Before Heart Surgery: A Patient Guide

Your healthcare team may have discussed the need for heart surgery with you. To better understand these discussions and what to expect, this brochure will explain:

- How the heart works
- Pre-surgery testing
- Surgery overview
- Preparing for surgery
- Care after surgery

If you have questions, ask your physician or nurse.

The heart

To better understand your heart problem, it is helpful to learn more about the heart and how it works. The heart is the largest muscle in the human body. It is about the size of a closed fist. The average heart beats 100,000 times a day, pumping about 2,000 gallons of blood. The right side of the heart pumps blood to the lungs where it gets oxygen; the left side of the heart then pumps the blood out to all parts of the body.

The heart has 4 chambers that pump the blood. The 2 upper chambers are called the right atrium and left atrium. The 2 lower chambers are called the right ventricle and left ventricle. Figure 1 shows where the atria and ventricles are in the heart.

Figure 1: Normal heart anatomy

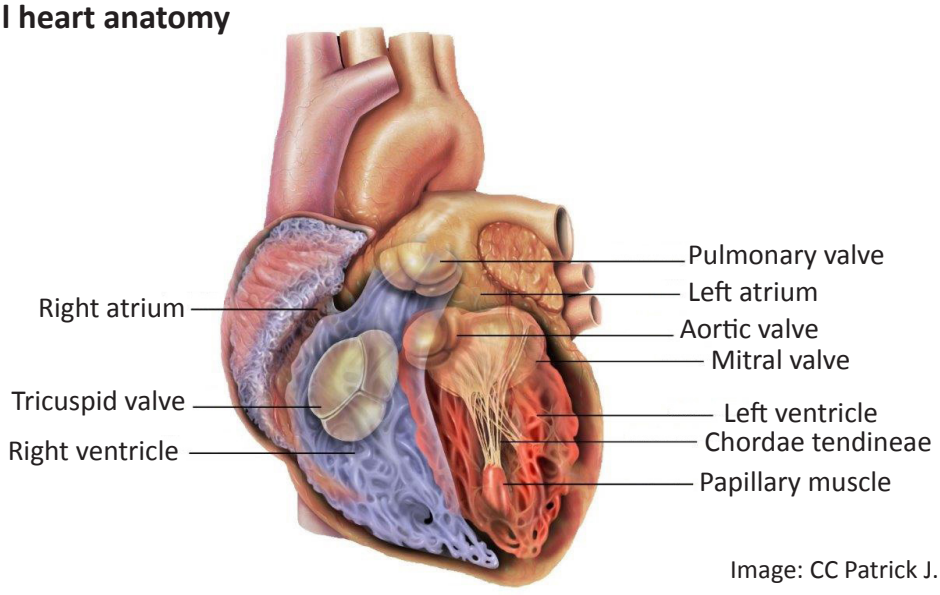
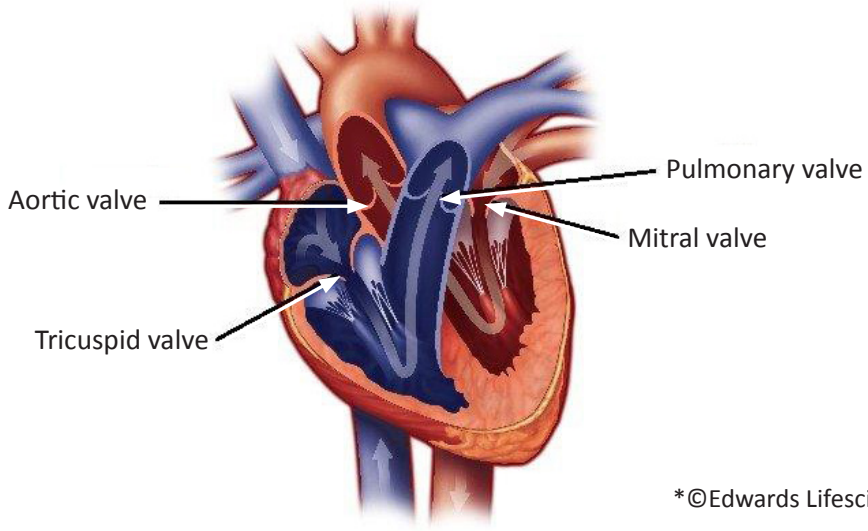


