Your Guide to Cardiac Surgery

Coronary artery bypass surgery and heart valve replacement

UW Medicine
UNIVERSITY OF WASHINGTON MEDICAL CENTER

This guide describes coronary bypass surgery, heart valve replacement surgery, and your recovery from surgery. It includes information about your hospital stay and your healthcare team, and a glossary of medical terms.

Scan with your phone camera for a digital copy of this handout.

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Heart Institute | Box 356087
1959 N.E. Pacific St., Seattle, WA 98195 | 206.598.4300

Coronary artery disease (also called *coronary atherosclerosis* or *ischemic heart disease*) refers to changes in the *coronary arteries*. These arteries bring oxygen to the heart muscle. This disease develops slowly, causing the inner artery layer to thicken, become uneven, and trap cholesterol and calcium.

Coronary Artery Bypass Surgery

Coronary artery disease may require *coronary artery bypass graft* (CABG) surgery. This operation helps blood flow to the heart again. The surgeon attaches a *bypass graft* (healthy blood vessel) to the aorta and to the coronary artery, bypassing the blocked or narrowed section.

This improved blood flow to the heart muscle allows the heart to function more efficiently. It can also reduce or stop *angina* (chest pain), prevent heart attacks, and it may help you live longer.

As many as 6 *grafts* (healthy blood vessels) are sometimes needed to fix all the narrowed or blocked arteries. We take bypass grafts from your leg veins (*venectomy*), the *radial artery* in your arms, or your *internal mammary artery* (IMA) in your chest wall. Choosing the right blood vessels for your surgery depends on your medical history.

- The leg vein we use is the *saphenous* vein. This vein is just under the skin, and it goes from your inner ankle to your upper thigh. It can be removed without harming the circulation in your leg.
- The IMA is about the size of a coronary artery, and it is located under your chest wall. This artery can be detached and sewn into the coronary artery.
- The *radial artery* is in your lower arm. This artery can be detached and sewn into the coronary artery.

What are the risks?

Bypass surgery is complex, but it has a high rate of success. Between 95% and 99% of people survive the surgery. Complications are possible, including:

- Pneumonia
- Kidney damage
- Collapsed lung (air leak between your lung and chest wall)
- Angina (chest pain)
- Stroke
- Infection
- Excessive bleeding
- Heart attack
- Heart palpitations (feeling of fast or abnormal heart rhythm)

Your surgery team will talk with you about your specific risks based on your heart condition, past surgeries, and other diseases you have. Other possible problems include the risks of anesthesia, *arrhythmia* (irregular heartbeat), and wound infection. Because the valves are close

to the areas that control heart function, there is a risk of a change in your heart rhythm. In this case, you may need a pacemaker or treatment with medication after the surgery.

Heart Valve Replacement Surgery

You may need valve replacement when one or more of your valves is diseased or no longer works.

Prosthetic Valves

A *prosthetic valve* is an artificial device that replaces a damaged or diseased heart valve. There are 3 main types of prosthetic valves. These are mechanical valves, bioprosthetic valves, and homografts. All prosthetic valves have possible long-term risks.

There is also a risk of any prosthetic valve becoming infected. If you have valve replacement, you must take antibiotics before seeing the dentist, and possibly before other medical procedures. Talk with your cardiologist about care instructions related to your valve replacement before you see other healthcare providers.

- **Mechanical valves** are made of strong, durable materials such as metal. They are very durable, and they help keep your blood flow normal. But the body sees mechanical valves as foreign or unfamiliar objects. Because of this, your body will try to coat the valve with *thrombin* (the part of blood used in clotting). This is dangerous because pieces of the thrombin can break off, go into the bloodstream, and cause strokes.

  Coumadin (warfarin) is a medicine that makes your blood thinner and prevents the thrombin from forming on the valve. With a mechanical valve, you must take Coumadin for the rest of your life. If you take Coumadin, there is a risk of bleeding because your blood will not clot normally. You will bleed longer than a person who is not taking it. If you forget to take your Coumadin, there is a risk of blood clotting and having a stroke.

- **Bioprosthetic valves** are taken from the hearts of specially raised animals. They are chemically treated so that the body does not see them as foreign. Bioprosthetic valves help keep your blood flow near normal. They are not as durable as mechanical valves. *Porcine* (pig) valves are not suitable for children or patients with renal (kidney) disease. This is because calcium can build up over time, so they do not last as long as other kinds of bioprosthetic valves.

  Bioprosthetic valves can wear out, become *stenosed* (stiffened), and cause the same type of symptoms you may have had before surgery.

  Bioprosthetic valves usually last 10 to 15 years and then must be replaced. If you have a bioprosthetic valve you may not need to take Coumadin, or you may only need to take it for 1 to 3 months after surgery. This depends on where your valve is located and your medical history. Your cardiologist and surgeon will decide if you need this medicine.

- **Homograft valves** are taken from a person after their death. It is chemically treated so that your body does not see it as foreign. Homografts are used for patients who are still growing. They are not often used for those who have a severe infection of their valves.

  Like bioprosthetic valves, a homograft can wear out, become stenosed (stiffened), and cause the same type of symptoms you may have had before surgery.

Long-Term Considerations

Risk of Infection

Artificial valves can get infected. The American Heart Association recommends taking antibiotics before dental procedures and before any surgical procedure involving your lungs, bladder, or digestive system. Tell your dentist, doctor, and other healthcare providers that you have an artificial heart valve.

Tell your healthcare provider right away if you notice signs of a valve infection, including:

- Fever
- Abdominal tenderness
- Bloody urine
- New heart murmur
- New onset of shortness of breath
- New swelling in your legs or ankles
- Weight gain of 2 to 5 pounds over 3 days

Anticoagulation Therapy

Anticoagulation therapy uses medication to prevent blood clots. You may need to take the medicine Coumadin to prevent clotting on your valve. If so, a pharmacist will talk with you about this medicine.

After discharge, we will check your clotting time every 3 to 5 days. We will adjust your medication dose as needed to keep you healthy. If you need anticoagulation therapy for a long time, we will check your clotting time every 4 to 6 weeks for as long as you are taking Coumadin.

