigan Health System outpatient pharmacy located on the first floor in the hospital lobby. You should learn names, dosages and purposes for all of your medications. In addition, always carry a card in your wallet with an updated list of your medications, including name, dosage, and frequency. **DO NOT** stop, skip or take an extra dose of your medication without checking with your physician. If your prescription is running low, call your physician for renewal.



Promoting a Healthy Lifestyle

Coronary artery bypass surgery can resolve or reduce the symptoms of coronary artery disease such as angina. No one can guarantee that your bypassed arteries will stay open. There are some conditions that you cannot control that will increase your risk of coronary disease. However, there are some things that you can and should control to slow the disease process.

Stop Smoking

The single most important thing you can do for your heart is to stop smoking. Smoking:

- Decreases the oxygen supply to the heart muscle
- Causes artery wall damage
- Decreases HDL (good) cholesterol
- Increases heart rate and blood pressure
- Can contribute to problems with heart rhythm

You must decide to quit smoking. No one else can make you stop. You can gradually eliminate cigarettes or stop all at once. Here are some tips to help:

- Set a date to quit
- Get support from family and friends
- Get support from your doctor – your physician can sometimes prescribe drugs that will aid you in your efforts to quit
- Use substitutes – sugarless candy, crafts or even a short straw that you hold in your hand
- Avoid using high fat, high calorie foods for substitutes
- Try a smoking cessation program – your cardiologist or local lung and heart associations can recommend one
- If you fail to quit, try again – YOU CAN DO IT
- The hospital has a Tobacco Counseling Service which works with patients and others to help them quit smoking.

Blood Pressure Control

High blood pressure can put added stress on your heart and arteries and speed up the process of atherosclerosis. It is important to have your blood pressure checked every six months and take your antihypertensive medication as directed.

- **DO NOT** stop taking your medication unless your physician tells you to
- **DO** follow a low salt diet and avoid adding salt to your foods
- **DO** exercise regularly and lose weight if necessary
- **DO** follow all physician's orders
- **DO** use relaxation techniques to decrease stress

Less Fat and Cholesterol in Your Diet

A lifestyle that promotes a normal weight includes moderate exercise and a healthy diet, which will lower your risk for progressing your heart disease. This eating plan should include a diet which is:

- **LOW**– in animal and dairy fat and tropical oils (saturated fat)
- **LOW**– in foods containing "partially hydrogenated vegetable oil" (trans fat)
- **LOWER**– in foods containing corn, safflower, and sunflower oils (omega-6 polyunsaturated fat)
- **HIGHER**– in foods containing olive, canola, and peanut oils; nuts and avocados (mono-unsaturated fat); fish, flax seed, canola oil, soybeans and some nuts like walnuts (omega-3 polyunsaturated fat).

  **Recent studies show that foods rich in omega-3 polyunsaturated fats may help reduce the risk of coronary disease, sudden death, abnormal heart rhythms, high triglycerides, blood clotting and some inflammatory and autoimmune diseases.*

You may also wish to include foods that contain plant stanols or plant sterols to lower your LDL cholesterol. These include some margarines, some juices and other foods.

A diet high in vegetables, whole fruits and whole grains (instead of juices, sweet and refined foods) provides additional vitamins, minerals, "plant chemicals" and fiber that protect your heart and arteries and promote weight control.

Regular Exercise

Regular exercise can strengthen your heart muscle and increase your body's ability to use oxygen.

- Brisk walking, jogging, swimming and bicycling are excellent forms of exercise
- Your exercise program should start slowly in the hospital and gradually increase

Exercise should be fun and should fit into your lifestyle. Everyone is different. Some people will be able to walk long distances and others will not. Simply do as much as you can, as often as you can.

Control Diabetes

Diabetes directly affects your heart and blood vessels. Good control of blood sugar is important to help with wound healing and preventing infection. It is important to follow a strict diet to try to reduce the amount of damage to your vital organs. If you have any questions about a proper diabetic regimen, please ask your nurse or hospital dietitian for diabetic diet education materials. Dieticians can help you choose healthy foods and develop meal plans to promote blood sugar control.

Decrease Stress

Stress is present in everyone's life. How you react to stress can directly affect your health. Many books and methods are available to help you control stress. Ask your cardiologist or nurse to recommend stress reduction programs in your community, helpful books or other sources of information.

Control Weight

Excess weight puts added strain on your heart and raises your blood pressure. It is important to control your weight. However, do not begin a weight loss program without consulting with your physician.

Hospital Services and Facilities

The University of Michigan Health System offers a variety of special amenities and services. If you have any questions about the following services and facilities, please ask your nurse for additional information.

Lodging and Dining

- ***Med-Inn***

  In addition to local hotels, a 30 room hotel is connected to the University Hospital. Single and double units, suites and family units are available. Free cribs, cable television and continental breakfast are included. Microwaves and refrigerators are also available for an additional fee.