Image: CC Patrick J. Lynch 2006

There are 4 valves in the heart that open and close with each heartbeat. This ensures the blood flows in only one direction. The mitral and tricuspid valves direct the blood from the upper chambers (atria) to the lower chambers (ventricles). The aortic and pulmonary valves then direct the blood flow from the lower chambers out to the lungs and other parts of the body. The closing of the heart valves produces the sound of the heartbeat. Figures 1 and 2 show where each of the valves is located.

Figure 2: Blood flow through the heart



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Pre-surgery evaluation

Before a decision is made about surgery, an evaluation needs to be done. This evaluation will help your physician decide if surgery is the best treatment option for you.

As part of your evaluation, many factors are considered, including your overall health and other chronic conditions such as diabetes, or kidney or lung problems. These diseases may affect how you recover after surgery. Depending on your health, you may need to meet with physicians from other specialty areas. They will talk with you, examine you and perhaps order tests. These specialty areas may include:

- Anesthesia
- Neurology
- Nephrology
- Immunology
- Gastroenterology
- Infectious Disease
- Pulmonary Medicine

If you need other consults or tests before a decision is made about heart surgery, we will help you complete the process as quickly and easily as possible. The following section explains tests and procedures that are often part of the evaluation process.

Pre-surgery testing

Depending on your condition, not all of these tests may be needed. If you have had these tests in the past, we will review those results first. Sometimes it is important to repeat a test so your surgeon has the most up to date information. Your physician will review any important test findings with you.

Cardiac catheterization (angiogram)

In this test, a catheter is inserted into a large blood vessel that leads to the heart. A special dye is injected that shows how well the blood flows to the heart. It will show any blockage or narrowing of the arteries in the heart. If present, they can then be treated during surgery. A heart catheterization may also be used to:

- Check for heart valve problems.
- Measure blood pressures within the heart.

Detailed instructions will be given, if you are scheduled for this test.

Echocardiogram

An echocardiogram is a noninvasive test. It uses high-frequency waves (ultrasound) to create a real-time, moving picture of the heart and how it functions. A small probe (transducer) is coated with a light gel. This is placed on your chest to obtain images of your heart. This test measures how much blood your heart ejects, or pumps, with each heartbeat. This is called the ejection fraction. A lower number indicates a weaker heart muscle.

This test also shows the:

- Size of the heart chambers.
- Thickness of the heart muscle.
- Function of heart valves.
- Presence of blood clots in any of the heart chambers.

Transesophageal echocardiogram (TEE)

The TEE also uses sound waves to look at the heart. It measures how well the heart valves function – if they open and close correctly. This determines if there is any blood leakage from valves. In this test, a probe is inserted into the esophagus. The probe rests behind the heart and allows certain parts of the heart to be seen more clearly than with the standard echocardiogram.

Before the test, you cannot eat or drink for several hours. During the test, you will receive sedation; this will make you sleepy. After the test you will need a ride home from family or friends. Detailed instructions will be given, if you are scheduled for this test.

Chest X-ray

A chest X-ray shows the size of the heart and checks for lung disease. A heart that is too large indicates some form of heart disease. A chest X-ray also will show any fluid in the lungs. You may have fluid in your lungs if you have severe heart failure that is not controlled by medication.

Carotid duplex ultrasound
The carotid arteries, found in the neck, provide most of the blood flow to the brain. In this test, sound waves check how well the blood flows through these arteries. This shows any blockages or narrowing that can be treated to prevent strokes.

Magnetic resonance imaging (MRI)
This test uses a magnetic field and radio waves to create detailed images of the heart chambers, blood vessels and valves, as well as blood flow through the heart and blood vessels.

Coronary computed tomography angiography (CTA)
A CT scan is a special way of looking inside your body. A CT produces images that are "cross-sectional planes" and shows your heart much like slices taken out of a loaf of bread. These "picture slices" can be used to provide a detailed 3-dimensional view of the heart and its vessels. A coronary CT angiogram (CTA) examines the coronary arteries for narrowing or blockages. In some cases, this test can be done instead of a cardiac catheterization.