We may ask you to take low-dose aspirin in addition to your Coumadin therapy. This can give you extra protection for your heart and chest area.

Preparing for Surgery

Within the 30 days before your surgery, you will have a pre-operative H&P (history and physical) appointment. This appointment usually takes about 3 hours. At this appointment:

- You will have an X-ray, blood and urine test, and a heart test called an *ECG* (electrocardiogram).
- You will meet your cardiac surgeon and cardiac surgery team. They will talk with you about your operation and answer your questions.
- We will ask you to sign a consent form to allow us to do your surgery.
- We will ask you if you have any *advance directives*. Two common advance directives are a living will and a power of attorney for healthcare. You are not required to have either of these directives, but if you do, please bring a copy to the hospital. We will add your directive(s) to your permanent record, so that your healthcare wishes are known.

- A staff member will teach you how to do slow, deep breathing with an incentive spirometer (a instrument that measures how deeply you are breathing). We will ask you to practice deep breathing before your surgery. You will also learn how to cough using a pillow. This will help with your recovery after surgery.
- Before your surgery, practice getting out of bed and standing up from a chair several times when you're at home. Use both arms and keep your upper arms close to your body during these movements.

"Keep Your Move in the Tube"

During surgery, your *sternum* (breastbone) will be cut. After surgery it takes time to heal. Permanent stainless-steel wires or cables will keep this bone together. Because of this, we will give you movement recommendations to "keep your move in the tube" for 12 weeks.

"Keep your move in the tube" means moving in a way that minimizes the stress on your sternum. The goal is to keep your upper arms close to your body, or in "the tube." This is the area around your upper arms, sternum, and attached muscles. See page 12 for more details.

Day Before Surgery

- We will give you special soap during your H&P appointment. Before your surgery you will need to take a shower, using this special soap to scrub your chest, legs, and arms. This helps to decrease the bacteria on your skin. If your legs, chest, or abdomen need to be shaved, we will do this in the operating room.
- You can eat and drink normally the night before the surgery. Do **NOT** eat or drink after midnight, other than small sips of water if you were instructed to take any medication on the morning of your surgery.
- Try to get a good night's rest before surgery.

Day of Surgery

You must remove jewelry and watches before surgery. It is best to keep these and other valuables at home, in our hospital safe, or with family members.

About 1 to 2 hours before surgery, you will change into a hospital gown and will take medicine to help you relax. Your family may visit you in the nursing unit before your surgery. There is a waiting room for family and friends on the 2nd floor of the Surgery Pavilion near the operating room.

Depending on which type of surgery you're having, you will be in the operating room for about 4 to 6 hours. When the surgery is done, the surgeon will come to talk with your family or will call them, if you prefer.

We will take you to the 5-Southeast Cardiovascular Intensive Care Unit (CICU) after your surgery. It takes the nurses and doctors about 2 hours after you arrive in the CICU to get you settled, and then your family may come in to see you.

Anesthesia

We will give you anesthesia for your operation to make you fall asleep and not feel pain. When you arrive in the operating room, a few steps are needed before you are anesthetized. After your skin is numbed, we will insert *catheters* (thin tubes) into 2 of your arm veins. Medicine, fluids, and blood transfusions may be given through these. Then we will give you medicine to put you to sleep. After you are asleep, we will insert a breathing tube through your mouth and into your windpipe. You will get oxygen and other gases through this tube during the operation. One member of the anesthesia care team will stay with you throughout the surgery and will closely monitor all your vital functions.

The Heart-Lung Machine

The heart-lung machine keeps oxygenated blood pumping through your body during surgery. A specially trained provider called a *cardiopulmonary perfusionist* operates this machine. Any surgery that requires a heart-lung machine is called an "open-heart surgery," whether the surgeon opens the heart or not.

The blood returning to your heart will be removed from your body by a set of tubes inserted in the right side of your heart. The heart-lung machine removes the carbon dioxide from the blood and provides the red blood cells with fresh oxygen, just as your lungs would. Another set of tubes carries the blood back to your heart.

Blood Requirements and Puget Sound Blood Center

The cardiac surgery team will use extra blood only when it is needed. Between 60% and 70% of open-heart operations can be done without blood transfusions.

Some patients will need transfusions of blood products such as packed red blood cells, platelets, or fresh frozen plasma. These come from Bloodworks Northwest.

The blood center uses only screened, unpaid volunteer donors. This means we depend on people's willingness to donate blood. You are not required to replace the donated blood you use – but friends, clubs, service organizations, or faith-based groups are often eager to help. Donating blood helps to make sure this important resource will be available when it is needed.

The all-volunteer system reduces the risk of viral illnesses being spread through transfusions. The blood center also tests donated blood for hepatitis and HIV/AIDS. Still, there is a slight risk of these diseases being spread through blood transfusions.

- According to Bloodworks Northwest, the estimated risk of getting hepatitis B or hepatitis C after blood transfusion is 1 in 1,000,000 per unit of blood.
- The risk of exposure to HIV (the virus that causes AIDS) as the result of a transfusion of blood in the Pacific Northwest is estimated to be about 1 in 1,900,000.
- Since 1985, when testing for HIV began, no patient has been reported to have contracted the AIDS virus from a transfusion provided by the Puget Sound Blood Center.

To learn more about blood donations or blood transfusions, call Bloodworks Northwest at 206.292.6500, or visit bloodworksnw.org.

Cardiovascular Intensive Care Unit (CICU)

The first 24 hours after surgery are the most critical. This is when most changes in your condition occur. This is also when you have little control over your recovery.

Visiting

In the UWMC Cardiovascular Intensive Care Unit (CICU), you will be monitored and cared for by highly skilled cardiac nurses. Most patients stay in the CICU for 12 to 24 hours. Family and close friends can visit. The waiting room in the CICU has a direct telephone that your visitors can use to call the nurse when they arrive. When they call, they will need to tell the nurse how many people are in their group.

Although family may visit any time, we encourage them to leave the hospital at night to rest. Family members should leave a telephone number where we can call them. They may call the CICU at 206.598.6500 at any time. Ask one family member to make phone calls to the CICU and then share information with others.