- ***Dining Facilities***

  University Hospital options include a cafeteria, Einstein Bros. Bagels, Fresh n Healthy Cafe and a vending area located in front of the cafeteria. Atrium Healthy Heart Cafe is located in the Cardiovascular Center.

- ***Friends Gift Shop***

  The gift shop is operated by the FRIENDS of University of Michigan Hospitals. The shop sells candy, cosmetics, magazines, paperback books, toys, stuffed animals, apparel, gift items, games, greeting cards, writing supplies, jewelry, accessories, infant items and much more. For patients who are unable to go to the gift shop, a gift cart circulates around the patient floors on weekdays.

Visiting Hours

In order to minimize patient stress, it is recommended that patients have no more than three visitors at any one time. Visitors are not allowed to remain with patients during examinations or treatments. Your nurse will provide you with specific visiting times and restrictions when you first come to the patient care unit.

Case Coordinator

A case coordinator is a nurse who will monitor your recovery from the time of your surgery until your discharge. This nurse will facilitate communication between you, your family and your caregivers.

Continuing Care

Prior to your hospital discharge, a nurse or social worker will be available to assist you with planning for your continuing care needs. Should you need visiting nurse follow-up, physical or speech therapy or services at home, this can be arranged for you.

Social Work

A social worker is available to assist you and your family with special requests, financial concerns and emotional support. Contact your nurse for additional information.

Dietitian

A dietitian is available to answer questions about your dietary needs and preferences. Information about specific diets is available in the hospital.

Pastoral Care

The University Hospital Office of Pastoral Care is available as needed, 24-hours a day for spiritual ministry, prayer and sacraments for patients of all denominations. A chapel is also available. Catholic and Protestant services are available. There are three Quiet Rooms for reflection or meditation available in the CVC.

Guest Assistance

The Guest Assistance Program office offers help to patients and their families. If you have questions, problems or concerns with any aspect of your hospital stay the Patient Services staff will do everything possible to help. Patient Services is dedicated to making your hospitalization more pleasant. This office is available to assist with special financial concerns.

Pharmacy

Prescriptions can be filled at the Patient/Visitor Pharmacy on the first floor. Non-prescription medications are also available. The Pharmacy accepts Visa and Master Card and participates in many insurance programs. Prescriptions can be transferred to or from other pharmacies. Mail order prescription service is also available. Prescriptions may take up to three hours to fill. Please be prepared for this delay.

Electronic Equipment

Because of the complex and critical nature of the Medical Center's electrical systems, and for safety reasons, we do not permit the use of personal TV sets or electric radios.

Battery operated radios and MP3 players with earphones are permitted, as are cell phones. The hospital staff cannot be responsible for replacing batteries or keeping the device secure.

Billing

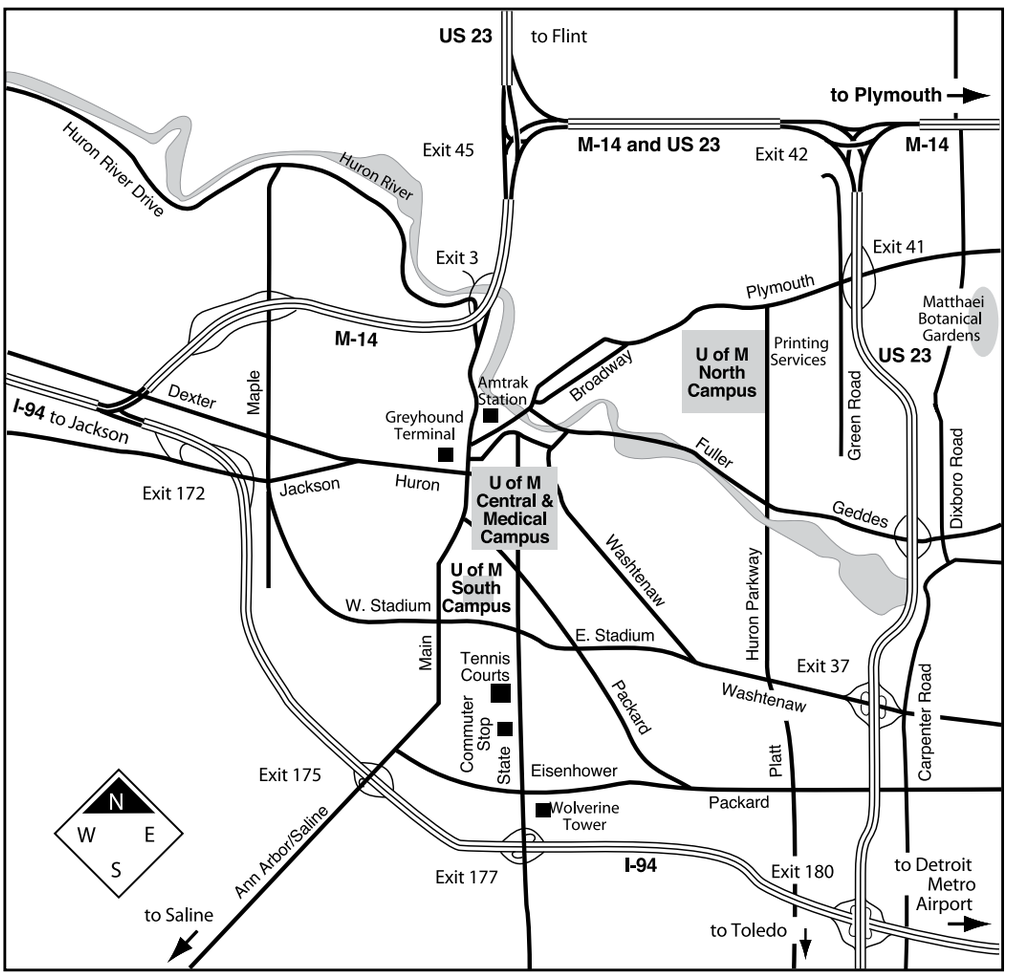
All billing correspondence will be mailed directly to your home address. Please feel free to ask any questions about your bill by calling the Patient Accounts office or the telephone number shown on your hospital bill.

