Dear Patient,

Thank you for choosing MedStar Heart & Vascular Institute at MedStar Washington Hospital Center for your cardiac care. The enclosed information will provide you with everything you need to know before, during and after your procedure. Please keep this guide with you during your hospital stay — your doctors, nurses and other members of the health care team will be referring to the contents of this book while you are under our care.

We hope you find this guide helpful in assisting you and your family through your procedure and toward a healthy recovery. If you have any questions after reviewing the information, please ask. Your health care team will be happy to answer them for you.

Best wishes for a speedy recovery.

Your Health Care Team at MedStar Heart & Vascular Institute

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ABOUT MEDSTAR HEART & VASCULAR INSTITUTE

On June 14, 2016 the Nancy and Harold Zirkin Heart & Vascular Hospital opened on the campus of MedStar Washington Hospital Center. It is a 164-bed state-of-the-art cardiovascular facility, the first dedicated heart and vascular hospital in the nation’s capital. It is the cornerstone of the MedStar Heart & Vascular Institute and has advanced cardiovascular care for patients throughout the Washington and mid-Atlantic regions.

Working closely with our vital new enterprise MedStar Health has combined the cardiac and cardiovascular resources of its MedStar Washington region hospitals: MedStar Washington Hospital Center, MedStar Georgetown University Hospital, MedStar Montgomery Medical Center, MedStar National Rehabilitation Hospital, MedStar St. Mary’s Hospital and MedStar Southern Maryland Hospital Center.
We provide the most experienced cardiovascular care in the region. Through cutting-edge technology, team approaches to care, ongoing research and highly experienced physicians and staff, MedStar Heart & Vascular Institute attracts patients from around the country and the world.

In both surgery and cardiology, the program ranks as one of the busiest in the nation with approximately 1,400 open heart surgeries and more than 16,500 cardiac catheterization procedures per year.

ABOUT MEDSTAR WASHINGTON HOSPITAL CENTER

MedStar Washington Hospital Center is a 926-bed major teaching and research hospital. It is the largest private, not-for-profit hospital in the nation's capital, among the 100 largest hospitals in the nation and a major referral center for treating the most complex cases. U.S. News & World Report consistently ranks the Hospital Center’s cardiology and heart surgery program as one of the nation’s best; it’s the only hospital in the Washington metropolitan area to earn a national ranking for heart care in FY 2015. A long-standing leader in cardiovascular care, MedStar Washington Hospital Center is home to MedStar Heart & Vascular Institute, which formed a first-of-its kind clinical and research alliance with Cleveland Clinic Heart & Vascular Institute in 2013. The Hospital Center also is a respected top facility in the Washington region in the areas of cancer, diabetes & endocrinology, ear, nose & throat, gastroenterology & GI surgery, geriatrics, gynecology, nephrology, pulmonology and urology. The hospital operates the Washington region’s first Comprehensive Stroke Center and the District’s only Cardiac Ventricular Assist Device program, both certified by The Joint Commission. The hospital is also home to MedSTAR, a nationally verified level I trauma center with a state-of-the-art fleet of helicopters and ambulances, and also operates the region’s only adult Burn Center. MedStar Washington Hospital Center has a $1.1 billion operating budget, employs a workforce of 6,300 associates and has a medical and dental staff of 1,600, comprising private attending physicians, employed faculty and advanced practice clinicians. In FY15, the hospital’s volume of service included 38,156 inpatient admissions, 23,087 surgeries, 87,009 emergency room visits, 389,535 ambulatory care visits and 3,361 births. Each year, nearly 370 medical and surgical residents and fellows train at the Hospital Center’s 37 fully accredited independent programs. MedStar Washington Hospital Center also maintains affiliations with several area medical schools, including Georgetown University School of Medicine.

To access the MedStar Heart & Vascular Hospital: Enter through the main entrance of the Hospital Center, and immediately turn right to enter the MedStar Heart & Vascular Hospital. There is a desk and waiting area for admissions and registration.

To access the patient care units, use the “N” North elevators.

2nd Floor—Critical Care Units - Coronary Care and Cardiac Surgery

3rd Floor—Cardiac Surgery and Heart Failure Patient Care Units

4th Floor—Cardiology and Vascular Patient Care Units, Cardiac Catheterization Lab and waiting area.

To access the 5th Floor for the Electrophysiology (EP) lab, use the “CD or B” elevators in the main hospital.
YOUR HEALTH CARE TEAM

An entire team of health care professionals may be involved in your care. Here is a list of the different titles they have, with an explanation of what they do.

**Advanced Practice Clinician:** These clinicians may include anesthesia assistants (AA), certified nurse anesthetists (CRNA), certified midwives (CNM), nurse practitioners (NP) and physician assistants (PA) who examine patients, diagnose injuries and illnesses and provide treatment in collaboration with our physician team.

**Anesthesiologist:** A doctor who is specially trained to provide life-support measures and to keep you comfortable during your operation.

**Cardiac Surgeon:** A doctor specially trained to perform your cardiac surgery.

**Cardiologist:** A doctor specializing in the care of patients with heart disease.

**Cardiovascular Technologist:** A person specially trained and certified to assist with procedures in the catheterization laboratory and on nursing units.

**Clinical Care Facilitator:** A registered nurse who collaborates with all team members to plan and carry out your care from admission to discharge. Clinical care facilitators are identifiable by their olive green scrubs.

**Clinical Specialist:** A nurse with advanced training in cardiac recovery.

**Certified Nurse Anesthetist (CRNA):** An advanced practice nurse specially trained to provide life support measures and to keep you comfortable during your operation.

**Dietitian:** A person who can explain and offer suggestions to improve your diet and nutrition.

**Echocardiologist:** A cardiologist specializing in diagnosing ultrasound images of the heart.

**Electrophysiologist:** A cardiologist specializing in diseases of the electrical system of the heart. This doctor also performs procedures in the electrophysiology laboratory (EP Lab).

**Hospitalist:** A hospital physician who directs and manages care for admitted patients.

**Intensivist:** A doctor who closely monitors and directs the care of patients in the Intensive Care Unit.

**Interventional Cardiologist:** A cardiologist specializing in procedures in the cardiac catheterization laboratory.

**Nursing Director:** The registered nurse (RN) who is responsible for and oversees the care delivered to you while you are on your unit.

**Nurse Practitioner (NP):** An advanced practice nurse who examines patients, diagnoses injuries and illnesses and provides treatment in collaboration with your physician team.

**Occupational Therapist:** A person who evaluates, assists and implements daily living activities, such as bathing, shaving and household activities. He or she helps make recommendations for rehabilitation services.

**Patient Care Technician:** The caregiver who assists you with morning care, showers and other basic care.

**Physical Therapist:** A person who evaluates, assists and implements activities, such as walking and strengthening exercises. He or she helps make recommendations for rehabilitation services.

**Physician Assistant:** A licensed care provider who examines patients, diagnoses injuries and illnesses and provides treatment in collaboration with your physician team.

**Primary Care Physician:** Your own personal doctor.

**Provider:** Any doctor or advanced practice clinician who is directing your care.

**Registered Nurse:** A licensed nurse who directs your nursing care.
**Research Nurse:** A nurse who works with the cardiac team to coordinate research programs.

**Resident:** A physician in a training program who provides medical care in collaboration with the attending physician.

**Respiratory Therapist:** A person who assists you with breathing treatments and breathing exercises.

**Social Worker or Case Manager (Nurse):** A person with special training in patients’ home care needs and issues surrounding leaving the hospital.

**Speech Therapist:** A person who evaluates your ability to speak and swallow.

**Surgical Systems Coordinator:** A registered nurse who provides educational information regarding your cardiac surgery. Consults and coordinates with surgeons/medical director to assess, plan and implement patient care and provide medical advice.

**Unit Clerk:** A person who greets visitors at the nurses’ station and on the phone, and takes requests over the intercom.

**RESEARCH**

The MedStar Cardiovascular Research Network (MCRN), based at MedStar Washington Hospital Center, is responsible for coordinating and performing cardiovascular research within the MedStar Heart & Vascular Institute (MHVI) and the MedStar Health Research Institute (MHRI).

MCRN is comprised of basic scientists, senior cardiovascular investigators, cardiovascular physicians, research nurses, technicians, support staff, and others who are dedicated to state-of-the-art research in cardiovascular care. The network draws on MedStar Heart & Vascular Institute’s enormous patient experience, which includes 15,000 catheterizations and more than 1,800 open-heart procedures per year. MCRN clinical research activities offer patients an opportunity to become involved with a number of clinical trials, including:

- Drug-eluting stent registries
- Carotid stent trials (for treating patients with stroke or at risk of stroke)
- Devices to more effectively treat peripheral vascular disease
- Acute coronary syndrome/MI interventions
- Percutaneous aortic valve replacement, mitral valve clips, left atrial appendage closure and PFO closure
- Cardiac imaging (MRI, cardiac CT, intra-vascular ultrasound (IVUS) and cardiac ultrasound)
- Atherosclerosis and lipids therapy (including state-of-the-art therapy with HDL to decrease plaque size and decrease risk of recurrent heart attack)
- Pharmacologic therapies for cardiovascular disease
- Gene discovery and translational research (to reveal genetic causes of cardiovascular diseases)
- Closure of congenital heart defects
- Angiogenesis/myogenesis (to improve heart function and to increase blood flow to the heart for patients with atherosclerotic heart disease)
- Congestive heart failure

For more information or to join a MCRN clinical trial, please call 202-877-5975. For more information about MCRN programs (which include several basic and clinical research labs where scientists and researchers collaborate on emerging techniques and technologies in cardiovascular care) visit the MedStar Health Research Institute at www.medstarresearch.org.
SECTION 2

Getting to Know Your Heart

HOW YOUR HEART WORKS

Your heart is a pump that circulates blood with fresh oxygen and nourishment throughout the body. Slightly larger than a fist, it lies inside the left side of your chest, just behind the breastbone. Your heart has four chambers — the upper two are the left and right atria, and the lower two are the left and right ventricles.

Your heart pumps blood continuously through the circulatory system, beating about 60 to 90 times each minute, or about 100,000 times each day.
There are four valves in your heart that open and shut with precise timing to keep blood flowing through the chambers. These valves function like one-way doors to keep the blood flowing in the proper direction.

The heart pumps blood through the four chambers in an organized sequence. The deoxygenated blood enters the heart in the right atrium, proceeds to the right ventricle and then on to the lungs where it picks up fresh oxygen. The left atrium then receives the freshly oxygenated blood and passes it on to the left ventricle, which pumps it into the aorta and on to the rest of the body.

The tricuspid valve is located on the right side of the heart, between the atrium and right ventricle.
The pulmonic valve manages blood flow into the lungs from the right ventricle. The mitral valve is located on the left side of the heart, between the left atrium and ventricle. The aortic valve manages blood flow into the aorta from the left ventricle.

The heart has an electrical system that makes it possible for the heart muscle to contract and pump blood in an organized sequence. This sequential system begins with an electrical impulse in the right atria of the heart. The impulse moves across the right and left upper chambers of the heart (atria), causing the muscle to contract and pump blood into the lower chambers (ventricles). The electrical impulse passes into the ventricles through a fiber network causing the heart muscle to contract and pump blood out of the ventricles.
The coronary arteries supply the heart muscle with blood rich in oxygen and nutrients. Lying on the surface of the heart, the coronary arteries divide into a web of smaller blood vessels that supply every area of the heart with blood.

**Conditions:**

**CORONARY ARTERY DISEASE**

Coronary artery disease, also called atherosclerosis, refers to buildup of fatty deposits (composed mostly of cholesterol) in the lining of one or more coronary arteries or their branches. As an artery fills up with fatty deposits, it narrows. The flow of blood and oxygen to the heart muscle decreases. Often, the first symptom of coronary artery disease is chest pain (angina), particularly when you exercise or are under stress. Complete blockage of an artery can damage the heart muscle (heart attack or myocardial infarction) and interfere with your heart’s ability to pump blood.

There are many possible treatments for coronary artery disease. To help you and your doctor decide what treatment is best for you, a cardiac catheterization may be performed.

**ANGINA**

Angina is a painful or uncomfortable feeling that can occur in your chest, back, arm, neck or jaw. It is a warning sign that your heart is not getting enough oxygen-rich blood.

Signs and symptoms of angina include:

♥ Discomfort, heaviness, tightness, pressure or burning in or near your chest.
♥ Discomfort in your shoulders, neck, throat or jaw.
♥ Fatigue, nausea, sweating, shortness of breath or indigestion may be associated with anginal pain.

**MYOCARDIAL INFARCTION**

A myocardial infarction, also called MI or heart attack, occurs when the heart muscle is deprived of oxygen and nutrients long enough to be damaged. Damage can be limited by getting help quickly.

**VALVULAR HEART DISEASE**

Stenosis is a narrowing of a heart valve. An insufficient or leaky valve allows the backflow of blood called regurgitation. Some people are born with abnormal valves and others may develop valve damage from infections, a heart attack or other disorders such as rheumatic fever.

An overworked heart can cause heart failure, shortness of breath, dizziness, chest pain, tiredness and fluid retention. Valvular disease can be treated medically, but if the disease becomes severe, your doctor may suggest valve replacement or surgical repair.

The opening and closing of the heart valves cause recognized heart sounds. Doctors listen to your heart to see if they can detect any extra heart sounds, called murmurs. This swishing sound, or murmur, is caused when a heart valve is not operating properly.