Care and Monitoring

A nurse will care for you during the critical hours after surgery. There will also be a doctor from the cardiac surgery team available at all hours. During your stay in the CICU we will constantly monitor your heart rate, heart rhythm, and blood pressure. You will have patches on your chest and catheters inserted into an artery or vein.

IV Catheters

Along with monitoring equipment, you will have several intravenous infusions (IVs). These IVs allow the nurse to give medicine, fluids, and blood transfusions when you need them. Usually, all except one of these IVs are stopped after 12 hours.

Pacemaker Wires

During surgery, your doctor will place small, temporary pacemaker wires on the surface of your heart. The ends of these wires will be taped to your abdomen and may be used after surgery to manage abnormal heart rhythms. The wires are easily removed before your discharge from the hospital.

Chest Tubes

After surgery, fluid must be drained from your chest cavity. The fluid will drain through chest tubes that we insert during your surgery. There will be 1 - 3 tubes, and these are usually removed within the first 24 hours after surgery. It is normal to bleed slightly for the first 24 hours after surgery.

Urinary Catheter

You will have a small catheter in your bladder to drain urine during surgery and the first part of recovery. We will remove this 24 - 48 hours after surgery.

Respiratory Therapy

When we take you to the CICU after surgery, your breathing tube is left in place and connected to a breathing machine (ventilator). This is needed until the effects of anesthesia wear off and you are awake enough to breathe on your own. Because of the breathing tube, you will not be able to talk or drink anything when you wake up.

After we remove the breathing tube, you will get oxygen from a face mask or nasal cannula (a thin tube that goes around your head and into your nose). Leave the mask or cannula on, because it gives you the extra oxygen you need after surgery.

Your throat may be sore, and your voice may be hoarse from the breathing tube. The hoarseness is because the breathing tube passes between your vocal cords. The soreness and hoarseness should improve with time. Ice chips may help if your mouth is dry.

After we remove the breathing tube, you must take deep breaths and cough up secretions (fluids). If the secretions remain in your lungs, bacteria may build up and cause pneumonia. Pain from your incision makes coughing uncomfortable. Splinting the incision (hugging a pillow to your chest) and taking your pain medicine regularly will reduce the soreness and let you cough more effectively.

An incentive spirometer

Incision pain may restrict your breathing and cause you to take shallow breaths. When this happens, partial collapse of the lungs may occur and keep you from getting enough oxygen. Using the incentive spirometer will encourage you to breathe deeply by showing how big your breaths are.

As soon as you are able, the nurse will have you sit on the edge of the bed or in a chair. This also helps with deep breathing and coughing.

Recovering on the Cardiac Telemetry Floor

When you are stable (usually 12 to 36 hours after surgery), we will transfer you from the CICU to the cardiac telemetry floor. Specially trained nurses will continue to assist you in your recovery. The remainder of your recovery becomes a shared responsibility between you and the staff caring for you. You will be expected to actively participate in your own care – cough and take deep breaths, get out of bed, and begin eating normally.

For a few days, your heart rate and rhythm will be monitored with a portable transmitter called a telemetry box. Your cardiac team will assess your progress and prepare you and your family for discharge.

To recover from your surgery, you need to:

- **Do deep breathing.** Taking slow, deep breaths (at least 10 times an hour with your incentive spirometer) helps you fully expand your lungs. This will help release trapped secretions so you can cough them up. Clearing your lungs this way helps prevent pneumonia, helps you feel better, and speeds recovery.

- **Walk and increase your activity.** Being active helps you to breathe more effectively. It strengthens your muscles, and helps your body regain the function it had before surgery. Follow “keep your move in the tube” guidelines. Keep your upper arms close to your chest, using them together to push, pull, or lift yourself out of a chair or bed (see page 12).

  The handouts, “Activities of Daily Living After Heart Surgery,” and “Phase 1 Cardiac Rehab: Open-Heart Surgery,” have more tips and examples. Your occupational and physical therapists will bring you a copy of these handouts if you do not already have them.

- **Eat healthy foods.** A balanced diet will nourish your body with proteins, vitamins, and minerals so you can heal faster. You will have a regular diet after surgery. Or, if you have high blood sugar, you will be on a carbohydrate-managed diet until your blood sugar levels normalize. Even if you are not hungry, we encourage you to eat. Walking and increasing activity will help you build an appetite.

Discharge Teaching

The average length of stay in the hospital after surgery is 4 to 6 days. During your stay, you or your family will receive instructions to help you prepare for discharge and going home. You will likely meet with a nurse, dietitian, pharmacist, occupational therapist, and physical therapist.

Exercise

Daily exercise should be a part of your life. Exercise helps with flexibility and gradually improves your strength and endurance. The physical therapist will review exercises with you. You should slowly increase your activity as you prepare for discharge. Once you are home, keep doing the exercises you learned while in the hospital.

Medications

We will prescribe medications for you to take after surgery to help you recover. You must take these medications exactly as they are prescribed. A pharmacist or a nurse will teach you about your medications and answer any questions you may have.

Nutrition

What you eat affects your health. A registered dietitian or diet technician can help you learn how to eat for a healthy heart. They can give you tips on heart-healthy food choices, shopping, and cooking. Ask your nurse how to set up an appointment with a dietitian.

Insulin Management

Many patients who have not been diagnosed with diabetes will need insulin after surgery. Sometimes this is due to a side effect from a medicine, such as prednisone. Or you may have had mild insulin needs before surgery.

If you have high blood sugar, you will be on a carbohydrate-managed diet until your blood sugar levels normalize. This diet will help lower your risk of infection and help your body heal.

Medical Alert Jewelry

For patients who have had valve surgery or who are taking Coumadin, we recommend buying a medical alert bracelet or necklace. Some patients prefer to carry wallet cards.

Many companies and some jewelry stores carry this type of identification. Here is one source for medical alert jewelry:

Medic Alert Foundation International
2323 Colorado Ave., Turlock, CA 95382
www.medicalert.org
888.633.4298

Preparing to Leave

Before you go home, a nurse will review pain management, activity guidelines, incision care, when to call the doctor, emotional reactions after surgery, and discharge planning with you.