Blood tests
Blood is drawn for many different types of tests during surgery evaluation. Some of the tests check blood type, cholesterol level, blood sugar, liver function and kidney function. Other tests look for signs of infection. The blood type and cross-match must be drawn at Northwestern Memorial Hospital and is used to make sure we have blood available if needed during surgery. Not all surgery patients require a blood transfusion, but it is important to be prepared ahead of time.

Dental exam
A recent dental examination (within 6 months) must be done before any heart valve surgery. This should include an X-ray of the teeth and jaw. You may see your own dentist for this exam. If you do have dental problems, please be sure to complete any major dental work before surgery. This is because an infection in your mouth could increase your risk for a severe infection after heart valve surgery.

Pulmonary function test (PFT)
If you smoke or have lung problems, this test shows how well your lungs work.

This test will measure:

- How easily the air moves in and out of your lungs.
- How much air the lungs can hold.
- How much oxygen goes from the lungs to the heart.

During the test, you will take deep breaths and blow into a mouthpiece that is attached to a machine. A blood sample is also drawn at this time.

This test helps to identify the type and extent of possible lung disease. PFTs may also be done along with a cardiopulmonary exercise test.

Surgery

Heart surgery may be performed in 1 of 3 ways. These pictures show different ways the surgeon may approach the heart.

- Figure 3: **Thoracotomy** shows a chest incision between the ribs.
- Figure 4: **Sternotomy** shows a 6- to 8-inch incision in the middle of the chest. This is used if a larger incision is needed. After repairing the heart, the surgeon uses wires to keep the breastbone together and closes the incision.
- Figure 5: **Mini-sternotomy** shows a small, 3- to 5-inch incision that is made in the upper or lower chest. This opens part of your breastbone. The exact site of the incision may vary, depending on what part of the heart needs surgery. Using special instruments, the surgeon makes the repairs, uses wires to keep the breastbone together, and closes the incision.

Figure 3: Thoracotomy

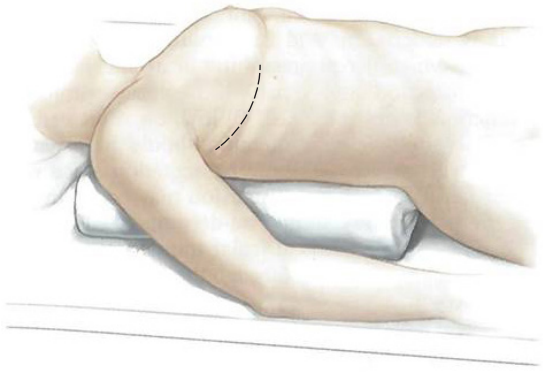


Figure 4: Sternotomy

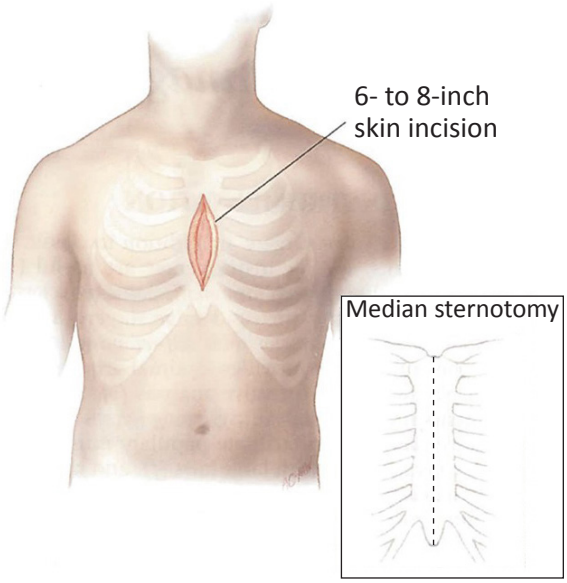
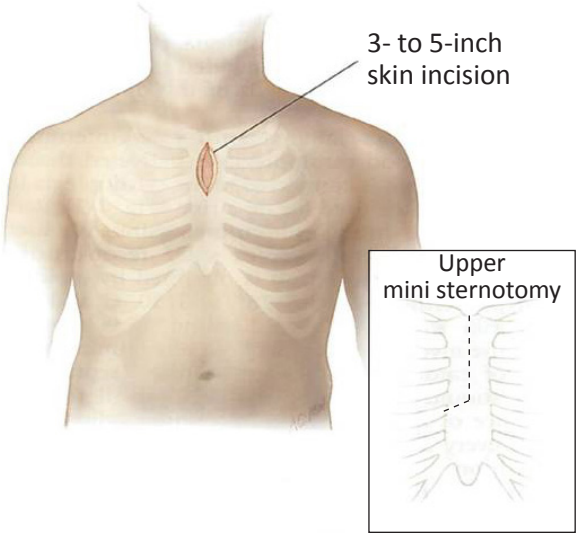