**DISEASES OF THE AORTA**

The aorta is the largest blood vessel in the body. It leads from the heart through the chest to the lower abdomen, where it divides into the major arteries to the legs. Along the way it supplies blood to all the organs of the body.
An aortic aneurysm is a ballooning in a weakened area of the aorta.

An aortic dissection occurs when there is a tear in the lining of the aorta that allows blood to leak in between the layers of the vessel. This may cause severe pain, or could result in injury to internal organs if the blood supply is compromised due to abnormal flow pathways.

An aneurysm or a dissection can be fatal if the artery ruptures. The risk of rupture can depend on the size of the diseased aorta, the portion of the aorta where the disease is located, and the ability to control high blood pressure.

An aneurysm or dissection of the aorta can be a result of vascular disease, a genetic (hereditary) defect or injury (trauma).

Risk factors for developing an aneurysm or dissection include, but are not limited to, heredity (family history), smoking, high blood pressure and high cholesterol.

ARRHYTHMIAS
Arrhythmias occur throughout the population and their severity varies widely.

An arrhythmia is an abnormal heart rhythm. It may feel like fluttering or a brief pause. It may be so brief that it does not change your overall heart rate. It can cause the heart rate to be too slow or too fast. Some arrhythmias do not cause any symptoms. Others can make you feel lightheaded or dizzy.

Before treatment, it is important for your doctor to know where an arrhythmia starts in the heart and whether it is abnormal. An electrocardiogram (ECG or EKG) is often used to diagnose arrhythmias. It creates a graphic record of the heart’s electrical impulses.

Treatment may include:

♥ Lifestyle changes
♥ Medicine to prevent and control arrhythmias
♥ Medicine to treat related conditions such as high blood pressure, coronary artery disease and heart failure
♥ Anticoagulants to reduce the risk of blood clots and stroke
♥ A pacemaker to help your heart beat more regularly
♥ Cardiac defibrillation and implanted cardioverter defibrillators (ICDs)
♥ Cardiac ablation
♥ Surgery

HEART FAILURE
Heart failure is defined as the inability of the heart to pump enough blood to meet the needs of the other organs in the body. The most common cause of this problem is when someone has had a heart attack and the heart muscle is now damaged and cannot work properly. However, this is not the only cause of heart failure. You can have a heart muscle problem without blocked arteries, or a lung problem can cause the right side of the heart to fail. You could also have problems with your hormones that harm the heart.

Taking Care of Yourself
The primary treatment for heart failure is the medications you are prescribed in the hospital. You will frequently be placed on starter doses and then when discharged, these doses will be increased by your cardiologist. Studies have shown that medications are the best way to keep the heart failure from getting worse and sometimes they can even help the heart recover.

Along with your medications, you will be taught to control your salt (sodium) intake as well as to limit the amount of fluid that you drink or eat daily. When
the heart is weak, the kidneys get fooled into trying to hold on to fluid. The more you drink every day, the more we have to use fluid pills to help get it back out of you. If you also eat too much salt, you will also hold onto fluid. When most people have too much fluid in their system, they begin to feel the symptoms of heart failure and come to the ER or their doctor’s office. The best thing you can do for yourself is to monitor your weight every day when you get up in the morning and write it down. When you gain three pounds in a short period of time, you will need to call your doctor. Fluid can be treated when there is a weight gain of less than 10 pounds but once you gain over 10 pounds, you usually have to be admitted to the hospital.

Symptoms
You may become short of breath because fluid backs up in the lungs. You may have trouble lying down flat and need to sit up suddenly to catch your breath. You may also experience a dry cough that gets worse when you lie down but is still present when you sit up. Fluid can also back up into the legs, stomach and/or abdomen, causing them to swell. None of these conditions should be ignored. You should seek care from your doctor.

What if the Pills Stop Working?
If you are consistent about taking your medications and sticking to the heart failure diet, and the medications still do not work, you may be seen by the Advanced Heart Failure Service. This service specializes in surgical as well as other medical options, to those who qualify. There are other options, too, so do not give up.

Recovery from Heart Failure
When your doctors think you are medically stable, you will be discharged. You will be in charge of your health. You will be given your “dry weight,” or the weight you need to try to maintain when you are at home. It will be up to you to let us know if you are not maintaining that weight. It should become a habit to weigh yourself first thing every morning and record your weight in a diary. When you gain three pounds or more, call your doctor. (See Section 6 about physical activities in the hospital and after you return home.)

You must also keep a list of your medications. The majority of the time, your medications will be changed when you are admitted to the hospital. Be sure you take the correct doses at the correct times during the day. If you have any questions, please check with your doctor. If you feel light headed or dizzy at home, call your doctor. Never stop or start medications without checking with your doctor first. You should not start any over-the-counter medications without asking first, because some could worsen your heart failure.

Be sure to follow the instructions given to you by your dietitian while in the hospital. People who do not watch what they eat are more likely to return to the hospital. Remember, only you have control over your health. Studies have shown that the more often patients are admitted to the hospital, the worse they do, and they may not live as long as patients who stay at home.

If you were not given an appointment to follow up with your doctor after you go home, schedule one for about a week after you go home. Bring your discharge papers to the office with you when you go so that your doctor will know your new medication list. It is important for you to keep your appointments! Do not wait until you feel poorly and need to call 911! The earlier you let the doctor know you do not feel well, the better your chances of avoiding admission.

Though you are not responsible for causing your heart failure, you can take good care of your health at home.
SECTION 3

Staying Healthy for Life

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NUTRITION—HEART HEALTHY DIET

Following a heart healthy diet is important for everyone—not just those with heart disease. Here are some tips to help you:

♥ Eat more fruits and vegetables—try for at least five or six servings per day.
  • One vegetable serving = 1 cup raw or ½ cup cooked.
  • One fruit serving = 1 small piece fresh fruit, ½ cup canned, ½ cup 100 percent fruit juice or ¼ cup dried.

♥ Increase fiber—at least 25 grams per day is recommended by the American Heart Association. Choose whole grain breads, cereals, brown rice, beans, oat bran, oatmeal, fruits and vegetables.

♥ Limit fried foods—use oil in small amounts; use monounsaturated oils like olive and canola oil. Use lean cooking methods—bake, grill, roast, broil and braise.

♥ Choose lean meats—trim fat, remove skin, and select leanest cut available. Limit red meat to 3-ounce servings, twice a week. A 3-ounce portion is the size of a deck of cards.

♥ Eat fish twice a week—be sure to choose a lean cooking method; avoid fish that is fried or cooked in butter.

♥ Limit egg yolks to no more than 3 per week—try egg whites or an egg substitute.

♥ Choose low-fat dairy products—skim and 1 percent milk are considered low-fat. You can use low-fat soy or lactose-free milk if you have a milk intolerance.

♥ Avoid Saturated and Trans Fats—
  • Saturated fats are found in animal foods (such as cheese, butter, cream, whole milk, ice cream and fatty meats) and some non-animal foods (such as palm and coconut oil).
  • Trans fats increase blood cholesterol, raise LDL (“bad”) and lower HDL (“good”). They are found in snack foods, baked goods, shortening, some fried foods, and stick margarines. Foods that have trans fats will have “hydrogenated” or “partially hydrogenated” oils listed in the ingredients.

♥ Read food labels for sodium content—choose foods containing less than 140mg of sodium per serving or less than 600mg sodium per meal.

LABEL READING

The first place to start when you look at a Nutrition Facts label is the serving size and number of servings in the package.

Nutrition Facts

Servings Per Container: 2

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<th>Calories 60</th>
<th>Calories from Fat 15</th>
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</thead>
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<td>Calories</td>
<td>60</td>
<td>15</td>
</tr>
<tr>
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<td></td>
</tr>
<tr>
<td>Total Fat</td>
<td>1.5g</td>
<td>2%</td>
</tr>
<tr>
<td>Saturated Fat</td>
<td>0g</td>
<td>0%</td>
</tr>
<tr>
<td>Trans Fat</td>
<td>0g</td>
<td>0%</td>
</tr>
<tr>
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<td>0%</td>
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<td>Sodium</td>
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<td>6%</td>
</tr>
<tr>
<td>Sugars</td>
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<td></td>
</tr>
<tr>
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<tr>
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* Percent Daily Values are based on a 2,000 calorie diet. Your diet values may be higher or lower depending on your calorie needs:

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<thead>
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</thead>
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<tr>
<td>Sat fat</td>
<td>Less than 20g</td>
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<tr>
<td>Cholesterol</td>
<td>Less than 300mg</td>
</tr>
<tr>
<td>Sodium</td>
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<td>Total Carbohydrate</td>
<td>300g</td>
</tr>
<tr>
<td>Dietary Fiber</td>
<td>25g</td>
</tr>
</tbody>
</table>

Calories

Do not worry so much about how many calories you should eat each day. Focus more so on serving sizes, healthy cooking methods and filling your plate with a variety of healthy foods.

Fat

Total fat should be less than 5 grams per serving (total for the day should be between 50 – 75 grams on a typical diet). Try to use foods with monounsaturated and polyunsaturated fats.

Saturated fats should total less than 3 grams per serving (total for the day is up to 15 grams on a typical diet).
It is important to avoid trans fats. Read food labels to ensure there are no trans fats in the item.

**Fiber**
A high fiber food has five or more grams. Your goal should be at least 25 grams of fiber per day.

**Total carbohydrate and sugars**
If you have high triglycerides, choose foods with less than 30 grams of total carbohydrate and less than 15 grams of sugars per serving.

If you are diabetic, pay attention to total carbohydrates (15 grams is considered 1 carb serving).

**SODIUM**
Eating too much salt or sodium may cause high blood pressure or hypertension. It may also cause your body to retain too much fluid and increase the work of your heart, especially if you have congestive heart failure.

For those with congestive heart failure, a low-sodium diet will help you feel better and keep you out of the hospital. This diet will prevent and control the build up of extra fluid around the heart, lungs and in your legs.

**Sodium Limits**
The goal is to limit your sodium intake to less than 2,000 milligrams (mg) per day. Read food labels for sodium content and be sure to take note of the serving size.

- Select foods with less than 140 mg per serving. If you eat more than one serving of these foods, you will get more than the amount listed.
- Foods with more than 300 mg per serving may not fit into a low-sodium meal plan.
- Use caution when eating outside of your home. Restaurant food can be high in sodium. Try to check nutrition facts on the Internet before dining when possible. Ask for sauces and dressing on the side. Specify no seasoning or only pepper.
- Keep in mind that salt/sodium is a programmed taste. You might find that food tastes bland when you begin a low sodium diet, but stick with it! After a short period of time (usually two weeks) your taste buds begin to change and the high sodium foods you used to enjoy will taste too salty.

**FLUID**
You may be asked to follow a fluid restriction in order to create a normal level of sodium in your blood and to prevent fluid retention. Do not restrict your fluid unless told to do so by your provider. It is generally 1,500 milliliters (ml) per day; this is equal to about 48 fluid ounces or 6 (8 oz.) cups.

**Low Sodium Seasonings**
Low sodium food does not have to be without flavor. Try these to add flavor:
- Herbs, spices and spice blends without sodium
- Garlic or garlic power, onion or onion powder, curry, cumin, basil, oregano, dry mustard or dill
- Hot pepper sauce, red pepper flakes or Tabasco
- Mrs. Dash herb blends and marinades
- Worcestershire Sauce (1 tsp./day)
- Prepared horseradish
- Vinegar
- Pepper and lemon pepper (without sodium)
- Lemon or lime juice
- Simple salad dressings — oil and vinegar

Check with your doctor before using a salt substitute. Many salt substitutes contain potassium, which your doctor may want you to limit. If indicated, add salt substitute after cooking, since the flavor changes when heated.