Before discharge, be sure to talk with your care team about any questions or concerns you have. We want to make sure you are fully prepared to go home. Some patients and family members learn well by watching educational videos. We have many videos that you and your family members may watch.

Follow-up Visit

You will have a follow-up visit with your cardiac surgeon in 1 to 2 weeks. You will also need to make an appointment with your cardiologist or referring doctor after this follow-up visit.

Recovering at Home

You may be worried about going home. We expect you to slowly return to a normal lifestyle. This section will help you know what to expect and how to care for yourself at home.

Pain Management

You can expect to have aches and pains. These are part of the healing process and may last up to 2 or 3 months. They often occur in the back, shoulders, neck, and chest. If you have had bypass surgery with a leg-vein graft, it is common to have incision pain in that leg.

You may be given a prescription for pain medicine. Take your medicine as directed. If you are sore or uncomfortable, do not hesitate to take the medicine. If you do not take the medicine, you may not do the amount of activity you should. If the pain medicine is not working well, call your doctor. You can also help your muscle soreness by using a heating pad, gently massaging the sore area, or taking a warm shower.

If your muscles feel stiff in the morning, warm-up exercises may help. Your physical therapists will teach you more about these exercises while you are in the hospital. Many women find that wearing a good support bra reduces pain by decreasing strain on the chest muscles. Avoid underwire bras.

Incision Care

You may shower when you return home unless your doctor tells you not to. Wash your incisions gently with mild, non-perfumed soap and water, and pat them dry.

After your incisions heal fully, about 6 weeks after your surgery, you may bathe in a tub. Until all the scabs have fallen off and your incisions are closed, you should not soak your incisions for longer than 5 minutes. This will help to prevent infection.

Avoid taking very hot showers and baths or soaking in hot tubs because you may become weak or dizzy, and possibly faint. This can happen because you are recovering from surgery, or because of the medications you are taking.

It is best to leave your incisions open to the air unless they are draining. If your clothing rubs or irritates an incision, you may cover the area with dry gauze. This gauze should be removed at night.

If your incisions are still draining when you leave the hospital, your nurse will give you instructions and supplies to care for your wounds at home. If you notice any signs of infection, call the Cardiac Surgery nurse practitioner on call at 206.598.6190. Signs include:

- Redness
- New drainage
- Warmth or heat at the incision site
- Fever (101ºF or 38.5ºC),

Do not apply any medicine or lotion to your incisions until they are completely healed and the scabs have fallen off, unless you have been told to do so by your healthcare team.

After a vein is taken from a leg, there tends to be swelling (edema) in that leg for a while. This puts pressure on and pulls at the incisions. To help you heal:

- Elevate your legs when you are sitting. A lounge chair at home may be helpful.
- During long car rides, stop to walk and stretch your legs every hour.
- Do not cross your legs when sitting or lying down. Crossing your legs limits your circulation and may increase swelling.

For some people with excess swelling in their legs, we may recommend wearing *anti-embolic* hose, or stockings. These are supportive stockings that decrease swelling, improve circulation, prevent blood clots from forming in your legs, and help your incisions stay closed. Wear them for 3 weeks after your surgery. Wear these when you are out of bed and take them off at night. After 3 weeks, continue wearing the stockings only if you still notice swelling in your legs.

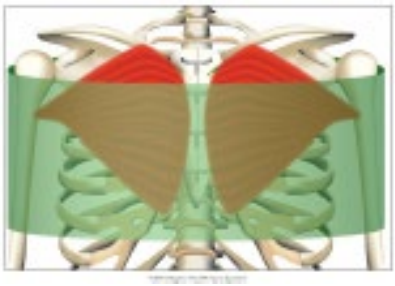
Home Activities After Surgery

After you return home, you will still need to avoid making your heart work too hard. Closely follow the guidelines in this section to help your recovery.

Your Daily Routine

The amount and type of activity you can do after discharge depends on your condition before surgery, the type of surgery you had, and your recovery.

Activity Recommendations: "Keep Your Move in the Tube"



The "tube" is the area around your upper arms, sternum, and the attached muscles.

During surgery, your breastbone (sternum) is divided down the middle and then wired back together with permanent stainless steel/titanium wires or cables. It will take about 3 months for this bone to heal. To help your recovery, remember to keep your movements *"in the tube."*

"Keep your move in the tube" is a phrase to help you use your arms and minimize the stress on your sternum. The "tube" is the area around your upper arms, sternum, and attached muscles. The goal is to keep your upper arms close to your body with each load-bearing movement. For the first 12 weeks after surgery:

- For all load-bearing movements such as lifting, pushing, or pulling, keep your upper arms close to your chest (in the tube) and use both arms.
- When performing tasks that do not involve lifting, pushing, or pulling, you can move your arms freely. Move slowly and listen to your body. Pain is a signal to stop or change the activity.
- There are no weight restrictions, but you should ease slowly into activities. Pain is a signal to stop or change the activity. We do not expect a sudden, sharp increase in pain. We do expect soreness.

Keeping your movements "in the tube" will help you to do your activities of daily living such as dressing, showering, and toileting without assistance. Your physical and occupational therapists will help you modify activities specific to your needs.

When to Restart Activities

You can do these activities as soon as you want to:

- Shower, shave, and wash your hair.
- Walk on level ground at a leisurely pace. Remember to slow down on hills.
- Walk up and down stairs at a normal pace – going up takes more energy. Slow down or stop when you become short of breath.
- Use a stationary bicycle at a leisurely pace.
- Ride in a car, go out for meals, or visit friends.
- Prepare meals, wash dishes and clothes. (Stay "in the tube" and listen to your body.)
- Do light housekeeping.
- Resume sexual activity (again, modifying to stay "within the tube").

Avoid these activities for 12 weeks after surgery:

- Vigorous activities such as running.
- High-impact sports such as softball, baseball, or tennis.
- Talk to your physical and occupational therapists about modifying and grading your return to sport and/or leisure activities.

Ask your doctor when these activities are safe for you:

- One-sided activities involving arms and chest muscles, such as gardening or doing heavy work with a screwdriver.
- Driving a car or truck. During early recovery your reaction time is slower, and you will get tired easily.