Wellness Resource Center

The Wellness Resource Center features a full-service library with a wide collection of print and audio visual resources on all aspects of cardiovascular health. Internet computers and copiers are available for CVC patients and their families. A small gift shop is located in the Center, on Level 2.

How to get to the University of Michigan Health System

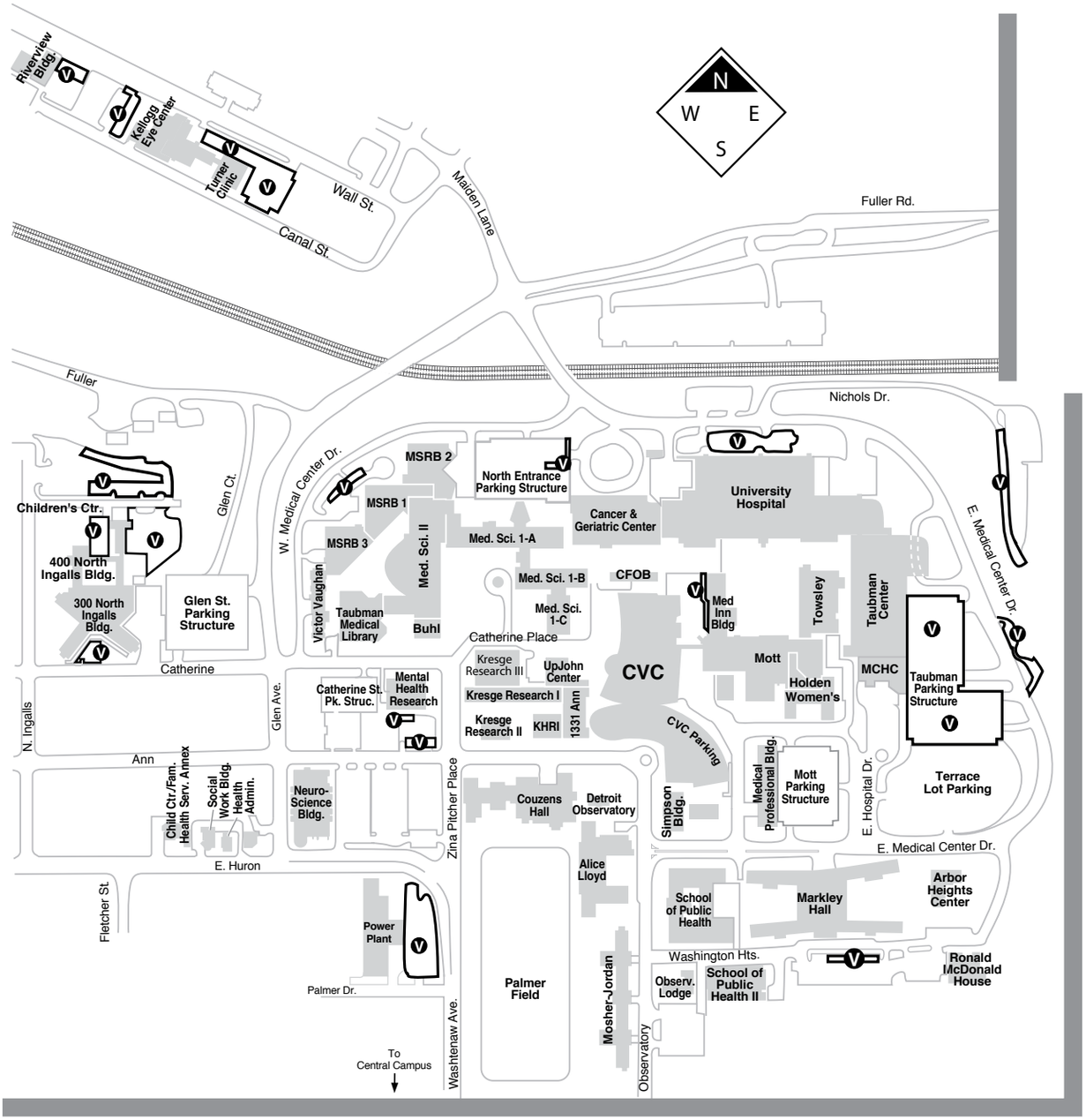
Ann Arbor



Hospital Phone Number

(734) 936-4000

University of Michigan **Medical Campus**



Glossary of Terms

anesthesiologist	the doctor responsible for monitoring your vital signs and general well being and administering the medications that affect consciousness before and during your surgery
aneurysm	a bulge or weakness in the walls of a blood vessel
angina	chest pain – often associated with blockage of the arteries that serve the heart
aorta	the large artery that carries oxygen-rich blood from the left ventricle of the heart to the rest of the body
aortic valve	the valve that controls blood flow between the left ventricle of the heart and the aorta (as blood exits the heart)
arterial line	a tube inserted into an artery (i.e. in the leg or wrist)
atria	the upper (filling) chambers of the heart
autologous	the patient's own blood
bioprosthetic valve	also known as a tissue valve, these come from animal (usually pig) or human (deceased) donors.
CABG	an acronym for Coronary Artery Bypass Graft surgery, which is the surgery that reroutes the blood supply to the heart by bypassing blocked arteries
cardiopulmonary bypass	works in place of heart and lungs during surgery to circulate blood to the body

chest tube	drainage tube placed around the heart and lungs to drain blood or fluid
chordae	tendon like cords which connect the edges of heart valves to the papillary muscle thereby restricting how far the valve leaflets can open or close
coronary arteries	the large blood vessels that supply the heart with oxygenated blood
Coumadin®	the commonly used trade name for the drug warfarin, an anti-coagulant (blood thinner) often prescribed to reduce the chances of stroke
diabetes	a metabolic disease that prevents the body from producing insulin (necessary to break down glucose) and regulating glucose levels in the blood
directed donor	blood that is donated from a friend or family member
endotracheal tube	a tube inserted into the lungs (via the mouth and throat) and attached to a respirator to supply oxygen when the lungs are unable to operate on their own