**DIABETIC DIET**
Meal Planning Guidelines for Diabetes
- Eat meals and snacks at the same times each day.
- Do not skip meals.
- Eat appropriate portion sizes (outlined in table on next page).
- Follow a heart healthy diet.
- Eat a variety of foods.
- Select foods that are high in fiber—whole grains, fruits and vegetables.
- Talk to your doctor before using alcohol.
# A GUIDE TO CHOOSING HEART HEALTHY, LOW-SODIUM AND DIABETIC APPROPRIATE FOODS

<table>
<thead>
<tr>
<th>FOOD GROUP</th>
<th>RECOMMENDED</th>
<th>NOT RECOMMENDED</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Grains</strong></td>
<td>• Whole grain breads and cereals, including oats and barley.</td>
<td>• High-fat bakery products (doughnuts, biscuits, croissants, Danish pastries, pies, cookies)</td>
</tr>
<tr>
<td>Serving Size:</td>
<td>• Pasta, esp. whole grain</td>
<td>• Snacks made with partially hydrogenated oils (chips, cheese puffs, snack mixes, regular crackers, butter flavored popcorn)</td>
</tr>
<tr>
<td>1 slice bread</td>
<td>• Brown rice</td>
<td></td>
</tr>
<tr>
<td>¾ cup dry cereal</td>
<td>• Low-fat crackers and pretzels</td>
<td></td>
</tr>
<tr>
<td>½ cup cooked rice, pasta or</td>
<td></td>
<td></td>
</tr>
<tr>
<td>cereal</td>
<td>Daily Servings: 6 to 8</td>
<td></td>
</tr>
<tr>
<td><strong>Vegetables</strong></td>
<td>• Fresh, frozen or canned vegetables without added fat or salt</td>
<td>• Fried vegetables</td>
</tr>
<tr>
<td>Serving Size:</td>
<td></td>
<td>• Vegetables prepared with butter, cheese or cream</td>
</tr>
<tr>
<td>1 cup raw</td>
<td></td>
<td></td>
</tr>
<tr>
<td>½ cup cooked</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Daily Servings: 3 to 4</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Fruits</strong></td>
<td>• Fresh, frozen, canned or dried fruit</td>
<td>• Fried fruit</td>
</tr>
<tr>
<td>Serving Size:</td>
<td></td>
<td>• Fruits served with butter or cream</td>
</tr>
<tr>
<td>1 small piece fresh</td>
<td></td>
<td></td>
</tr>
<tr>
<td>½ banana</td>
<td></td>
<td></td>
</tr>
<tr>
<td>½ cup fresh, canned, or</td>
<td></td>
<td></td>
</tr>
<tr>
<td>frozen</td>
<td></td>
<td></td>
</tr>
<tr>
<td>¼ cup dried</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Daily Servings: 2 to 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Milk</strong></td>
<td>• Nonfat (skim), low-fat or 1 percent skim or buttermilk</td>
<td>• Whole milk</td>
</tr>
<tr>
<td>Serving Size:</td>
<td>• Nonfat or low-fat yogurt or cottage cheese</td>
<td>• 2 percent milk</td>
</tr>
<tr>
<td>1 cup milk</td>
<td>• Fat-free and low-fat cheese</td>
<td>• Whole milk yogurt or ice cream</td>
</tr>
<tr>
<td>6 ounces yogurt</td>
<td></td>
<td>• Cream</td>
</tr>
<tr>
<td>1.5 ounces cheese</td>
<td></td>
<td>• Half and Half</td>
</tr>
<tr>
<td>½ cup low-fat cottage cheese</td>
<td></td>
<td>• Full-fat cream cheese</td>
</tr>
<tr>
<td>Daily Servings: 2 to 3</td>
<td></td>
<td>• Full-fat sour cream</td>
</tr>
<tr>
<td>**Meat and Other Protein</td>
<td>• Lean cuts of beef and pork (loin, leg, round, extra lean hamburger)</td>
<td>• Full-fat cheese</td>
</tr>
<tr>
<td>Foods**</td>
<td>• Skinless poultry</td>
<td></td>
</tr>
<tr>
<td>Serving Size: 3 ounces of</td>
<td>• Venison and other wild game</td>
<td></td>
</tr>
<tr>
<td>cooked beef, poultry, fish</td>
<td>• Dried beans and peas</td>
<td></td>
</tr>
<tr>
<td>Daily Servings: 2 (6 ounces</td>
<td>• Nuts and nut butters</td>
<td></td>
</tr>
<tr>
<td>per day)</td>
<td>• Meat alternative made with soy or textured vegetable proteins</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Egg whites or egg substitute</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Cold cuts made with lean meat or soy protein that are lower in sodium</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• High-fat cuts of meats (ribs, T-bone steak, regular hamburger)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Bacon</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Sausage</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Cold cuts like salami or bologna</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Corned beef</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Hot dogs</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Organ meats (liver, brains, sweet-breads)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Poultry with skin</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Fried meat, poultry and fish</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Egg yolks (no more than 3 per week)</td>
<td></td>
</tr>
<tr>
<td><strong>Fats and Oils</strong></td>
<td>• Unsaturated oils (olive, peanut, soy, sunflower, canola)</td>
<td>• Butter</td>
</tr>
<tr>
<td>Serving Size:</td>
<td>• Low-fat salad dressings</td>
<td>• Stick margarine</td>
</tr>
<tr>
<td>1 tsp. oil, margarine</td>
<td>• Seeds and nuts</td>
<td>• Shortening</td>
</tr>
<tr>
<td>1 Tbsp. dressing</td>
<td>• Avocado</td>
<td>• Partially hydrogenated oils</td>
</tr>
<tr>
<td>Daily Servings: 2 to 3</td>
<td></td>
<td>• Tropical oils (coconut, palm, palm kernel oils)</td>
</tr>
</tbody>
</table>
Foods Containing Carbohydrates

These foods increase your blood sugar; make sure you eat them in appropriate portions.

♥ Breads, crackers and cereals
♥ Pasta, rice and grains
♥ Starchy vegetables, such as potatoes, corn and peas
♥ Beans and legumes
♥ Milk, soy milk and yogurt
♥ Fruits and fruit juices
♥ Sweets, such as cakes, cookies, ice cream, jam and jelly

Serving Sizes of Carbohydrates for Meal Planning

1 serving = about 15 grams of carbohydrate. Refer to table of Recommended/Not Recommended Foods (on page 20) for average serving sizes of foods. Also be sure to read food labels for carbohydrate content.

For many adults, eating three to five carbohydrate servings at each meal and one to two carbohydrate servings at each snack is a good plan.

ANEMIA

Many patients with chronic illnesses such as kidney disease may have anemia. After cardiac surgery you may be at risk for becoming anemic. Some patients may feel run down or fatigued; check with your doctor if symptoms persist.

The general iron requirement for adult men and women (not pregnant, breastfeeding or menstruating) is 10 mg a day.

Some good sources of iron include:

♥ Enriched and fortified grain products. Some cereals will meet most adults’ daily iron needs, for example, Total, 100% Bran Flakes, Grapenuts.
♥ Meat, fish and poultry
♥ Beans and soybeans
♥ Spinach and kale
♥ Dried prunes, apricots and raisins

Be sure to include foods high in vitamin C to aid in iron absorption, such as oranges, grapefruits and other citrus fruits.

COUMADIN

If you are prescribed Coumadin (Warfarin) due to blood clotting issues you will need to be mindful of how much vitamin K you are getting from foods and dietary supplements. Vitamin K will interfere with your Coumadin. If your intake of vitamin K food is not consistent, Coumadin may not be as effective. It is important to take this medication as directed by your physician.

Dietary Recommendations:

♥ Eat a normal, balanced diet and maintain vitamin K intake by eating ½ cup or more of one of these foods each day. Be consistent in the amount you eat. For example, you could eat about a cup of one of these foods on most days.
♥ Do not make drastic changes to your diet without talking to your healthcare provider. For example, if you eat a romaine lettuce salad most days, it would not be a good idea stop eating it entirely.
♥ Use caution with vitamin K supplements, multivitamins and herbal supplements. Ask your healthcare provider before taking these supplements.

Foods high in vitamin K include cooked greens like kale, spinach, turnip greens, collard greens, Swiss chard and mustard greens. A typical portion size is ½ cup cooked.

Foods with moderate amounts of vitamin K include raw spinach, turnip greens, green leaf lettuce, broccoli, endive, romaine lettuce and brussels sprouts. A typical portion size is 1 cup raw.

RISK FACTORS

Smoking Facts

Smoking is probably the most deadly risk factor for heart disease:

♥ Heart attack patients who quit smoking live two times longer than those who continue smoking.
♥ Survivors of cardiac arrest have a lower risk of another cardiac arrest if they quit smoking.
Patients with coronary artery bypass have a lower risk of vein graft failure if they quit smoking.

Patients with PTCA (percutaneous transluminal coronary angioplasty) and/or stent placement have lower restenosis rates if they become non-smokers.

Non-smokers have less angina than smokers.

Smoking harms the body by:

- Raising the blood pressure.
- Lowering the oxygen supply to the heart and lungs.
- Increasing the risk of blood clots.
- Damaging the arteries.

**What Happens When I Quit?**

**After 24 hours:**
Your risk of heart attack decreases.

**After 48 hours:**
Nerve endings adjust to the absence of nicotine. Your ability to taste and smell starts to return.

**After two weeks to three months:**
Your circulation improves.
Your exercise tolerance improves.

**After one to nine months:**
Coughing, sinus congestion, fatigue and shortness of breath decrease.
Your overall energy level increases.

**After one year:**
Your risk of heart disease decreases to half that of a current smoker.

**After five to 15 years:**
Your risk of stroke is reduced to that of a lifelong non-smoker.

**After 10 years:**
Your risk of dying from lung cancer drops to almost the same rate as a life-long non-smoker.
You decrease the risk of other cancers (of the mouth, larynx, esophagus, bladder, kidney and pancreas).

**After 15 years:**
Your risk of heart disease is reduced to that of a lifelong non-smoker.

**NON-MODIFIABLE RISKS FOR HEART DISEASE**

Non-modifiable risks are risks that cannot be changed. They include:

- **Advanced age.** Coronary artery disease is more likely to occur as you get older, especially after age 65.
- **Family history of heart disease.** You have an increased risk of developing heart disease if you have a parent with a history of heart disease, especially if they were diagnosed before age 50. Ask your doctor when it’s appropriate for you to start screenings for heart disease so it can be detected and treated early.
- **Race.** African Americans have more severe high blood pressure than Caucasians and, therefore, a higher risk of heart disease. The risk of heart disease is also higher among Hispanic Americans, American Indians, native Hawaiians and some Asian Americans. This is partly due to higher rates of obesity and diabetes in these populations.

**MODIFIABLE RISK FACTORS FOR HEART DISEASE**

These are risks that you can control. They include:

- Cigarette smoking and exposure to tobacco smoke.
- High blood cholesterol and high triglycerides: especially high LDL (“bad”) cholesterol greater than 100 mg/dL, and low HDL (“good”) cholesterol under 40 mg/dL. Some patients who have heart or blood vessel disease, and other patients who have a very high risk, should aim for an LDL level less than 60 mg/dL. Your doctor can provide specific guidelines.
- High blood pressure 140/90. (The first number—systolic—measures the pressure in the arteries when the heart beats. The second number—diastolic—measures the pressure in the arteries between heartbeats.
- Uncontrolled diabetes (HbA1c less than 6.4).
- Physical inactivity.
- Being overweight (body mass index [BMI] 25–29 kg/m2) or being obese (BMI higher than 30 kg/m2)

**NOTE:** How your weight is distributed is important. Your waist measurement is one way to determine fat distribution. Your waist circumference is the mea-
urement of your waist, just above your navel. The risk of cardiovascular disease increases with a waist measurement of more than 35 inches for women and more than 40 inches in men.

♥ Sleep apnea. When a snorer repeatedly stops breathing for brief moments, it can lead to cardiovascular problems. It prevents restful sleep and is associated with high blood pressure, arrhythmia, stroke and heart failure.

♥ Uncontrolled stress or anger

♥ Diet high in saturated fat and cholesterol

♥ Drinking too much alcohol

The more risk factors you have, the greater your risk of developing coronary artery disease.

ABOUT BLOOD PRESSURE

Blood pressure is typically recorded as two numbers, written as a ratio like this:

<table>
<thead>
<tr>
<th>Blood Pressure</th>
<th>Systolic (mm Hg (upper #))</th>
<th>Diastolic (mm Hg (lower #))</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>less than 120 and less than 80</td>
<td></td>
</tr>
<tr>
<td>High Blood Pressure (Hypertension)</td>
<td>140 or higher or 90 – 99</td>
<td></td>
</tr>
<tr>
<td>Stage 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>High Blood Pressure (Hypertension)</td>
<td>160 or higher or 100 or higher</td>
<td></td>
</tr>
<tr>
<td>Stage 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hypertensive Crisis (Emergency care needed)</td>
<td>Higher than 180 or Higher than 110</td>
<td></td>
</tr>
</tbody>
</table>

What is the American Heart Association’s recommendation for healthy blood pressure?

This chart reflects blood pressure categories defined by the American Heart Association.

Reduce Your Risk Factors

Reducing your risk factors involves making lifestyle changes. Your doctor will work with you to help you make these changes.

♥ If you smoke, you should quit.

♥ Make changes in your diet to reduce your cholesterol, control your blood pressure and manage blood sugar if you have diabetes. Low-fat, low-sodium and low-cholesterol food are recommended. Limiting alcohol to no more than one drink a day is also important. A registered dietitian can help you make the right dietary changes.

♥ Increase your exercise/activity level to help achieve and maintain a healthy weight and reduce stress. Check with your doctor before starting an exercise program.

♥ Take medications as prescribed. If lifestyle changes aren’t enough to control your heart disease, medications may be prescribed to treat certain risk factors, such as high cholesterol or high blood pressure. Your doctor will determine the best medications for you based on your personal needs, presence of other health conditions and your specific heart condition.

How can I learn more?

1. Talk to your doctor, nurse or other healthcare professionals. If you have heart disease or have had a stroke, members of your family also may be at higher risk. It is very important for them to make changes now to lower their risk.

2. Call 1-800-AHA-USA1 (1-800-242-8721), or visit americanheart.org to learn more about heart disease.

3. For more information on stroke, call 1-888-4-STROKE (1-888-478-7653) or visit us online at strokeassociation.org.

Knowledge is power, so learn and live!
More women have heart disease than men. In fact, heart attacks kill more women than men, and women are more likely to die from their first heart attack than are men. More than half a million women die from heart disease each year, accounting for approximately 45 percent of all female deaths in the United States. Heart disease causes about 10 times as many deaths in women as breast cancer and all other cancers combined.