Exercise Guidelines

Daily exercise is a key part of your healing process. Regular exercise may help strengthen the heart muscle, allowing it to pump more efficiently. Exercise improves muscle tone and circulation, assists in weight loss or maintenance, and promotes a general sense of well-being.

- If you are not on beta blocker medications, you can use your pulse as your guide to tell you how hard your heart is working. Keep your pulse no greater than 20 to 30 beats per minute above your resting heart rate.
- Take the time to warm up your muscles and increase circulation before and after exercising to increase efficiency and to prevent injuries.
- Wait 1 hour after eating before you exercise or walk. When you are walking long distances, stay on level ground. Hills and stairs are okay if you slow your pace to keep your heart rate within the guidelines.
- Wear comfortable, flat shoes and loose clothes. Any clothing that restricts your movements may make breathing more difficult.
- Avoid being outside on very hot or very cold days during your recovery. Extreme temperatures add to heart stress. In the winter, walk in the afternoon or during the warmest part of the day. During the summer, walk in the morning or during the coolest part of the day.

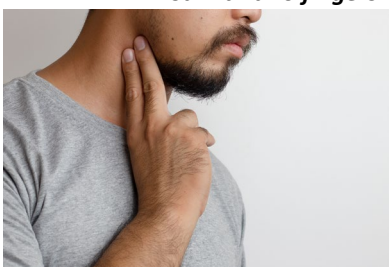
How to Take Your Pulse

Your best guide to how hard your heart is working is your pulse. When you feel your pulse, you are actually feeling your heart pushing blood through your arteries.

Use your fingers (never your thumb, which has its own pulse) to find your pulse on the inner part of your wrist just below your thumb. If you cannot find your wrist pulse, gently find the pulse in your neck. Do not press hard or you could reduce blood flow to your head, making you dizzy or faint. Start with 0 and count your heartbeats for 1 minute (or count for 15 seconds and multiply by 4). Check your pulse:

- When you are at rest
- During activity
- At the end of activity

Check your pulse in your wrist with two fingers.



Check your pulse in your neck very gently.

Use your pulse rate as your guide to how hard your heart is working. It is important that your heart rate does not increase to more than 20 to 30 beats per minute above your resting heart rate.

Beta-blockers can affect your heart rate. If you are on beta-blockers, a tool called “rate of perceived exertion” may be more helpful to understand how hard your heart is working. Please refer to your “Phase 1 Cardiac Rehab: Open-Heart Surgery” handout for more details about this tool.

Warm-up and Cool Down Exercises

Daily exercise is important, and usually the main exercise you will do after surgery is walking. Warm-up and cool-down exercises allow your heart and breathing rate to increase slowly before you walk and decrease slowly afterward.

Do your warm-up exercises for at least 5 minutes before and after walking. Your occupational and physical therapists will give you examples of arm and leg exercises that you can use for this.

Walking Progression

The distance and timing of your in-hospital walking program will be based on your tolerance. In the beginning, it is best to increase the distance you walk before increasing your walking speed. Remember to use your pulse rate as your guide to how hard your heart is working.

The goal while you are in the hospital is to walk 3 to 4 times per day. The long-term goal is to walk at least 30 - 40 minutes every day by 6 weeks after your procedure. We will monitor your heart while you are in the hospital. When you are at home, tell your doctor if you have any of the symptoms listed in the slow-down signals section (see below).

Slow-Down Signals

Your body will tell you if the exercise you are doing is too hard for you. If you experience any of the symptoms listed below, slow down, write down what happened, and talk with your nurse or doctor.

Reduce your exercise level if:

- Your heart rate or pulse increases more than 20 - 30 beats above your resting heart rate.
- Your heart rate or pulse stays high for 10 minutes after exercise ends.
- You are breathless for longer than 10 minutes after exercise ends.
- You have persistent fatigue, up to 24 hours later.
- You have pain in your joints, shins, or heels.
- You have pain or cramping in your calf (lower leg) muscles.

STOP your exercise and talk with your doctor before starting again if you:

- Have an abnormal heart rhythm – irregular pulse, palpitations, sudden very slow pulse, or sudden burst of rapid heartbeats.
- Have new or prolonged pain or pressure in your chest, arms, or throat.
- Are dizzy, confused, or light-headed.
- Lose coordination or faint.
- Have cold sweats or become pale.
- Have nausea or are vomiting.

Do **NOT** exercise if you have:

- A bad cold, flu, or fever.
- Extreme fatigue.

Resuming Sexual Activity

It is normal to have some concerns about your return to sexual activity after open-heart surgery. It is best to talk openly with your partner about your concerns. Sexual intimacy provides important physical and psychological satisfaction. Talk with your occupational therapist, physical therapist, nurse, or doctor about any questions you have. This is a common concern, and it is normal to have questions.

Sexual intimacy can take many forms. During the early weeks of recovery, you may be afraid or still feel very tired. During this time, touching, holding, and caressing without intercourse are ways to be close and share intimacy. As your daily activities, exercise, and endurance increase, you can decide for yourself when it is best to return to full sexual activity.

There is no reason to avoid sexual activity. Increased heart rate and rapid breathing are normal during arousal. During orgasm, the heart rate may increase about the same as briskly climbing 2 flights of stairs.

Follow these guidelines:

- You may resume sexual activity when you are comfortable and ready to do so.
- For 12 weeks, remember to “keep your move in the tube” with your upper arms close to your chest. Monitor yourself and either stop or change your movement if pain increases.
- Sexual activity will be less stressful when both partners are relaxed. If you are upset, fatigued, or stressed, it is best to avoid sexual activity until you are feeling better. Talking with your partner about any fears or concerns may help you relax and reconnect.
- Wait 1 hour after meals or alcohol before beginning sexual activity. This will help your digestion and other bodily processes work without competing for blood and oxygen.

Returning to Work

At your follow-up visit, talk with your surgeon or cardiologist about returning to work. Most patients can return to their regular work schedule within 3 months after surgery, and many return earlier.

Common Responses to Surgery

Sleep Problems

During recovery after surgery, it is common to have:

- Increased sleep.
- Difficulty falling or staying asleep.
- Waking during the night.
- Nightmares or very intense dreams.
- Night sweats.