Figure 5: Mini-sternotomy



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Risks

Every surgery has some risk of complications. The amount of risk depends on factors such as age and health.

Risks may include:

- Bleeding
- Infection
- Atrial fibrillation
- Heart rhythm problems
- Lung or heart problems
- Stroke or kidney failure (this is rare)

Your surgeon will discuss your individual risks with you.

Lodging information for patients and families

At Northwestern Medicine, we are committed to providing the best possible experience for our patients and their families.

We understand that patients from out of town and those visiting family members at the hospital may need to stay overnight. For your comfort and convenience, we have negotiated reduced rates at a variety of hotels near the hospital. To find a hotel room for your visit, please call 312.926.7666 (ROOM) to reach one of our customer service representatives. Our representatives also are able to assist you with long-term lodging arrangements. More information about discounted lodging and a list of hotels can be found at **nm.org/location/northwestern-memorial-hospital**.

Guide to the downtown medical campus

Northwestern Medicine®

Guide to the Downtown Medical Campus

Northwestern Memorial Hospital
Feinberg and Galter Pavilions

1. Main drive-through entrance
   251 E. Huron St.
2. Emergency Department
   250 E. Erie St.

Galter Pavilion

3. Stone Institute of Psychiatry
   201 E. Huron St.
4. Physician offices
   201 E. Huron St.
5. Robert H. Lurie Comprehensive Cancer Center of Northwestern University
   675 N. Saint Clair St.

   Same Day Surgery
   675 N. Saint Clair St., Fifth Floor

Prentice Women's Hospital

6. Main drive-through entrance
   250 E. Superior St.
7. Entrance
   250 E. Superior St.

   Robert H. Lurie Comprehensive Cancer Center of Northwestern University
   250 E. Superior St.
8. Entrance
   Corner of Chicago Avenue and Fairbanks Court

Other Locations

9. Lavin Pavilion
   259 East Erie St.
   Entrance and parking

   Preoperative Clinic
   17th Floor
10. Olson Pavilion
    Ambulatory Surgery Center
    710 N. Fairbanks Court
    Sixth Floor
11. Northwestern Memorial HealthCare Human Resources
    541 N. Fairbanks Court
    17th Floor
12. Stone Institute of Psychiatry
    Administrative offices and outpatient services
    Onterie Center
    446 E. Ontario St.
13. Physician offices
    211 E. Chicago Ave.
14. Physician offices
    737 N. Michigan Ave.
    (Entrance on Chicago Ave.)
15. Physician offices
    150 E. Huron St.
16. Physician offices
    645 N. Michigan Ave.
17. Arkes Pavilion
    Physician offices
    676 N. Saint Clair St.
18. Northwestern Memorial Imaging Center
    676 N. Saint Clair St.
19. Physician offices
    680 N. Lake Shore Drive

Need a physician? Call physician referral at 312.926.8400.
For more information on Northwestern Medicine, visit nm.org.

Before your surgery

If you develop a cold or flu before surgery, please call the nurse practitioner (NP) the day before your surgery is scheduled. Surgery may be postponed until you are well.