**SYMPTOMS**

Many women ignore the symptoms of heart disease because their symptoms are often different than the typical chest pain we most associate with a heart attack. Because women delay in getting help they are more likely to have had a “silent” heart attack.
attack, or to die of their first heart attack. Women may brush off their symptoms as not significant, and may ignore them or minimize them when discussing their health with their physician.

The following symptoms are abnormal, and should be taken seriously especially if they occur with activity or exercise:

- Chest pain or pressure
- Unusual fatigue
- Jaw, neck and/or shoulder pain, pressure or numbness
- A feeling of indigestion or abdominal pain
- Palpitations (“skipped beats” or racing heart)
- Blackouts or fainting
- Nausea and vomiting
- Sweating

You should see your physician if you experience any of these symptoms frequently (about once a day) or with activity or exercise. It is important to describe when the symptoms occur, and what triggers or relieves them. It is helpful to make a list of your symptoms, past treatments and all medications you are currently taking. These symptoms are serious, and should be investigated.

**KNOW YOUR RISK FACTORS**

Any woman can develop heart disease, but some women are at higher risk than others. For example, African-American women are 60 percent more likely to die of heart disease than Caucasian-American women. Because of the protective effects of estrogen, younger women are at less risk than postmenopausal women. This does not mean that women do not develop heart disease before menopause. They do! Especially smokers or those with diabetes.

Risk factors are traits or habits that make a person more likely to develop a disease. In the United States, two out of three women have at least one major risk factor for heart disease, and this percentage increases with age. You can do some things to reduce your risk of heart disease. First you must understand your risk. The risk factors for heart disease include:

- High blood pressure
- High cholesterol
- Obesity (waist measurement larger than 35” and a BMI greater than 30)

- Cigarette smoking
- Age
- Race
- Family history of heart disease
- Menopause
- Physical inactivity
- Drinking large quantities of alcohol
- Diabetes
- Stress

While some risk factors cannot be avoided or changed—such as family history or ethnicity—most risk factors can be controlled. By taking an active role in your health, you can substantially reduce your risk of heart disease or your risk of death from heart disease. By changing your lifestyle you can improve your health tremendously!

**High Blood Pressure**

Uncontrolled high blood pressure can lead to heart disease, stroke, kidney failure and many other health problems. High blood pressure makes it very hard for your heart to pump blood to all parts of the body. The stress on the vessels of the heart is tremendous, and can lead to heart attack. Even slightly high blood pressure doubles the risk of heart disease.
Most of the time, there are no symptoms associated with high blood pressure. You should have your blood pressure taken at every physician visit. You can have your blood pressure taken at community screening fairs and in most grocery stores. If your blood pressure is above normal, your physician and nurse will advise you about diet and exercise changes to help lower blood pressure. Your physician will work with you to prescribe the right blood pressure medication.

**Cholesterol**

You can reduce your risk of heart disease and death by one-third by simply lowering your cholesterol level to below recommended levels. Estrogen has an important influence on the way our body handles lipids—the fat we eat and produce. Most women experience increased cholesterol levels after menopause. Women who have had early menopause, either naturally or because their ovaries have been surgically removed, are twice as likely to develop heart disease as women of the same age who have not begun menopause.

Since there are no symptoms of high cholesterol, it is vital that you have your blood drawn and tested for cholesterol. You can participate in cholesterol screening in your physician’s office and at community screening fairs.

High cholesterol levels can be reduced with diet, exercise and medications. Your physician and nurse will work with you to develop a diet and exercise plan. Many women need medication to bring their cholesterol level down despite diet and exercise. Your physician will prescribe the appropriate medication.

**Obesity**

Weighing more than you should is not just a cosmetic issue, but a major contributor to your risk of death from heart disease. In the United States, approximately 60 percent of white women, 80 percent of black women, and 68 percent of Hispanic women are overweight. Twenty-two percent to 36 percent are classified as obese. The best way to determine where your weight should be is to have your physician or nurse calculate your body mass index (BMI). Women who are overweight have a BMI greater than 25 kg/m². Women who are obese have a BMI greater than 30 kg/m².

In addition to BMI, body fat distribution is an important predictor of heart disease risk. Women with central obesity (an apple shape) have a higher risk of high blood pressure, high blood sugar and heart disease than women with body fat concentrated in the hips and thighs (pear shape). If your waist is greater than 35 inches, you are at a higher risk for heart disease.

Your physician, nurse and dietitian will help you plan a low-fat, low-calorie diet plan to help you lose weight safely. Your physician may recommend a program or center specializing in weight management. Exercise is vital to losing weight and keeping it off. Losing weight will also help you control your blood pressure and cholesterol level. Weight loss medications and supplements have side effects and interact with other medications. Do not take these without

**Physical Inactivity**

Physical inactivity is a major contributor to obesity. Increasing your physical activity will assist in lowering your cholesterol level, your weight and your blood pressure. Cardiac rehabilitation programs offer monitored exercise with education and counseling. Research has shown that women and the elderly are less likely to be enrolled in cardiac rehabilitation programs and less likely to complete cardiac rehabilitation programs than men. Women who complete rehabilitation programs and exercise training after a heart
attack show greater functional improvement than men who do the same.

There are many exercise options for women with other limiting factors, such as osteoarthritis. Discuss your options with your physician or nurse and look at the cardiac rehabilitation list in the back of this book for a center near your home. You will need a referral from your physician to join a cardiac rehabilitation program.

**Smoking**

Smoking is probably the most deadly risk factor for heart disease. Female smokers are 60 percent more likely to develop heart disease than non-smokers. They develop heart disease, on average, 19 years earlier than women who do not smoke. Their life expectancy is seven years shorter than non-smokers. The risk of sudden cardiac death is two to four times greater for women who smoke than for women who do not smoke. Half of all heart attacks in women younger than 55 are due to smoking.

Nicotine causes increased blood pressure and narrowing of your arteries. Your heart does not get the blood supply that it needs and has to work harder to pump blood throughout your body. Nicotine also increases fat deposits in the arteries of the heart, increases the tendency of your blood to clot as well as decreases the level of oxygen in your blood.

If you quit smoking now, you decrease your excess risk of heart disease and death by a third within two years. Your risk continues to decrease over time and will eventually decrease to the level of women who have never smoked. Quitting is difficult, but not impossible. There are resources and advice in the Staying Healthy for Life chapter.

**Diabetes**

Diabetes is a greater risk factor for women than for men and is more prevalent in women beyond the age of 45. More than 80 percent of diabetic patients die from cardiovascular disease. High blood sugar levels appear to reverse the protective effects of estrogen on the development of heart disease.

New research has demonstrated that controlling diabetes can reduce the risk and severity of heart disease. If you are diabetic, you should closely monitor your blood sugar levels and use your medication as prescribed to keep your blood sugars within normal ranges. New recommendations for controlling blood sugar are developing, so consult with your physician frequently about your diabetes. Diet and exercise are vital to maintaining healthy blood sugars and weight.

Patients with diabetes do not usually experience the typical chest pain symptom of a heart attack. You should work closely with your physician to understand your symptoms and control your other risk factors as well as your diabetes.

**Menopause**

Changes that occur during menopause are associated with a higher risk of heart disease. Women experience higher cholesterol levels, weight gain, an increased tendency to form blood clots, and higher blood pressure. These changes are related to the hormonal changes that occur naturally with menopause.

Hormone replacement therapy (HRT) is no longer recommended to treat these changes. HRT can be used for menopausal symptoms in women who are healthy with minimum risk. The decision to take HRT must be an individual decision made with your physician. Make an appointment to talk to your physician about this important decision.

**TAKE CARE OF YOURSELF**

You take care of so many people—your spouse, children and parents. For your sake and theirs, take care of yourself! List your risk factors and then work on the ones that you can change. See your physician for regular check-ups and follow the advice of your health care team.

♥ Take control of your diet
♥ Exercise regularly
♥ Maintain a healthy weight
♥ Stop smoking
♥ Control your blood sugar
♥ Reduce and manage your stress
♥ Limit alcoholic beverages
Your doctor has sent you to the MedStar Heart & Vascular Institute Cardiac Catheterization Lab so you can receive specialized diagnostic tests and state-of-the-art treatment procedures for your heart from the most experienced cardiologists in the field. We offer many procedures to both diagnose and treat heart problems with minimally invasive techniques. We care about your experience in the cardiac catheterization lab, and want you to feel as comfortable as possible during your stay with us.

**BEFORE YOUR PROCEDURE**

Your doctor will arrange for your procedure and tell you what time to arrive at the hospital. In general, you should not eat after midnight the day of your test. Occasionally, your doctor may allow you to eat a light breakfast. You should take your...
morning medications with sips of water. If you are unsure of what to take, bring your pills with you and we can tell you which ones you should take that day. On the day of the procedure, please bring your medications in the original bottles or a detailed list of your medications, including the name of the medicine, the dose, and how many times you take it daily. Before your procedure you will need to have a thorough history and physical examination, blood work and ECG. You will have an IV inserted in order to give you medications and fluids during the test. We will check your blood pressure and give you sedatives to help you relax. A team of nurses, researchers, nurse practitioners, cardiovascular technicians, and physicians will provide your care in the cardiac catheterization lab. We will make sure that you understand your procedure by explaining it to you and answering any questions that you have.

**CARDIAC CATHETERIZATION/CORONARY ANGIOGRAM SUMMARY**

A cardiac catheterization or coronary angiogram is a diagnostic procedure performed to study the functioning of your heart, your heart valves and coronary arteries. A cardiac catheterization provides a detailed assessment of the heart’s performance. Your cath results will give your doctor information about:

- The presence and severity of blockages in the coronary arteries
- How well the heart valves work
- The strength of the heart muscle (how well it pumps blood)
- Any heart muscle damage

The results of your cardiac catheterization will be available to your physician later that day. Your doctor will review the results with you and your family, and will make recommendations on therapy. Patients often go home several hours after a diagnostic catheterization. If additional treatment is needed, many options are available. Some treatments may require that you return to the cath lab.

**What is involved?**

You will be required to fast after midnight. This means nothing to eat or drink including water (with the exception of your medication) if your test is scheduled for the following morning. Before being taken to the cardiac catheterization laboratory, your physician will insert an IV to provide you with fluids and medications, including a mild sedative.

In the cardiac catheterization laboratory, you will be placed on a special X-ray table. The room houses a number of special sophisticated pieces of equipment (Figure 1). Some of your groin area and, in some cases, your arm will be shaved and then scrubbed with a special antiseptic solution in preparation for the procedure (Figure 2). You will then be covered with sterile towels and sheets.

**Radial Access**

The radial artery, located at the wrist, is now commonly used for coronary angiography and interventional procedures, such as PCI (percutaneous coronary intervention). It allows for faster recovery and much shorter bed-rest following the procedure. The cardiologist will decide which artery will be used (depending on the anatomy and the expected procedure.)
Before inserting the catheter, the area will be numbed with a local anesthetic. This will cause brief stinging and burning. Plastic tubes called “introducer sheaths” are inserted in the groin or arm. The physician will use this to guide the catheters. A contrast dye is then injected into the catheter to visualize the heart and blood vessels (Figure 3). This may cause a slight warming sensation. Digital films will be made during the contrast injections. You may be asked to take a deep breath or cough during the study. The total catheterization procedure usually takes between 30 and 60 minutes, depending on the complexity of the procedure and the information required.

Once the procedure is completed, the sheaths are removed. There are no incisions or stitches when the groin site is used. Pressure is held for 15–20 minutes or longer if necessary to stop the bleeding from the sheath site. A pressure device may be used to apply additional pressure.

**PERCUTANEOUS CORONARY INTERVENTION/ANGIOPLASTY**

If your catheterization shows blockages in the coronary arteries, you may need an angioplasty procedure. Percutaneous Transluminal Coronary Angioplasty (PTCA) or Percutaneous Coronary Intervention (PCI) is a technique used to open narrowed or blocked coronary arteries with small balloons threaded through the coronary arteries to the site of the blockage. The balloons are then inflated to split, compress and mold the plaque into the wall of the artery, re-establishing adequate blood flow.

**What does the angioplasty procedure involve?**

An angioplasty begins with a catheterization. If a blockage is found in your coronary arteries, your physician may perform an angioplasty during your initial catheterization.

♥ Another catheter is inserted through the introducer sheath in the artery, and threaded all the way up to the arteries in the heart. This catheter is easily seen with a fluoroscope (a form of X-ray), and helps your doctor see the areas of blockage.

♥ A small guide wire, designed to act as a conduit through which the rest of the angioplasty equipment (including the balloon catheter) is passed, is put into the artery and through the blockage. The guide wire functions as a rail over which the balloon catheter is advanced (Figure 4).

♥ Finally, with the aid of the guide wire, the balloon catheter is inflated to break up the plaque and clear the blockage (Figure 5).

♥ You may experience some pain that lasts only a few seconds or as long as it takes to dilate the narrowing and begin to re-establish normal blood flow.

♥ The balloon is inflated in order to push the plaque away and clear the blockage. It is then deflated and removed; the blockage is significantly reduced (Figure 6).

AN ANGIOGRAM OF THE LEFT ANTERIOR DESCENDING ARTERY (LAD) BEFORE ANGIOPLASTY (LEFT) AND AFTER ANGIOPLASTY (RIGHT).
**BIOABSORBABLE VASCULAR SCAFFOLD (BVS)**

A bioabsorbable vascular scaffold is a new type of stent that is similar to a regular stent. However, a BVS stent dissolves over several years so that no foreign material remains in the artery.