There may be many reasons for these changes, such as interrupted sleep during your hospital stay, anesthesia, and medications. As you catch up on your sleep at home and get back to your normal sleep cycle, these problems will get better on their own.

Even if these sleep issues make you feel tired and weak, try to get dressed every day and do your normal activities. Go for a walk, have lunch, then take a nap. Rest between your activities.

You will sleep better at night if you are physically active during the day. Do not sleep all day and then lie awake at night.

Temporary Depression and Mood Swings

People recovering from heart surgery sometimes become depressed. You may find yourself crying for no apparent reason or feeling more emotional or sentimental than normal. We don't know exactly why this happens. Try increasing activity and exploring old interests. Some patients have found that this helps with depression.

If you experience mood changes, you and your family will be better able to cope knowing it is common and temporary. If you would like to discuss taking a medication that can help with depression, talk to the nurse practitioner on call at 206.598.6190. Do not hesitate to contact your care team when you need help. We are here for you.

Restlessness and Difficulty Concentrating

After surgery, it is common to be irritable and restless. You might find it hard to concentrate. You may notice that the things you were looking forward to doing after surgery no longer interest you. These reactions are common and temporary after any major surgery. With time, your interests should return to normal.

Temporary Memory Loss

It is very common for people to have a period after surgery when their attention span is short, and their short-term memory is poor. This may be due to many factors, including anesthesia and medications. With time, your memory should return to normal.

Decreased Appetite

A decreased appetite is also common after heart surgery. However, your body needs increased calories for healing during this time. We recommend you eat what sounds good to you in the first weeks after surgery. After 6 to 8 weeks, you may need to make dietary changes such as decreased fat, cholesterol, and salt. If you have had a coronary artery bypass or have a history of coronary artery disease, we suggest you follow a heart-healthy diet. Talk with your care team about a diet that is right for you.

Independence

Before surgery, you may have become more dependent on family members or friends as your health got worse. With successful heart surgery, you will be able to be more independent again, and no longer need as much help. Your family and friends may need to adapt to these changes in your lifestyle.

Your Healthcare Team

Many people are involved in your care during your hospital stay. A team of specialists provides expert care before, during, and after your surgery. This team includes:

- **Cardiac surgeons** perform your heart surgery. They will talk with you before surgery and direct your care during recovery. The UW Medical Center team of cardiac surgeons works closely together. One of these surgeons is always available.
- **Cardiac anesthesiologists** administer your anesthesia. They check and treat your physical condition at all times during surgery and right afterward.
- **Cardiac services nurses** are specially trained in caring for heart surgery patients. They will teach you about your heart surgery, and they will care for you during your recovery from surgery.
- **Cardiac surgery nurse practitioners** communicate directly with the surgeons and oversee your care while you are in the cardiac surgery unit. They will answer your questions after your discharge. They will participate in your clinic appointments.
- **Cardiac surgery pharmacists** monitor your medication treatment plan during your hospital stay. They will teach you about your medications before you return home.
- **Dietitians** assist you and your family in planning any needed changes in your diet.
- **Occupational therapists** will help reintroduce activities of daily living. If needed, they will help you recover strength and independence after your surgery.
- **Perfusionists** run the heart-lung machine during surgery.
- **Physical therapists** will help you move and exercise after surgery. If needed, they will help you recover your strength, endurance, balance, and independence with movement.

- **Physician assistants** work with you, your surgeon, and your nurse to provide your care in the hospital and at follow-up visits.
- **Respiratory therapists** manage the mechanical ventilator and assist with breathing exercises. They will help with your care while you are in the critical care unit.
- **Social workers** can help you with discharge planning, care after leaving the hospital, housing, support, and counseling.
- **Speech language pathologists** are available to assess your communication, cognition, and swallowing, and assist with your recovery.
- **Surgical residents** are doctors completing post-graduate training in surgery. The team of residents is led by the chief cardiac fellow, who has completed 5 years of post-graduate training in surgery and is continuing specialty training in cardiovascular surgery. Surgical residents play an important role in your care during your hospital stay.

Glossary of Medical Terms

ACE inhibitors – Medications that help treat heart failure and high blood pressure. They make it easier for the heart to pump blood.

Aerobic exercise – A type of exercise where the body keeps up with the muscles' need for more oxygen. Examples include swimming, jogging, and cycling. During these activities, you will have a high heart rate.

Angina pectoris – Chest pain or pressure caused by narrow or blocked coronary arteries. This pain may spread to your left arm or jaw.

Angioplasty – A procedure to open narrow coronary arteries. A thin tube with a balloon at the tip is placed in the artery. The balloon is inflated to push the buildup of fatty deposits (plaque) against the artery walls, making more room for blood to flow. Also see percutaneous transluminal coronary angioplasty (PTCA).

Antiarrhythmic agents – Medications that help treat abnormal heart rhythms. They work by slowing signals in the heart's nerves, so the heart can beat more normally.

Anticoagulant – Medications that prevent blood clotting (for example, heparin or Coumadin).

Aorta – The main blood vessel that carries oxygen-rich blood from the left ventricle of the heart to the rest of the body.

Arrhythmia – An abnormal heart rhythm, or change from your usual heart rhythm.

Artery – A blood vessel that carries oxygen-rich blood away from the heart. It has thick walls that help it handle the pressure from each heartbeat.

Atherosclerosis – A disease where fatty deposits (plaque) build up on the inner walls of the arteries, especially the coronary arteries. This causes them to be narrow or blocked, which can lead to a heart attack (myocardial infarction).

Atria – The upper chambers of the heart. The right atrium gets blood with waste (carbon dioxide) from the body. The left atrium gets fresh, oxygen-rich blood from the lungs. This goes to the left ventricle, which pumps it to the rest of the body.

Atrial fibrillation – An irregular heartbeat where the atria (top chambers of the heart) shake, causing the heart to beat fast and irregularly.

Beta blockers – Medications that slow down the heart rate and lower blood pressure. They can also help with chest pain (angina).

Blood pressure – The force of blood pushing against the walls of the arteries as the heart pumps it around the body.