Packing for your hospital stay

We recommend you do not bring valuables, such as money or jewelry, to the hospital. Please bring these items with you:

- A list of allergies
- A list of all your current medications (prescription, over-the-counter, and herbals)
- Photo ID
- Medical insurance information and card
- Medicare card if you have Medicare
- Containers for your eyeglasses, contacts and dentures (if applicable)
- Toiletries (basic self-care supplies will be provided in the hospital)

We will contact you the day before surgery to confirm what time to arrive at the hospital.

Antibacterial shower

On the evening before or the morning of surgery, you will be asked to shower with an antibacterial soap (such as Dial®) to reduce the number of germs on your skin. Also, be sure to wash your hair. Patients with beards may consider shaving. This may ease care in the weeks after surgery. It also will reduce discomfort when the breathing tube is removed after surgery.

Nail polish and makeup

Patients should remove any nail polish and makeup before surgery. During surgery your circulation is checked by looking at your skin and nails.

Diet

Do not eat or drink anything after midnight the night before surgery or the morning of your surgery. This includes gum and hard candy.

Medications

On the morning of surgery, with a small sip of water, take only the medications that you were instructed to take. If you have diabetes, follow your nurse practitioner's guidelines for taking medications.

Arriving at the hospital

The surgery nurse practitioner will call you 1 or 2 days before your procedure with a surgery time. Please arrive at the time you were instructed to come. Park in Parking Garage A at 222 East Huron Street. **To receive discounted parking, bring your ticket in with you.**

Come to the reception desk in the main lobby of Galter Pavilion at 201 East Huron Street, which is across the street from Parking Garage A. This is where your family can check in, obtain visitor passes and validate discount parking. Then, go to the 5th floor registration desk in the Same Day Surgery Unit.

When you first arrive at the registration desk, your information will be checked and updated, as needed. You will be directed to the waiting area until called by the nurse. When you are called, you will go to the 7th floor pre-operative (pre-op) room.

Once in the pre-op room, you will change into a hospital gown and cap. A nurse will review your medical history, and check your temperature, blood pressure and pulse. An intravenous (into the vein, or IV) line will be inserted into the vein in your arm or hand.

Your anesthesiologist will talk with you before surgery. Be sure to tell the anesthesiologist about any crowns, bridges or loose teeth so extra care can be taken during surgery. You also may be visited by a surgical resident or fellow.

During this time, your family can relax in the 7th floor waiting area. Once the nurse has you prepared for surgery, you may have 2 adult visitors at one time. If your surgery is delayed for any reason, your nurse will provide you with updates.

When the operating room is ready, the team will take you in to surgery. At that time, your family will be shown to the waiting room on the 7th floor. Family members should check in with the volunteer, who will provide updates on your progress during surgery.

During surgery

In the operating room, you will be given medication to help you relax and feel drowsy. You will be connected to a heart monitor, and you will breathe oxygen through a face mask. A special catheter, called an arterial line, may be placed in your arm to monitor your blood pressure at all times.

Next, general anesthesia is given until you are completely asleep. A breathing tube will assist your breathing during surgery and may cause a slight sore throat afterward. For heart valve surgery, a transesophageal echocardiogram (TEE) probe will be placed in your esophagus. The probe allows the surgeon to look at your valves before and after the surgery.

After surgery

You will go directly to the Intensive Care Unit (ICU). Your surgeon will speak to your family to answer any questions they may have. When you arrive in the ICU, you will still be asleep. The ICU staff will need some time, usually 45 to 60 minutes, to settle you into the room. Once you are settled into your ICU room, the ICU nurses will let your family know they can come and see you.

The ICU nurse will work with your family to determine the best time for visitors. This is to ensure you get adequate rest to aid in your recovery.

You will likely be asleep for 4 to 6 hours after surgery. As you wake up, you will be very groggy. You may have soft restraints on your wrists. These serve as friendly reminders to keep you from pulling out any tubes and drains. It is normal to try to remove these unfamiliar objects while you are groggy. We will remove the restraints as soon as you are awake and aware of your surroundings. As you wake up from anesthesia, your nurse and physicians will assess your condition, pain level and readiness to remove the breathing tube.

You will have many tubes and wires attached to your body.