**Risks of Cardiac Catheterization/PCI**

Even though more than one million catheterizations are performed in this country every year, it is still a highly specialized procedure. There is normally less than a one percent chance of serious bleeding, death, stroke, heart attack or need for emergency heart surgery. There is a chance of an allergic reaction to the IV dye used. The IV dye may cause kidney damage, which is more likely if you have a history of kidney disease or diabetes, and it is usually temporary. There is a chance for complications (bleeding, bruising, swelling, infection or numbing of the area) at the sheath insertion site. The most common complication is bruising, or hematoma (swelling of clotting blood), at the insertion site.

The major risk involved in angioplasty is the potential for closing off the coronary artery while trying to reopen it. Fortunately, this only occurs in two to three percent of patients. Should the narrowing worsen or close during the procedure, an emergency operation (coronary artery bypass surgery) may be required. In addition, angioplasty has risks similar to those associated with routine cardiac catheterization.

**Recovery after your Catheterization Procedure**

The total catheterization procedure takes between 30 and 60 minutes, and possibly longer for certain procedures. The staff will be with you during the procedure to keep you updated and to be sure that you are relaxed and comfortable.

When the procedure is over, you will go to one of the cardiac floors in the hospital or the recovery area in the cardiac catheterization lab. If the procedure was completed through the groin, you will have to keep your leg straight and lie on your back for approximately two to four hours. The nurse will only be able to raise the head of the bed slightly. These measures are necessary to help prevent bleeding at the groin site.

If you had the procedure through your arm or wrist, you can sit up immediately after the procedure, but will need to be on bed rest for at least an hour until the sedatives wear off. You will have to keep the arm or wrist straight, in order to prevent bleeding and allow the site to heal.

If no significant blockages are found during the catheterization, you may go home by late afternoon on the day of your procedure. If you have had any additional treatment during your procedure, or require further testing, you will stay overnight and will likely go home one to four days after the procedure. If significant blockages are found that may require heart surgery, you will likely stay overnight, and members from the heart surgery team will come and discuss your treatment options with you.

In general, after leaving the hospital, you should avoid heavy lifting (more than 10 or 15 pounds) and strenuous exercise for one week. Follow the discharge instructions that you have been given for information on your activity, diet, medications and when to call your doctor. You will receive prescriptions for any new medications, which you should fill as soon as possible after leaving the hospital. Your primary cardiologist will give you medication refills as needed. You should see your primary cardiologist in one to two weeks, or as directed on your discharge instructions. It is important to bring your discharge instructions with you to your appointment.

**ATHERECTOMY**

Atherectomy is a procedure used to cut away the blockage (plaque) responsible for the narrowing in the artery. We use several atherectomy techniques.

**Directional Atherectomy**

Directional atherectomy is a procedure that uses a catheter with a small mechanically driven cutter (rotates at 2000 rpm) that shaves the plaque and stores it in a collection chamber. The plaque is removed from the artery when the device is removed. This is used in large arteries with soft blockages.
Rotational Atherectomy (Rotablator)
Rotational atherectomy (Rotablator) uses a high-speed (180,000 rpm) rotating diamond chip burr, which grinds plaque into very small particles. These particles can usually pass harmlessly through the coronary arteries. This technique works best on hardened calcified blockages. This procedure has a success rate of 90 percent with few complications.

LASER ATHERECTOMY
Laser atherectomy involves the use of a cool laser beam directed toward the blockage through a special catheter placed in the coronary artery. The laser beam vaporizes the blockage (plaque), changing it into gases and water. The laser is particularly useful in blockages that may be too long for a regular angioplasty balloon, in totally occluded blockages and in blockages in both stents and bypass graft arteries. Laser angioplasty is often followed by balloon angioplasty for the best results.

RHEOLYTIC THROMBECTOMY
This system is designed specifically for clot removal. A special pump delivers high-pressure saline to the tip of the catheter, where it is transformed into high velocity jets. The saline jets create a vacuum and break the clot into fragments. The fragments are then suctioned out of the artery. The system is useful where there are extensive clots, such as in a heart attack or disease in a bypass graft.

INTRAVASCULAR ULTRASOUND
For many years, the only way of directly viewing the coronary arteries was through angiography or catheterization. With the invention and refinement of intravascular coronary ultrasound (IVUS), it is now possible to thread a tiny ultrasound “camera” into the coronary arteries to give a valuable cross-sectional view from the inside-out. This shows the physician where the normal artery wall ends and the plaque begins. In certain situations, IVUS can aid in the selection and sizing of stents and balloons, and can verify that a stent has been properly deployed.

CUTTING BALLOON
The cutting balloon combines the features of conventional balloon angioplasty with advanced microsurgical capabilities. As the cutting balloon expands, longitudinally mounted blades are exposed. The blades cut the plaque, facilitating expansion of the blockage. The cutting balloon is particularly useful in very hardened blockages, and is often used to open blockages in previously placed stents.
CORONARY STENTS

There are basically two types of stents: bare-metal and drug-eluting stents. Bare-metal stents are made up simply of the metal alloy. A drug-eluting stent is coated with a drug that is released over time into the surrounding tissue of the artery. While the stent functions to keep the artery walls open, the drug works to slow the growth of unwanted cells and prevents the artery from re-stenosing or closing-up. Your doctor will decide which stent is the right one for you, based on the size, complexity and location of the coronary blockage.

The blockage length is evaluated by an angiogram to determine the correct stent size (Figure 1, above). The stent is pre-mounted on a balloon. After the balloon and stent are positioned across the lesion (Figure 2), the balloon is inflated (Figure 3), deflated and withdrawn, leaving the expanded stent in place attached to the surface of the treated vessel (Figure 4). In several large clinical studies using this device, stenting was successful in more than 98 percent of patients. Follow-up studies confirm that the re-stenosis (re-narrowing) rate after coronary stenting is lower when compared with balloon angioplasty.

Risks of Coronary Stents

The major risk after stent placement is the possibility of blood clots forming at the site of the stent. This problem has been reported in less than one percent of our patients. It can cause a heart attack if the clot completely blocks all blood flow through the coronary artery. To prevent this complication, special ultrasound catheters are often used to measure the precise expansion of the stent, making certain that the stent is completely pressed against the wall of the artery.

A combination of anti-platelet medicines, including aspirin, clopidogrel (Plavix), ticagrelor (Brilinta) and prasugrel (Effient), are typically recommended for at least one year to prevent blood clots from forming inside of the stents. After this time period, the risk of a clot forming is very rare—less than one percent. If you have a stent placed in your coronary artery, it is very important that you continue taking these medications as prescribed, and you should not stop these medications at any time without the approval of your cardiologist.

RADIATION THERAPY

Your doctor has told you that you may have developed a new blockage at the site of your previous stent procedure. This section describes intracoronary radiation therapy, which will help prevent your arteries from re-narrowing again in the future.

What is intracoronary radiation therapy?

Intracoronary radiation therapy is a treatment for certain types of blockages that occur in your coronary arteries (the arteries that supply blood to your heart). The re-narrowing is due, in part, to an overgrowth of scar tissue in the percutaneous coronary intervention (PCI) site. Small doses of radiation delivered directly to the angioplasty site will slow down or stop this rapid scar tissue growth. Patients are eligible for the radiation therapy procedure only if the re-narrowing has occurred within a previously implanted stent.

How will I know if I am a candidate for radiation therapy?

Several key factors will determine if you are a candidate for radiation therapy. Your medical history will be carefully screened for any conditions that may exclude you from treatment. You must also have a cardiac catheterization/coronary angiogram of the arteries to determine if they have re-narrowed at the exact same site of your previous PCI. Your eligibility for radiation
therapy will also depend on the length of the blockage and the size of the artery.

What can I expect from the radiation therapy procedure?
The radiation therapy procedure is very similar to your previous angioplasty, and is an additional specialized procedure that can be done during the cardiac catheterization. After the catheters are inserted into the arteries of the heart, your doctor must first do an angioplasty (as previously described) to open up the blocked artery (Figures 1 and 2, next page). Angioplasty balloon, laser rotablator, and/or more stents may be used (Figure 3). Next, radiation treatment is delivered to the angioplasty site by means of a special source-wire balloon, or catheter (Figure 4). The radiation source is placed in the newly opened artery and dwells for approximately five minutes (Figure 4). The radiation is then completely removed (Figure 5).

What are the benefits and risks associated with radiation therapy?
If the radiation therapy is successful in preventing your artery from re-narrowing, it may decrease your chances of having additional treatment to this artery. Risks associated with radiation therapy include re-narrowing of the treated vessel, clots in the arteries and death. The dose that is used is approximately one-sixth of the dose a cancer patient would receive.

BALLOON VALVULOPLASTY

What is balloon valvuloplasty?
Heart valves direct blood flow through the chambers of the heart and to the rest of the body, so it is important that they function properly. The valves that are typically narrowed are the mitral valve and the aortic valve, and the condition is called mitral and aortic stenosis. This condition can cause you to feel short of breath with activity, chest pain, dizziness or passing out spells, and heart failure or excess fluid build-up. Valvuloplasty is a procedure in which a doctor stretches a heart valve or breaks the adhesions in a valve that may be too narrow, using a large diameter balloon catheter introduced through the skin into a vessel in the groin.

When is it used?
This procedure may be performed if you have a scarred valve that does not open all the way and blocks the flow of blood to the lungs, to the chambers of the heart, or to the body.

Current treatment alternatives for valve disease include:

♥ Drugs to help relieve the symptoms
♥ Surgical repair of the valve
♥ Valve replacement

What happens during the procedure?
You will be taken by members of the staff into the cardiac catheterization procedure room and placed on a special X-ray table. There will be a movable camera near your head, which the doctor uses to take pictures of your heart, and other equipment used to monitor your heart and take measurements of the pressures in your heart. To get ready, the staff will then clean and shave both areas of the groin and possibly also areas of your arms and wrists, and drape sterile towels and
sheets across your body to keep these areas clean. Before the doctor inserts the catheter, the area will be numbed by a local anesthetic (numbing medication), which will cause a brief stinging and burning sensation, but then should leave the area numb. The doctor will then insert a large IV into the site called a “sheath,” which helps to guide the catheters during the procedure. The sheath will either be placed in the artery or the vein in the groin, depending on which valve has the problem. Through this sheath, the doctor can then thread smaller catheters or wires into the artery that travel all the way up to the heart. The doctor can use these catheters to check the valves and take special measurements within the heart.

The doctor will guide a wire through the sheath up into your heart into the problem valve. A catheter with a balloon will be placed in the small valve, guided by X-ray and possibly also with a special echocardiogram called transesophageal echocardiogram (TEE). Doctors usually use a TEE when doing mitral valvuloplasty because it makes it easier to see the exact area of the valve, whereas the aortic valve is easier to see with simple x-rays. Once the balloon catheter is in place, the balloon is inflated, stretching open the area of the valve. The doctor will use a special pacing wire to make the heart beat fast during the inflation, so that there is not too much blood flow through the valve while the doctor is working inside of it. This is why it is common to feel palpitations during the procedure when the balloons are being inflated.

The doctor may repeat this process several times until the valve opening is the right size. In some cases, the doctor may use a small amount of contrast dye to take X-ray pictures to check the valve after the procedure, but most of the time it is not necessary.

PERCUTANEOUS AORTIC HEART VALVE REPLACEMENT

Heart valve disease refers to several conditions that prevent the heart valves from either closing or opening normally. This can result in a leaky valve (regurgitation) or a valve that does not open adequately (stenosis). Traditionally, heart surgery is used to repair or replace the valve. Most patients can undergo surgery without difficulty. For patients who are too ill to withstand open heart surgery, non-surgical approaches are being developed to treat the heart valve disease less invasively through a catheterization procedure.

Your doctor has told you that you have aortic stenosis. This is usually caused by a calcification (hardening) related to aging as well as degeneration of the leaflets of the aortic valve. This accumulation of calcium on the heart’s valve hardens and thickens the valve in the process of narrowing it. As a result, the valve cannot open completely and blood flow is reduced. This inability of the valve leaflets to open wide (stenosis) forces the heart to work harder, causing symptoms such as shortness of breath, fatigue, chest pain, light-headedness or passing out.

You will be evaluated for an investigational procedure involving implantation of a percutaneous aortic heart valve. As part of this evaluation, the following tests may be done:

♥ echocardiogram
♥ cardiac catheterization
♥ angiogram and CT scan of the leg arteries
♥ blood work
♥ neurological evaluation

If results of your evaluation show you are eligible for the minimally invasive valve replacement, your doctors will decide which type of procedure and which type of valve would be the best for your heart. Some of the valves we use are newer valves that require you to participate in a research study. If that is the case, our research team will discuss the procedure with you in detail and you will be asked to sign additional consent forms for the research team in order to have the procedure.

What does the percutaneous aortic valve procedure involve?
If you are selected to receive the percutaneous heart valve, the procedure will be performed in the cardiac
catheterization lab through the artery in the groin. It is done with local anesthesia and sedation to make you comfortable.

During the procedure, a catheter is placed in an artery in your groin and guided into the chambers of the heart.

Prior to implantation, the valve will be carefully crimped (compressed) and mounted on the balloon delivery system by a member of the team. The valve will then be inserted through the groin and into the heart through a tube and delivered inside of the diseased aortic valve. The valve will then be balloon-expanded to fit across your diseased aortic valve which will be held open permanently.