Bradycardia – A slow heartbeat, usually fewer than 50 or 60 beats per minute.

Calcium channel blockers – Medications used to prevent chest pain (angina), treat abnormal heart rhythms, and lower blood pressure. These can also help blood vessels relax and prevent spasms of the heart vessels, especially after procedures like balloon angioplasty or after heart bypass surgery.

Cardiac – Heart (for example, a cardiac surgeon is a heart surgeon)

Cardiac arrest – See Ventricular fibrillation.

Cardiac catheterization – A test where a small tube (catheter) is put into an artery, usually in your leg, and guided into or near your heart. This test helps your doctor check your heart and blood vessels. A special dye is used to see the shape of the vessels more clearly.

Cardiac Intensive Care Unit (CICU) – The intensive care unit where patients with serious heart conditions are closely monitored and treated by a highly skilled healthcare team. The CICU has state-of-the-art equipment so seriously ill patients can be monitored at all times and, if needed, be treated right away.

Cardiac surgeon – A doctor who specializes in heart and blood vessel surgery. Cardiac surgeons operate to prevent or repair damage caused by birth defects, blocked arteries, or heart attacks.

Cardiologist – A doctor who treats and diagnoses heart disease.

Cardiomyopathy – A condition where the heart muscle becomes weak, making it harder for the heart to pump blood.

Catheter – A thin, flexible tube that is inserted into blood vessels or body cavities for medical procedures.

Catheter ablation – A procedure to treat fast heartbeats. It uses radio waves to block abnormal electrical pathways between the heart's atria (right or left upper chamber of the heart and ventricles (right or left lower chamber of the heart).

Cholesterol – A fatty substance found in food and made by the body. It helps the body make hormones and bile acids, and it strengthens cells. Most cholesterol in the blood comes from the food we eat and is made by our liver. Eggs, meat, dairy, and plants can contain cholesterol, but the biggest source of cholesterol is saturated fats (for example meat, butter, cheese, palm oil).

Congenital – A term that means “present at birth.” Congenital abnormalities are birth defects that are caused by genetics, damage in the uterus (womb), or problems during birth.

Coronary artery – A blood vessel that brings oxygen-rich blood to the heart muscle.

Coronary artery bypass graft (CABG) – Heart surgery performed to go around narrow or blocked arteries using new blood vessels. This restores blood flow to the heart.

Coronary artery disease (CAD) – Another name for atherosclerosis or blocked/narrowed arteries.

Coronary stent – A small metal tube placed in a narrowed artery to keep it open and improve blood flow. It is left in place in the coronary arteries. This can help prevent the need for bypass surgery.

Defibrillation – An electric shock used during cardiac arrest to restart the heart's normal rhythm.

Diastolic pressure – The bottom number in blood pressure readings. For example, if your blood pressure is 120/80, your diastolic pressure is 80. This shows the amount of pressure in your arteries when the heart is resting between beats.

Edema – Swelling caused by extra fluid in cells, tissues, or body cavities.

Electrocardiogram (ECG) – A test that records the heart's electrical activity.

Electrode – A patch placed on the skin to measure electrical signals from your heart.

Electrolyte – Minerals like sodium, potassium, and calcium that help balance fluids and support body functions.

Electrophysiology – The study of electricity in the body, for example the heart's electrical signals.

Heart attack – See Myocardial infarction.

Heart failure – When the heart doesn't pump blood effectively, causing fluid buildup in the body.

Hematocrit – A measurement of how many red blood cells are in your blood.

Hematoma – A bruise or bump caused by bleeding under the skin.

High-density lipoprotein (HDL) – The "good" cholesterol that helps remove fat and cholesterol from the blood and artery walls. People who exercise, have a healthy weight, and who don't smoke have higher levels of HDL.

Hypertension – Another word for high blood pressure.

Implantable defibrillator system (IDS) – A device placed in the chest to treat life-threatening heart rhythms. This helps patients with uncontrolled ventricular tachycardia or ventricular fibrillation. It is also called an *automatic implantable cardiovascular defibrillator* (AICD).

Incentive spirometer – A device that measures how deeply you can breathe.

Internal mammary artery (IMA) – A blood vessel under the chest wall, which is often used for coronary artery bypass graft surgery.

Intravenous (IV) – A thin tube inserted into a vein to give you fluids and medications.

Ischemia – When blood flow to an organ is reduced due to a blocked or narrow blood vessel.

Low-density lipoprotein (LDL) – The "bad" cholesterol that can build up in blood vessels.

Myocardial infarction (MI) – Another term for a heart attack. This is caused by a blockage in the heart's blood supply.

Nitroglycerin – Medicine used to prevent or relieve chest pain (angina) by improving blood flow to the heart.

Normal sinus rhythm – A normal heartbeat controlled by the heart's natural electrical system.

Occupational therapist – A healthcare professional who teaches you how to safely resume activities of daily living such as showering and dressing.

Open-heart surgery – Any surgery that uses a heart-lung machine to keep the body working while the heart is operated on. This is an open-heart surgery whether the surgeon opens the heart or not.

Palpitations – The feeling that your heart "skipped a beat," or a fluttering sensation.

Percutaneous transluminal coronary angioplasty (PTCA) – A procedure that uses a balloon catheter to open narrow arteries. This procedure is sometimes called balloon angioplasty.

Pericardium – The thin sac surrounding the heart.

Permanent pacemaker – A small electronic device placed in the chest to help the heart to beat regularly.

Plaque – Fatty deposits in arteries that can narrow or block blood flow. This can lead to a heart attack.

Premature ventricular contractions (PVCs) – The most common type of arrhythmia, or abnormal heart rhythm. PVCs are extra or skipped heartbeats caused by early signals in the ventricles.

Pulmonary edema – Fluid buildup in the lungs due to the heart's left side not pumping properly. This usually causes shortness of breath.

Sheath – A short tube used to protect the blood vessel during procedures.

Sodium – A mineral that helps maintain fluid balance in the bloodstream and body cells. Too much sodium causes the body to hold water, which may lead to high blood pressure.

Stenosis – Narrowing of an opening, valve, or passageway in the body.

Sternum – The breastbone.