- A breathing tube in your throat will help you breathe. While the tube is in place, you will not be able to speak. Do not try to speak. You will be asked "yes" and "no" questions so you can communicate with the nurse. The tube will be removed as soon as you are awake and able to breathe on your own.
- Chest tubes will collect fluid that may build up around your heart and lungs. Some of these tubes are removed the day after surgery; some chest tubes may stay in longer, depending on the amount of drainage.
- A monitor will record your heart rate, rhythm and blood pressure.
- A Swan-Ganz catheter is a special IV line usually inserted in your neck in the operating room. It measures the pressure in your heart and lungs. Based on these measurements, IV fluids and medicines will be given and adjusted.
- You will be wearing a temporary pacemaker. This will help your heart if the rate is too slow. The pacemaker is removed before you go home.
- **IV lines** may be inserted in your neck, hands or arms to give other fluids and medicines. They will gradually be removed during your hospital stay. The last one will be removed before you go home.
- A **pulse oximeter** checks the oxygen level in your blood. It is connected to a small clip that fits on your finger.
- A **catheter**, or tube, will drain urine from your bladder. The nurses will check your urine output often. This catheter is usually removed within the first 24 to 48 hours after surgery.
- **Elastic stockings** and **compression boots** gently squeeze your calves to promote blood flow and help prevent blood clots from forming in your legs.

Once your breathing tube is removed, your nurse will have you begin deep breathing and coughing exercises. To be sure you are taking deep breaths, you will use a device called an incentive spirometer. You should take 10 deep breaths with the spirometer every hour that you are awake. Your nurse will show you how to do this and how to support your incision with a pillow when coughing. This, along with turning in bed every few hours, helps prevent the mucus and fluid build-up in your lungs that might lead to pneumonia.

Your surgeon uses a team of professionals to care for you after surgery. Members of this team may include:

- **Registered nurses (RNs)**: Nurses who monitor your condition, provide pain medicine as well as other necessary medications, and perform other activities to help you recover.
- **Cardiac surgery fellows**: Physicians in specialty training who assist the attending physician and work with specialists on your care team.
- **Critical care specialists**: Physicians who assist during the ICU stay.
- **Cardiologists**: Physicians who manage medication changes during the hospital stay.
- **Physician assistants (PAs)**: Licensed healthcare professionals who assist the surgeons during the surgical procedure and with immediate pre- and post-surgical management.
- **Advanced practice nurses (APNs)**: Nurses with advanced degrees who assist with daily assessments and coordination of care among the post-op team.
- **Physical therapists (PTs)**: Licensed healthcare professionals who assess physical movement and ability to return to activity. Physical therapists also instruct patients on the proper ways to avoid stress on incisions and begin exercise safely.
- **Occupational therapists (OTs)**: Licensed healthcare professionals who teach you how to safely perform daily at-home activities after your surgery while you have lifting and other post-operative restrictions.
- **Discharge planners and social workers**: Clinicians who assist with any arrangements for home health, rehabilitation and skilled care that may be needed after discharge. They begin to follow your progress in the ICU.

Other specialists may be asked to consult, as needed. Be assured that your surgeon is in frequent contact with this team and directs your care.

Pain control

It is important that you take your pain medicine as needed. Good pain relief can help you become more active and speed your recovery. Let your nurses and physicians know how your pain medicine is working. Rate your pain on a scale of 0 to 10, with 0 meaning no pain and 10 being the worst. It is best to take pain medicine before pain becomes severe; otherwise it is more difficult to control. Many patients find it helpful to take pain medicine before walking or other activities. At first, you will receive IV pain medicine. Later on, you will take the pain medicine by mouth.

Diet

Nausea is not uncommon after surgery, so your diet restrictions will be removed slowly. Medication can be given to treat nausea if needed.

It is important to drink fluids after surgery. After your breathing tube is removed, you will be able to take ice chips. Slowly, you will progress to a liquid diet. When you are able to tolerate solids, you will resume a regular diet. Most patients will be on a heart-healthy (low-fat, low-sodium) diet after surgery.