**After the procedure:**
After your valve replacement, you likely be taken to the Cardiovascular Intensive Care Unit (CVICU) for close monitoring. When you are ready, you will be transferred to a cardiology floor in the hospital for recovery. The typical hospital stay after a valve replacement in the cardiac catheterization lab is three to seven days.

**MITRAL CLIP**
The mitral valve is a 2-leaflet valve that separates the left atrium and ventricle, allowing blood to flow from the atrium to the ventricle and preventing it from flowing back. Mitral regurgitation is a condition in which there is a leak in the valve. In cases of a severe leakage, this condition can lead to heart failure, pulmonary edema, reduced cardiac function, and death, if left untreated.

The Mitral Clip™ is a device that allows the repair of the leaking valve without open heart surgery. It grasps both leaflets and holds them together to reduce the leak between the leaflets. The clip is inserted through a vein in the groin and advanced to the heart where it is placed in the mitral valve guided by a transesophageal echocardiogram. Once the severity of regurgitation has been adequately reduced, the device is released and the system is removed.

What does the transapical or transthoracic aortic valve procedure involve?
During this type of procedure, the new replacement valve will be inserted through a small incision in your chest wall. This is performed with a team of cardiac surgeons, interventional cardiologists and anesthesiologists under general anesthesia. A small incision will be made on the left side of your chest so the doctors can see the bottom of your heart. Prior to implantation, the valve will be carefully crimped and mounted onto the balloon delivery system. The valve will then be inserted into your heart through a tube and delivered directly into your diseased aortic valve. The valve will then be balloon-expanded to fit across your diseased aortic valve which will be held open permanently. The doctors will then stitch up your heart and chest when the procedure is completed.
ATRIAL SEPTAL DEFECT AND PATENT FORAMEN OVALE

An atrial septal defect and patent foramen ovale are both different types of defects in the heart. They occur in the septal wall of the atria of the heart and are present from birth. Most people do not realize that they have these abnormalities until they are adults. They are detected by an echocardiogram of the heart, usually with a special “bubble study,” in which doctors can view the abnormal flow of bubbles through the defects. These abnormalities can also be seen with a transesophageal echocardiogram, which is a sonogram of the heart using a probe placed in the esophagus.

ATRIAL SEPTAL DEFECTS (ASD)

Atrial septal defects (ASD), one of the most common heart defects, are caused by incomplete growth of the septal wall during fetal development. When an ASD is present, blood flows through the opening, usually from the left atrium to the right atrium of the heart, known as a left to right shunt. This causes an abnormal increase in blood flow in the right side of the heart (Figure 1, below). The right side of the heart does more than its normal share of work, because it is receiving so much extra blood. This may cause you to feel tired, have shortness of breath and palpitations. Closing the ASD often alleviates these symptoms.

PATENT FORAMEN OVALE (PFO)

A patent foramen ovale is a flap-like opening in the atrial septum that allows blood to flow between the atria in the fetus prior to birth. Normally, the foramen ovale closes at or shortly after birth, but if it does not close, it is referred to as a patent foramen ovale (PFO). It is a very common defect and is known to occur in 20 percent of the population. A PFO may allow blood to cross from the right atrium to the left atrium (Figure 2), which is known as a right to left shunt. This may potentially be associated with a stroke if a blood clot travels from the right side of heart through to PFO to the brain. This is known as a paradoxical embolism. Patients with this type of embolism are usually treated with anti-platelet medication (e.g., aspirin) and/or blood thinners to prevent the blood clots from forming. For those with high risk for recurrent stroke or who cannot tolerate medication to prevent blood clots after a stroke, a PFO may be closed percutaneously to prevent further strokes from occurring.

What happens during the procedure?

During this procedure, an occluder is used to repair the ASD or PFO heart defect. The occluder is made of two flat wire mesh discs with a connection between them which pulls the discs up to the septum wall. The discs help to close the hole and provide a foundation for the growth of tissue. The placement of an ASD or PFO occluder takes place in a catheterization lab.

The procedure will start with a catheterization procedure. An imaging catheter will be inserted through your groin to enable your physician to get a close-up image of your heart during the procedure.

An angiogram procedure will be performed so your physician can visualize your heart throughout the procedure.
Your physician will measure the pressure and oxygen content in the different chambers of your heart.

The occluder is inserted into the heart through a catheter. When it is properly positioned over the defect, the physician will push the occluder out of the catheter until the discs sit on each side of the defect, closing off the hole. The occluder will then be released (Figure 3).

The physician will then remove the catheter and the imaging probe, if used. The procedure takes one to two hours.

When can I go home?
Patients receiving an ASD or PFO occluder typically return home the day after the procedure. You may be asked to avoid demanding activities for at least one week.

LEFT ATRIAL APPENDAGE CLOSURE FOR ATRIAL FIBRILLATION

Atrial fibrillation is a heart condition in which the upper chambers of your heart beat too fast. This condition can cause blood to stagnate and form clots in an area of your heart called the left atrial appendage (LAA). The LAA is a small pouch on the left side of your heart and is about the size of your thumb. If a clot forms, it can increase your chances of having a stroke or other related problems.

BLOOD THINNING MEDICATIONS FOR ATRIAL FIBRILLATION

Treatments are currently available to protect you from stroke or related complications from blood clots. Your doctor may prescribe medication that thins your blood. Blood thinning medications such as warfarin (Coumadin), rivaroxaban (Xarelto), apixaban (Eloquis), edoxaban (Savaysa) or dabigatran (Pradaxa) are effective in reducing the risk of stroke, but may cause undesirable side effects such as bleeding. The strength of warfarin can be affected by certain foods and medications, and requires you to have frequent blood draws to monitor the dosage.

ALTERNATIVE TREATMENT OPTIONS FOR ATRIAL FIBRILLATION

Recently, alternatives to blood thinning medications have been developed. For those who have atrial fibrillation, it is believed that if the left atrial appendage is isolated, then blood clots that could potentially cause you harm would not be able to exit that area.

LAA Closure

The WATCHMAN left atrial appendage system has been designed to be permanently implanted in the left atrial appendage of your heart. The WATCHMAN is now FDA approved and the Amulet™ device is currently in trial. Patients who have atrial fibrillation, require treatment for potential blood clot formation and can take anti-coagulation medication, such as warfarin, rivaroxaban, apixaban, edoxaban or dabigatran, may be eligible to participate.

How the WATCHMAN™ Works

It has been well documented in the medical literature that more than 90 percent of blood clots found in patients with atrial fibrillation are found in the left atrial appendage (LAA). The WATCHMAN device is designed to keep harmful-sized blood clots that form in the LAA from entering your blood stream. These blood clots can potentially cause a stroke. The WATCHMAN device is made of materials that are common in many medical devices. The device is designed to be permanently placed just behind or at the opening of the LAA.
HYPERTROPHIC OBSTRUCTIVE CARDIOMYOPATHY (HOCM)

Hypertrophic cardiomyopathy (HCM) is a genetic condition in which heart muscle tissue thickens without any obvious cause in the left ventricle of the heart. While HCM is a genetic disorder, it is uncommon for many members of a family to actually develop the disease. The heart muscle thickening usually occurs in the septal muscle which forms the wall between the right and left ventricles of the heart. It can be diagnosed by a simple echocardiogram (sonogram of the heart) and the degree of thickening can be followed over time by your cardiologist. If the thickened septal muscle gets big enough, it can bulge out and cause changes in the mitral valve that result in blocking the blood flow of the heart as blood is pumped out of the left ventricle to the rest of the body. In medical terms, this is called a left ventricular outflow obstruction. When this occurs in the setting of HCM, it is called hypertrophic obstructive cardiomyopathy (HOCM). This may cause strain on the heart, as it has to work harder to pump blood, and in some people causes dysfunction of the mitral valve, known as mitral regurgitation. People with HOCM may experience palpitations, shortness of breath, chest pain and experience dizziness or passing out spells. Medications such as beta blockers, calcium channel blockers and anti-arrhythmic agents can help to control the symptoms. Many patients develop arrhythmias (irregular heart beat), which can be fatal. For those patients at high risk for fatal arrhythmias (also called sudden cardiac death), doctors will usually implant defibrillators to protect the heart.

While most patients with HOCM can be managed with medication, some do not have improvement in symptoms. For these patients, there are two treatment options to decrease the muscle size of the septum, allowing for better blood flow. The first is to have open heart surgery with a septal myectomy—a surgical procedure to cut out the overgrown tissue. The second is a less invasive procedure called a septal alcohol ablation—done here in the Cardiac Catheterization Laboratory, or Cath Lab.

SEPTAL ALCOHOL ABLATION

What does the procedure involve?
A septal alcohol ablation is a procedure in which the doctors use small amounts of alcohol inside the coronary arteries to burn off the excess muscle tissue in the heart. You are given sedation medication for your comfort during the procedure. The doctor starts with a cardiac catheterization (as previously described) to get into the arteries of the heart. A transesophageal echocardiogram—a special sonogram of the heart done by inserting a probe down your esophagus—is used to guide the doctors and to be sure that they can inject the alcohol safely.

Once in the arteries, the doctor will use intravenous (IV) dye to take X-ray images. The arteries that supply blood to the septum of the heart (the septal arteries) will be located and small amounts of alcohol will be placed into one of the arteries for a short period of time. The doctor will inflate balloons in the artery to close off the section of the artery with the alcohol and prevent back-flow of the alcohol to other areas of the heart. The alcohol causes the tissue to die, and over time, this area of tissue will scar and shrink down. It causes an effect that is very similar to that of a heart attack, only this is a well-controlled system to damage unwanted excess tissue in the heart. This is why it is common to feel chest pain after the procedure.

What are the risks?
One of the greatest risks of the procedure is developing a slow heart rate called “heart block,” in which the top of the heart beats separately from the bottom. This electrical disturbance can cause a dangerously slow heart beat. Heart block can occur because it is possible to damage the small area of tissue responsible for keeping the top of your heart beating in sync with the bottom of your heart while excess tissue is burned off during the procedure. If this occurs, it usually happens within the first few days after the ablation. If you develop heart block, you may need a permanent pacemaker inserted prior to being discharged from the hospital. About 5 percent of patients...
require a permanent pacemaker. After the septal alcohol ablation, we will usually keep you in the hospital for about four days to monitor your heart rate.

**RIGHT HEART CATHETERIZATION (RHC)**

A right heart catheterization (RHC) is a procedure that is done to measure pressures within the heart and to accurately measure heart function. It can be done on its own or as part of a cardiac catheterization (also known as a left heart catheterization). In an RHC, doctors insert a small catheter into the femoral vein in the groin or the internal jugular vein in the neck and thread the catheter into the right chambers of the heart. With this special catheter in place, doctors can take measurements of the pressures within each chamber of the heart and the pulmonary arteries, measure oxygen balance and assess heart function. An RHC is most commonly used in the diagnosis and management of congestive heart failure or pulmonary hypertension.

**ENDOMYOCARDIAL BIOPSIES**

Endomyocardial biopsies are tissue samples of heart muscle taken during a right heart catheterization for analysis. Heart biopsies can be helpful for diagnosing conditions in cases of unexplained heart failure. At MedStar Washington Hospital Center, many of our endomyocardial biopsies are performed as an ongoing assessment of patients that have had a heart transplant. Doctors can diagnose and monitor signs of rejection, injury or infection in these patients.

**INTRA-AORTIC BALLOON PUMP (IABP)**

The intra-aortic balloon pump is a device that provides blood pressure support and increases blood flow to essential organs such as the heart and the brain. It is used in cases where the heart fails to provide adequate blood flow to the body or in cardiac procedures where there is an increased risk of heart failure during and/or after the procedure.

The balloon is inserted through an artery in the groin and placed in the descending aorta. The balloon inflates during the heart relaxation, thus increasing the blood flow to the heart and brain. It deflates during the heart contraction, thereby increasing flow to the rest of the body.

**PERCUTANEOUS LEFT VENTRICULAR ASSIST DEVICE (IMPELLA)**

The percutaneous ventricular assist device (VAD) provides blood pressure support. It is mainly used in cases of a weak heart in which the body does not receive enough blood flow. It is used during cardiac procedures where there is a risk of heart failure during and/or after the procedure. The VAD is inserted through an artery in the groin and placed across the aortic valve and into the left ventricle of the heart. The device acts as a pump, suctioning blood from the ventricle and pumping it into the aorta, which helps the heart to supply blood to the rest of the body.

**PERIPHERAL ARTERIAL DISEASE**

Peripheral arterial disease (PAD), also known as poor circulation, is a common vascular problem in which blockages in arteries outside of the heart reduce blood flow to various areas of the body. It is caused by fatty deposit (plaque) buildup in the artery wall which reduces blood flow, also known as atherosclerosis. PAD affects 8 to 12 million Americans. The risk of PAD increases with pre-existing heart disease, high blood pressure, diabetes, high cholesterol, increasing age (especially after the age of 50), tobacco use and family history of PAD. PAD can occur in the carotid arteries of the neck (carotid artery disease), subclavian arteries of the upper chest and arms, arteries of the kidney (renal artery stenosis), arteries of the aorta and iliacs in the abdomen (aorto-iliac artery disease) and in the legs (lower extremity PAD).

**CAROTID ARTERY DISEASE**

Your doctor has told you that you may have carotid
artery disease. The nonsurgical method of treating carotid artery disease is called carotid stenting.