Stroke – Damage to part of the brain, caused by a blocked or burst blood vessel. Feeling, movement, and body function can be affected.

Systolic pressure – The top number in blood pressure readings. For example, if your blood pressure is 120/80, your systolic pressure is 120. This shows the amount of pressure in your arteries when the heart pumps blood.

Tachycardia – A fast heartbeat.

Telemetry monitoring – A system that sends heart activity to a monitor for your cardiac care team to watch. A small telemetry machine is connected to sticky patches on your chest.

Thrombin – A part of the blood that helps it clot.

Urinary catheter – A tube used to drain urine from the bladder. Also called a Foley catheter.

Valves – Structures in the body that allow fluids to flow in one direction but stop them from going backward. Your most important valves are in your heart and veins.

Veins – Blood vessels that carry blood from around your body back to heart

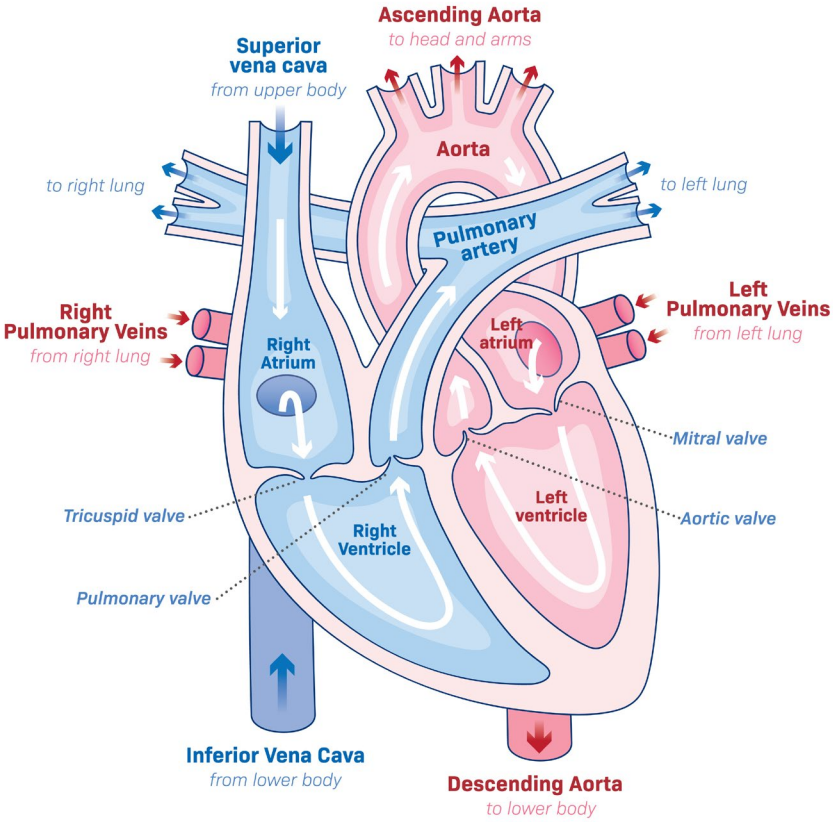
Venectomy – Surgery to remove a vein or part of a vein.

Ventilator – A machine that helps patients breathe, used during and right after surgery.

Ventricles – The lower chambers of the heart. The right ventricle pumps blood to the lungs, and the left ventricle pumps oxygen-rich blood to the body.

Ventricular fibrillation (VF) – A dangerous heart rhythm where the heart moves quickly and randomly instead of pumping blood, leading to loss of consciousness. This is also called cardiac arrest.

Ventricular tachycardia – A fast, dangerous heart rhythm that starts in the ventricles.



The valves and ventricles of the heart.

Questions?

Your questions are important. Call your doctor or healthcare provider if you have questions or concerns.

Cardiac Surgery ARNP on call: 206.598.6190

Cardiac Surgery Clinic: 206.598.8060

Cardiac Surgery Patient Care Coordinator: 206.598.3636

Open Heart Surgery Patient CareMap®

Your care plan may be different.

	Day Before Surgery	Day of Surgery	Day 1 After Surgery	Day 2	Day 3	Day 4	Day 5	Home Care
Unit		Cardiac Intensive Care Unit and Surgical Floor	Cardiac Telemetry Floor			 Discharge Home		Call your doctor if you have: • Fever • Irregular heartbeats • Shortness of breath • Weight gain/swelling • Excessive fatigue or pain • Nausea, dizziness • Signs of infection
Activity		• Bed rest ➡ Chair 	• Chair for meals • Walk in room 2-3 times with help 	• Chair for meals • Walk 100-240' 4 times 	• Chair for meals • Walk 240-480' 4 times 	• Chair for meals • Walk 480' 4 times 		• Follow activity guidelines from physical therapist 
Treatments	Pre-op Weight: _____ Goal Weight: _____	• Oxygen by mask or nasal prongs after breathing tube is out Weight: _____	• Do breathing exercises 10 times each hour • Chest tubes and urinary catheter out • Heart rhythm monitor Weight: _____	Weight: _____ Kgs above preop: _____	• Oxygen discontinued if no longer needed	• Pacer wires out		• Do breathing exercises 10 times each hour while awake for 1 more week • Weigh daily
Diet	• No food or liquids after midnight 	• Sips of water and ice chips when breathing tube is out • Fluids may be limited	Kgs above preop: _____ • Eat as tolerated (may have loss of appetite) 	• Goal: Eat 50% of meals, no nausea 	• Goal: Eat 75% of meals, no nausea 			
Hygiene	• Pre-operative shower 	• Sponge bath 	• Wash sitting up in chair 	• Shower 24 hours after chest tubes out 				• Watch incision for signs of infection 
Education	• Watch video: "Open Heart Surgery" • Read through "Your Guide to Cardiac Surgery"	• Surgeon talks with family in waiting room 			• Patient Education Videos (see video list) • Refer to class schedule on wall		Education Videos • "Open Heart Surgery Home Recovery" • "Fitness" • "Diet" • "Lifestyle Changes"	

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Heart Institute | Box 356087
1959 N.E. Pacific St., Seattle, WA 98195 | 206.598.4300