intra-aortic balloon pump	a device placed in the aorta and used to temporarily reduce the workload on the heart and allow it to recover
IV	abbreviation for intravenous – a catheter inserted into the veins used to dispense medications and fluids
leaflets	the small flaps on the valves of the heart which serve as "doors," allowing or preventing the passage of blood
mechanical valve	an artificial device implanted in the heart to take the place of a natural valve
mitral valve	the valve between the left atrium and left ventricle

monounsaturated fats	fats that tend to be liquid at room temperature and can lower LDL (low density lipoprotein, or bad) cholesterol when used in place of saturated fats in the diet; good sources are olive, canola and peanut oils
nasogastric tube	a tube inserted into the stomach (via the nose) to drain the stomach contents
pacemaker	an electrical device, sometimes temporary and sometimes permanently implanted, with the purpose of regulating the heart beat
pneumonia	the condition of having an infection inside the lungs
polyunsaturated fats	much the same as monounsaturated fats, as they can also lower LDL; good sources are corn, soybean and safflower oils; fish and flax
pulmonic valve	the heart valve between the right ventricle and the blood vessels that lead to the lungs (where blood is pumped to pick up oxygen)
saturated fats	fats that tend to be solid at room temperature and can contribute to elevated levels of LDL (bad) cholesterol; taken mostly from animal sources
stenosis	narrowing or blockage of an artery or heart valve opening
Swan-Ganz catheter (PA Line)	a large and long intravenous catheter inserted through the neck used to monitor the blood pressure in the heart
trans fat	fats that are made during a process called hydrogenation, which turns a liquid oil into a solid or semi-solid fat at room temperature; these fats can increase LDL and decrease HDL; avoid foods with partially-hydrogenated or hydrogenated oils
tricuspid valve	the heart valve between the right atrium and the right ventricle
urinary catheter	a drainage tube inserted into the bladder to drain urine
ventricle	a lower (pumping) chamber of the heart

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Art courtesy Louis K. Meisel Gallery, New York, by Paul Giovanopooilos, Heart "C", 1989, mixed mediums on canvas, 84 x 63 inches. Art photographed by Steve Lopez.

Additional pictures by Wendy Baker, RN.

www.cardiac.um-surgery.org