**What is carotid artery disease?**

Carotid artery disease is when plaque and fatty deposits build up on the walls of the carotid artery. The carotid arteries, located on each side of the neck, are responsible for carrying oxygen rich blood to the brain. When one or both of these arteries become narrowed due to a buildup of plaque, it increases your risk of having a stroke.

**How is carotid artery disease treated?**

The current options for treating carotid artery disease include medical therapy and surgery. Carotid endarterectomy surgery usually involves local or general anesthesia, a small incision made in the neck in the carotid artery to remove the plaque, and one to two days recovery in the hospital. Carotid stenting is a nonsurgical alternative for treating carotid artery disease. Instead of surgically cutting the artery to remove the plaque, a small angioplasty balloon is used to open the artery, and a stent is implanted to provide extra support (Figure 1).

**Before carotid stenting**

Before you can have an angioplasty of your carotid artery, there are several tests that must be completed.

1. **Cerebral angiogram.** Pictures of the brain arteries are taken using dye through catheters inserted in the femoral artery. This is similar to a cardiac catheterization, in which pictures are taken of the heart arteries. Although we use small amounts of dye, you may feel a warm feeling in your head when the dye is injected.

2. **Carotid ultrasound.** This is a non-invasive test to check the blood flow through the carotid arteries. It is also called a Doppler study, a sonogram or a duplex study. Even if you have had them done at your doctor’s office or another hospital, they may need to be repeated at the Hospital Center.

3. **CT scan or MRI.** You need to have had either a CT scan of your head without contrast or an MRI of your brain within the past six months to evaluate for evidence of a previous stroke.

4. **Heart evaluation.** We prefer that you have had an evaluation of your heart within the past six months. If you had a noninvasive test such as a stress test or thallium scan, we will have to analyze the results before you come to the hospital. If the stress test or thallium scan is positive (that is, if it shows that there are areas of the heart muscle that are not getting enough blood and oxygen), you may need to have a heart catheterization. We may also have to do an echocardiogram.

5. **Neurological evaluation.** This is done when you come to the hospital before the procedure. It gives a baseline of your neurological status.

6. **In preparation for the procedure,** you may be started on aspirin and clopidogrel (Plavix).

**How is the carotid stent procedure performed?**

Once you are in the catheterization laboratory, a sheath is placed in the artery and vein, usually using the femoral artery in the groin. A catheter is then inserted through the sheath and threaded up to the carotid artery. It is designed to act as a channel through which the rest of the angioplasty equipment is passed. Next, a small guide wire is often attached to a special filter or balloon and advanced through the artery across the blockage (Figure 2). The guide wire functions as a rail over which the balloon catheters and stents are advanced.

The balloon catheter is positioned across the plaque and inflated to mold the plaque into the wall of the artery. During the balloon inflations, which last six to 10 seconds, you may feel some tightness in your throat. Then the stent is positioned across the area of blockage and expanded with the aid of a balloon into the wall of the artery (Figure 3, at left, and Figure 4, next page). The average length of the procedure is approximately one hour.
What are the risks involved in carotid stenting?
The major risk in carotid stenting is the potential for a stroke, heart attack or death. The most common problem is a temporary drop in blood pressure when the balloon is inflated. If this occurs, it may be necessary for some patients to stay in the Intensive Care Unit overnight.

SUBCLAVIAN ARTERY STENOSIS
This form of peripheral artery disease affects the subclavian arteries, the large arteries on either side of your upper body, which supply blood to the arms. Left subclavian stenosis is more common than right stenosis. Symptoms include fatigue of the affected arm and a difference in blood pressure between both arms. Diagnosis is determined with MRA (magnetic resonance angiography), but must be confirmed by angiography. Treatment is usually angioplasty and stenting of the blockage.

RENAL ARTERY STENOSIS
Renal artery stenosis is a narrowing or blockage of the artery that supplies blood to the kidney, caused by atherosclerosis or scar formation in the artery.

Causes, incidence and risk factors
Renal artery stenosis is caused when athero-embolic renal disease results in narrowing of the renal artery. In the elderly, renal artery stenosis is most commonly associated with atherosclerotic disorders, including atherosclerotic heart disease. Atherosclerotic plaque is deposited within the renal artery, causing it to become narrowed (stenosed). A second cause is fibro-muscular disease, a condition more common in young women, where fibrous tissue grows in the wall of the renal artery and narrows it. It may also be caused when scar tissue forms in the renal artery after acute arterial obstruction or traumatic injury to the kidney.

Renal artery stenosis often causes hypertension, and is usually discovered while investigating the cause of difficult-to-control hypertension. In fact, renal artery stenosis accounts for one to two percent of all cases of hypertension. The disorder may also be discovered when a bruit (loud whooshing sound) over the kidney is noted on a routine examination.

Signs and Tests
1. Your blood pressure may be high, and there may be a history of hypertension that is refractory or difficult to control.
2. A bruit (abnormal sound) may be heard on examination with a stethoscope over the kidney. Additional tests that are performed include:
   - A radionuclide scan, or nuclear medicine scan, may indicate a decreased blood flow.
   - A kidney X-ray, kidney CT scan or kidney ultrasound may indicate a decreased size of the kidney, and/or a decreased arterial flow secondary to narrowing of the artery.
   - Renal arteriography shows the exact location of the stenosed area.

Treatment
Treatment varies depending on the extent and severity of the symptoms. Non-surgical approaches include medication and renal artery stenting. With renal artery stenting (Figures 1 and 2 below), the groin artery is entered and a catheter is threaded up through the aorta to the diseased renal artery. Next, a small guide wire is advanced through the artery and across the blockage. A balloon catheter is placed over the wire and positioned across the blockage. The balloon is inflated to mold the plaque into the wall of the artery. A stent is positioned across the blockage.
and expanded with a balloon. The average time of the procedure is about one hour. When the procedure is over, you will go to a monitored bed. The introducer sheath will be removed from your groin when the blood thinners wear off, generally between one to five hours after the procedure is completed. You will need to keep your legs straight and not bend the groin area for six hours to prevent bleeding at the catheter site.

AORTO-ILIAC DISEASE AND LOWER EXTREMITY PERIPHERAL ARTERIAL DISEASE (PAD)

When PAD affects the aorta and iliac arteries, it is known as aorto-iliac disease. And when it affects the arteries of the legs, it is referred to as lower extremity PAD. The aorta is the major artery that carries blood and oxygen to all areas of the body. The iliac arteries branch off from the aorta in the lower abdomen and supply blood to many other arteries in the legs. PAD in all of these areas can cause very similar symptoms.

What are the symptoms?

PAD in the aorta, iliacs and lower extremities causes poor blood flow to the legs. This can cause heavy, dull, cramping or aching pain in the legs while walking (known as intermittent claudication), because the muscles in the lower extremities do not receive enough blood flow to keep up with the demands while exercising. People with intermittent claudication usually experience this muscle pain in the hips, thighs or calves, and it usually resolves with rest. If PAD is severe, pain may occur even at rest, especially at night when legs are elevated. Resting pain may be relieved when legs are lowered. Along with claudication and leg pain, patients with PAD may experience leg numbness or weakness, color changes of the legs, no pulse or weak pulses, coldness in the legs or feet and non-healing sores.

How is it diagnosed?

PAD is usually diagnosed by a variety of methods. It can be suspected on physical exam by your doctor. The doctor may find a weak or absent pulse to the lower extremities, poor wound healing where blood flow is restricted, and an abnormal sound heard by stethoscope over the affected artery. An ankle-brachial index (ABI) is a non-invasive test to check the blood flow in your legs. A blood pressure cuff is used to measure pressures in the legs and is then compared to pressures in the arms to determine if there is poor blood flow. This is easy to do and can be done in the doctor’s office. Other testing can include an ultrasound, CT scan, or MRI to visualize any blockages in the arteries. In the cardiac catheterization lab at the Hospital Center, doctors can perform a peripheral angiogram, similar to a cardiac catheterization, to view blood flow in these arteries.

How is PAD of the aorto-iliac and lower extremity arteries treated?

The current approved methods for treating PAD include medical management, peripheral artery angioplasty, stenting and bypass surgery. There are a few FDA approved drugs for claudication. The drugs do not remove, decrease or prevent plaque formation. They increase oxygen release to the muscles. Bypass surgery involves creating a bypass graft using a blood vessel from another part of your body, allowing blood to flow around (or bypass) the blocked artery. Surgery requires general anesthesia, followed by three or four days in the hospital. An alternative to surgery is peripheral endovascular intervention with angioplasty and stenting of the blocked arteries in the catheterization lab. Instead of surgically bypassing the artery, a small angioplasty balloon is used to open the artery and then a stent is implanted to provide extra support. The potential advantages of peripheral angioplasty and stenting over surgery are a shorter stay in the hospital and an earlier return to full activity.

How is the peripheral angiogram, angioplasty, and stent procedure performed?

Once you are in the catheterization laboratory, a sheath is placed in the artery and vein, usually using the femoral artery in the groin or brachial artery in the arm. A catheter is inserted through the sheath and special dye is then injected into the arteries to take pictures of the blockage (Figure 1, below). During the time the dye is injected, you may feel a warm sensation down your leg or arm. The catheter is designed to act as a channel through which the rest of the angioplasty equipment is passed. Next, a small guidewire is advanced through the artery across the blockage. The guidewire functions as a rail over which the balloon catheters and stents are advanced. The balloon catheter is positioned across the plaque and inflated to mold the plaque into the wall of the artery (Figure 2, next page). An Intravascular Ultrasound (IVUS) catheter may then be advanced to the stented arteries.
area through the same sheath. The IVUS will allow the doctor to assess the accurate placement of the stent. The average length of the procedure varies. The result is seen in Figure 3, above.

ABDOMINAL AORTIC ANEURYSM (AAA)
Your doctor has told you that you have an abdominal aortic aneurysm (AAA). This section describes the non-surgical method of treating this aneurysm with a stent graft.

What is an abdominal aortic aneurysm?
AAA is an enlarged segment of the aorta, located in the abdomen, called an aneurysm. The aorta is the blood vessel that carries blood from the heart to the lower part of the body. When the aneurysm exceeds five centimeters in size, or is enlarging at a fast rate, there is the potential for rupture and death.

How are abdominal aortic aneurysms treated?
The initial method for treating AAA is surgery. Surgical AAA repair is done under general anesthesia, with a three or four day hospital stay, followed by a four to six week recovery period. Stent grafts are a more recent non-surgical alternative to surgical AAA repairs. The graft is delivered through an incision in the groin and guided up through the artery to the area of the aneurysm. The graft is then expanded to a pre-established diameter. The potential advantages of stent grafts over surgery are a shorter stay in the hospital, an earlier return to full activity and a reduction or elimination of general anesthesia.

What is needed before I can have abdominal stent grafting?
Before you can undergo stent grafting for AAA repair, there are several tests that must be performed:

1. Abdominal Angiogram: Pictures of the abdominal aneurysm are taken using dye through catheters inserted in the femoral artery located in the groin area. It is very similar to a cardiac catheterization, in which dye pictures are taken of the heart arteries. While dye is being injected, you may feel a warm sensation in your abdomen and legs.

2. Spiral Computed Tomography (CT): You will need to have an abdominal Spiral CT scan with IV contrast. This type of scan produces higher resolution with less radiation exposure than conventional CT.

3. Intravascular Ultrasound (IVUS): An ultrasound is done during the angiogram procedure. An ultrasound catheter is inserted into the same femoral artery. IVUS will allow the doctor to assess the accurate size of the aneurysm.

4. Ankle-brachial Index (ABI): This is a non-invasive test to check the blood flow in your legs. A cuff will be placed on your ankle to measure the blood pressure. This is similar to taking a blood pressure reading from the arm.

The abdominal angiogram, Spiral CT scan and IVUS studies are very important in establishing the size of the stent graft for the abdominal aortic aneurysm. These studies need to be done at the Hospital Center. We will assist you in scheduling the procedures.

How is the abdominal stent graft procedure performed?
The procedure will be performed under either regional or general anesthesia. If regional anesthesia is used, only a specific region of the body will be insensitive to pain, and the nerve impulses from this area will be blocked and not able to reach the brain. You will remain conscious during the procedure, but may be given a sedative for relaxation. If general anesthesia is used, your entire body is anesthetized. You will not be awake or feel anything during the procedure.

Once you are in the catheterization laboratory, an introducer sheath will be placed in your groin arteries and possibly an arm artery. Then a delivery catheter will be inserted and advanced to the aneurysm site in your aorta. The stent graft will be deployed, and will expand to its pre-established diameter (Figure 1). Additional stent grafts may be placed to assure that the aneurysm is covered.
PROCEDURES IN THE ELECTROPHYSIOLOGY LABORATORY

Cardiac electrophysiology is a medical specialty devoted to the diagnosis and treatment of abnormal heart rhythms. Electrophysiologists, fully trained cardiologists who have undertaken additional fellowship training in clinical cardiac electrophysiology, have expertise in the diagnosis and treatment of cardiac arrhythmias.

Electrophysiology studies are performed in a specialized procedure room called an electrophysiology laboratory (EP Lab). The EP Lab at MedStar Washington Hospital Center offers the most advanced diagnostic tools for diagnosing and treating cardiac arrhythmias. Through early detection and treatment, severe arrhythmias can be diagnosed and treated with the goal of relieving symptoms and preventing the common causes of sudden cardiac death.