Activity
On the day after surgery, your activity will increase. Your nurse or therapist will help you sit at the side of the bed and then, in the chair. When you are getting out of bed, do not use your chest muscles or arms to pull yourself up. Cross your arms over your chest, sit up and swing your legs over the side of the bed. This will help your breastbone heal if you have had a chest incision.

As you are able, your nurse will help you walk in your room and later, in the hall. It is normal to feel weak and unsteady at first. Always ask your nurse for help when getting out of bed.

Most patients stay in the ICU 1 to 2 days. Sometimes your condition may require a longer stay.

Visitors
Visitors are allowed 24 hours per day. We ask that only 2 visitors are in the room at any time, and visitors are not allowed to sleep in patient ICU rooms. Visitors who are sick or have been recently exposed to an infection will not be allowed to see you. Children under the age of 12 may not visit. Everyone entering your room and leaving your room must wash their hands.

Step-Down Unit
As you progress, you will be transferred to the Step-Down Unit, where you will receive care until you go home. Your heart rhythm will be monitored while in the hospital. You also will play a more active role in your care.

The nurse will help you bathe. You will learn how to wash around your incision. Do not apply any lotions or creams to your incision. Once all your tubes and drains have been removed, you may shower with help. Your chest incision may appear bruised and may be discolored from the soap used to wash your skin before surgery.

You will be encouraged to gradually increase your activity each day. You may begin walking in the halls 3 to 4 times each day and sitting in a chair for all your meals. Remember to increase the time and distance each time you walk. This light exercise will help you become stronger as you prepare to go home. A physical or occupational therapist will instruct you on activity and exercise.

As you recover, continue to use your incentive spirometer, and to cough and deep breathe 10 times every hour while awake.

A dietitian may visit to explain any specific diet guidelines. These may include following a low-sodium diet to prevent fluid buildup, limiting the fluids you drink and following a low-fat, low-cholesterol diet.

The mind-body connection

Emotions and behaviors can play an important role in your recovery. The cardiac behavioral medicine team is available to help you and your family manage the emotional, behavioral and social components of your heart health, surgery and recovery.

One of our cardiac behavioral medicine specialists may visit you in the hospital to offer relaxation techniques or other tips to help you. They are also available on an outpatient basis to help you prepare for surgery, help you adjust after surgery, or to help you make any necessary lifestyle changes. A relaxation CD is available to help you learn relaxation techniques.

Relaxation audio recordings can be accessed online (in English) and downloaded to a PC or Mac. The link is **nm.org/cvrelaxation**. Enter the password: heart.

Undergoing cardiovascular surgery can trigger many emotions. Do not be surprised if you or your loved ones feel sad, excited, scared, frustrated or worried at times. For most patients, these emotional changes resolve quickly. However, some patients can develop clinical depression or clinical anxiety, which can interfere with your surgery and recovery. Monitor your mood and report any sustained changes in mood that last more than 3 to 4 days to your medical team. Possible symptoms of clinical depression or anxiety can include:

- Sadness or feeling down
- Diminished interest in activities that you used to enjoy
- Decreased motivation or energy
- Disrupted sleep or appetite
- Feelings of guilt, worthlessness or hopelessness
- Thoughts of wanting to die
- Feelings of panic or intense fear
- Nightmares or recurrent thoughts of your surgery

The cardiovascular team will work with you to make your surgery and recovery as smooth as possible. To make you comfortable while in the hospital, bring some mementos from home such as photographs, favorite music, or puzzles and games that can distract you when you are uncomfortable or unable to sleep. You may also use your cell phone. Once you have returned home, you may feel emotionally exhausted. If you become frustrated with your recovery, remember to focus on your overall progress since surgery, and celebrate each milestone in your surgery and recovery. Communicate your needs clearly with friends and family so they are aware of your limitations and desires.

For more information about your recovery after you leave the hospital, please refer to the discharge instructions that you will receive.

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** Carpentier's Reconstructive Valve Surgery, p. 16-17, Alain Carpentier, MD, PhD, David Adams, MD and Farzan Filsoufi, MD, Saunders (2010) Elsevier, Philadelphia, PA. Permission for use obtained.

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