ELECTROPHYSIOLOGY STUDY (EPS)

An intra-cardiac electrophysiology study (EPS) is a diagnostic procedure used to evaluate a documented or suspected cardiac arrhythmia (abnormal heart beat). These tests study the electrical flow of the heart and are performed to collect detailed information on why the heart is not beating normally. EPS results will give your doctor information about:

♥ The cause of an arrhythmia or abnormal heart beat.
♥ The effectiveness of medications used to control arrhythmias.
♥ The functioning of implantable devices.
♥ The cause of symptoms that might be caused by an arrhythmia.

Your doctor will review the results with you and your family and make recommendations on therapy. Patients often go home several hours after an EPS. If treatment is needed, many options are available and may require that you return to the laboratory.

TRANSESOPHAGEAL ECHO (TEE)

What is a TEE?

A Transesophageal Echo (TEE) is a test performed by inserting a flexible tube (1/2” in diameter) into your mouth and down your esophagus (food pipe). This tube has a probe (transducer) on the tip that uses soundwaves to produce moving pictures of your heart. These pictures give the doctor a clearer and closer look at your heart. This helps your doctor identify and treat problems such as infections, blood clots, disease or defects in your heart’s walls or valves.

PERMANENT PACEMAKER IMPLANTATION

A permanent pacemaker is an artificial device used to treat heart rates that are too slow. The human heart has a natural pacemaker that regulates heart rate. When this natural pacemaker becomes defective, the heart will not beat regularly, and may cause symptoms such as dizziness, loss of consciousness and/or chest pain. Something must be done to restore the heart’s normal rhythm. A pacemaker is a small unit implanted inside the body (usually just under the skin at the upper left or right chest, just under the collarbone), which helps regulate your heart rate.

The device consists of two parts: the generator and the wires.

How does the device work?

The unit is powered by lithium battery and delivers electrical impulses to the heart through the insulated wires (leads). This causes the heart to beat more regularly. Most pacemakers are demand pacemakers, meaning that the pacemaker only sends an impulse to the heart if your heart rate goes below a set rate.

Types of permanent pacemakers

There are several different types of permanent pacemakers, such as:

♥ Single chamber models
♥ Dual chamber models
♥ Biventricular models

Single chamber models

In a single chamber model, a pacemaker wire is inserted into the right ventricle.

Dual chamber models

In a dual chamber model, pacemaker wires are inserted into both the right atrium and the right ventricle. This type of pacemaker synchronizes the rhythm between the atria and the ventricles, mimicking the heart’s normal conduction.
BIVENTRICULAR MODELS
In a biventricular model, both the right and left ventricles are paced in order to “resynchronize” the heart’s pumping function and improve the pumping ability of the heart. It is used in certain groups of patients with heart failure.

Most people stay in the hospital overnight after a pacemaker is inserted and leave the following day. A chest x-ray is done to evaluate your lungs.

All devices must be checked on a regular basis to make sure they properly meet the individual patient’s needs and to verify the correct functioning of the device. Normally, devices are checked every three to six months.

IMPLANTED CARDIAC DEFIBRILLATOR (ICD)
An implanted cardiac defibrillator (ICD) is a device used to treat heart rates that are abnormally fast or disorganized. Patients at risk for sudden cardiac death by either ventricular tachycardia or ventricular fibrillation are candidates for ICD implantation. The device can detect a potentially life-threatening arrhythmia and respond by administering a shock directly to the heart muscle. The shock is strong enough to bring the heart out of this hazardous rhythm, but is harmless to the rest of the body.

The device is similar to a pacemaker, but slightly larger. It is placed in the body, usually under the skin at the upper left chest just under the collarbone. It consists of two parts, the generator and the wires, and constantly monitors the heart’s rhythm.

How does the device work?
If the ICD detects an abnormally fast rhythm, it will either regulate the heart rhythm by rapid pacing, or it will deliver a small electric shock to the heart to convert the heart rhythm back to normal. The individual might not feel the rapid pacing, but the electric shock would feel like a strong jolt to the chest. An ICD also performs similarly to a pacemaker, and can pace the heart if it detects a slow heartbeat.

Normally, the patient remains in the hospital overnight following the procedure and can leave the next day. Implanted defibrillators must also be checked on a regular basis approximately every three to six months. You will receive an ID card and book specific to your device.

ABLATION: RADIOFREQUENCY OR CRYO
Ablation is an interventional procedure used to treat rapid and abnormal heart rhythms. Successful ablation cures the abnormal heart rhythm and may eliminate the need for medication. Destroying the abnormal pathways lets the heart’s normal rhythm work properly, or if required, allows a permanent pacemaker to pace the heart.

How does the procedure work?
Ablation treats an arrhythmia by using energy to destroy parts of the abnormal electrical pathway that is causing the arrhythmia. The procedure is very similar to an electrophysiology study, and can be performed during an EPS. During the procedure, energy is sent to the tip of the catheter to ‘heat’ or ‘cool’ and destroy the affected area.

Ablation is most often used to treat:
♥ Supraventricular tachycardias (SVTs)—abnormally fast heartbeats that originate at the atria of the heart.
♥ Wolff-Parkinson-White (WPW) Syndrome—a condition in which an extra electrical pathway runs between the atria and the ventricles, causing the electrical signal to arrive at the ventricles too soon.
♥ A-V nodal re-entrant tachycardia—extra conduction pathways in the heart that cause the heart to beat more quickly than normal.
♥ Atrial flutter and less common atrial fibrillation that does not respond to medications.
♥ Ventricular tachycardia—abnormally fast heartbeats that originate from the ventricles of the heart.

IMPLANTABLE LOOP RECORDER
An implantable loop recorder is a diagnostic device smaller than a paper clip that is inserted under the skin in the upper chest area. Patients who suffer from recurrent unexplained fainting spells, palpitations or dizziness are good candidates for this device.

Often, physicians have a difficult time diagnosing the reason for these spells. An implanted loop recorder will allow your physician to see if there are any arrhythmias associated with your symptoms.
This will allow the doctor to find an effective treatment much faster. The recorder continuously monitors your heart rate and rhythm for up to three years. Your physician can play the information back later for analysis.

When a patient experiences fainting, or symptoms of fainting, they are given an implantable loop recorder. The patient is given an activator that is placed over the device. This requires the pushing of a button to flag the episode. The patient or family member can do this. This allows the EKG rhythm to be captured and stored. If the button is not pushed, and it was an abnormal rhythm, it will be stored automatically.

HEAD-UP TILT TABLE TEST

Head-Up Tilt Table Testing is a diagnostic tool used primarily to evaluate individuals having unexplained episodes of lightheadedness or fainting spells. A positive tilt table test usually indicates something called neurocardiogenic syncope (vasodepressor syncope or vasovagal syncope). Under normal circumstances, the heart rate and blood pressure increase when the head is tilted up. In positive tests, there is initially an appropriate response. There is then a sudden drop in blood pressure and possibly heart rate after the body has been tilted up. The patient has symptoms of lightheadedness or fainting.

CARDIOVERSION

A cardioversion is an interventional procedure used to convert a fast and/or irregular heart rhythm or arrhythmia. Patients can have irregular rhythms without any symptoms. Some of these arrhythmias, such as atrial fibrillation and atrial flutter, can lead to other serious problems, such as heart failure or stroke. Physicians often try to convert these rhythms back into a normal rhythm with medications before trying cardioversion. A cardioversion is very similar to defibrillation. It involves sending an electrical shock through the chest wall to “jolt” the heart back into a regular rhythm.

FREQUENTLY ASKED QUESTIONS ABOUT ELECTROPHYSIOLOGY PROCEDURES

How long will I be in the lab?
You will be in the lab one to six hours. This varies depending on the severity of your condition and the number of other patients in the lab at that time. We will do everything we can to keep you and those with you updated on your condition. Please feel free to let the receptionist in the waiting room know if you have any questions.

When will my procedure start?
Although you arrived very early in the morning, each patient’s case will be considered on an individual basis. Each doctor will make a decision for his or her patient, based on the patient’s clinical situation. Your early arrival assists us in preparing you for the procedure, but does not govern when you will have your procedure.

Will I be allowed to have visitors before the procedure starts?
Family and friends will be allowed to visit for a brief time before the procedure. There may be events or circumstances in the lab that can prohibit visitors. Should this occur, we will make every attempt to contact those who are waiting for you. Please know that your clinical care is our top priority.

What are the next steps?
After the procedure, your nurse will monitor your blood pressure, heart rate, groin area or incisions, and pulses in your feet. Your nurse will also ask if you are experiencing any discomfort. You will either return to your room or the lab holding area. You will remain on bed rest for approximately four to six hours after your sheaths/catheters are removed. Once your groin has been checked, you will be asked to take a walk with your caregiver. After your walk, your groin will be checked again. At this time, you will continue to rest and your plan of care will be established for the next 24 hours.

When will I see my doctor after the procedure?
Your doctor will meet with those in the waiting room after your procedure to update them on your condition. After this, he or she will provide instructions for your plan of care to the Advanced Practice Clinician (APC), which will either be a nurse practitioner or physician’s assistant, who will care for you. This will give the doctor the opportunity to assist other patients,
while ensuring that you are receiving excellent care in preparation for discharge.

**Does it hurt to have the catheters removed?**
Your nurse and cardiovascular technician will be with you during this procedure to give you oxygen and IV fluid, and to monitor your blood pressure, heart rate and pulses in your feet immediately after the procedure is finished. Pressure must be applied to the site for about 10 minutes to make sure there is no bleeding. Then a bandage will be applied.

**Can I sit up?**
If you had catheters inserted into your groin for the test, sitting up may cause bleeding, so we can only raise the head of your bed slightly. We will work with you to find the most comfortable position for the few hours that you must lie in bed. If you had a pacemaker or device implanted, you may sit up immediately after your procedure.

**When can I eat?**
You may eat when you are fully awake and back in your room.

**Can I go to the bathroom?**
You may go to the bathroom four hours after the groin catheter has been removed. A nurse will help you with a urinal and/or bedpan while you are on bed rest.

**Will my medicines change?**
Your electrophysiologist/cardiologist and cardiology APC will decide if any of your medications need to be adjusted.

**When can I go home?**
Some people can go home several hours after the procedure, while others may spend the night in the hospital. Your cardiologist or APC will let you know how long you will be staying. If leaving in the morning, please make arrangements for someone to drive you home.

**Will I need medication after the procedure?**
Every patient is different. If it is determined that you will need medication post procedure, it will be prescribed by your APC upon your discharge.

**Will my current medication regimens change after the procedure?**
Potentially—your body may respond to the treatment/procedure in different ways. Your medication will be adjusted based on how your body responds.

**How long will I have to stay in bed after a pacemaker or device implantation?**
Your doctor will leave specific orders as to when you can get out of bed. You may be asked to stay in bed overnight, but be allowed to walk to the bathroom with assistance from your nurse.

**Will there be any additional restrictions after a pacemaker or device implantation?**
You will be fitted for an arm sling that should be worn for 48 hours following the procedure. This will assist in minimizing your shoulder movement after the new implant.
This chapter will help you prepare for your cardiac surgery and recovery.

Your doctor has sent you to the MedStar Heart & Vascular Institute for cardiac surgery. Our team is the most experienced in the field. We offer many surgical procedures. We care about your experience and want you to feel as comfortable as possible during your stay with us. Your surgeon is in surgery most of the day, so any of your questions can be answered by your surgical team, including nurse practitioners, coordinators and nursing managers. The surgical team is a spokesperson for your surgeon.

The discharge planning process begins soon after your surgery. Before you are admitted, please discuss your discharge plan with your loved ones. Most patients discharge to home and need assistance with care for the first week. However, some patients may need inpatient rehabilitation. If you think you may need inpatient rehabilitation please come prepared with a list of preferred facilities.

**DAY BEFORE SURGERY**

If you are not told what time to arrive at the hospital on the day of your surgery, please call 202-877-7464 between 3 and 4:30 p.m. If your surgery is on a Monday, please call the Friday before.
If you do not contact anyone, please arrive at the hospital at 5 a.m. on Monday, Wednesday, Thursday and Friday, and 6 a.m. on Tuesday.

Pack your personal robe, slippers and toiletries (women should include a bra). We suggest that your family bring these items the day that you are transferred to the step-down unit, typically the day after surgery.

Use a Dulcolax (Bisacodyl) suppository or a Fleet (sodium biphosphate) enema, which is available at most drug stores or pharmacies. Repeat if necessary, as it is important to have a bowel movement before surgery.

Do not eat or drink anything after midnight the night before your surgery.

To help stop infections before they start:

❤ Shower with chlorhexidine the night before and the morning of surgery. Chlorhexidine will be provided with further instructions.

❤ Do not shave your chest or legs the week before surgery.

❤ Insert the mupirocin ointment nasal (nose) prep into each nostril the night before surgery. The mupirocin ointment will be provided with further instructions.

DAY OF SURGERY

❤ Please shower with soap and water and apply the chlorhexidine soap from your neck to your toes and leave on for two minutes before rinsing off.

❤ Do not use lotion, powder, perfume or deodorant.

❤ Do not wear contact lenses.

❤ Leave jewelry, including all rings, watches, money and other valuables at home.

❤ Bring your insurance cards and a photo ID.

❤ Take only the medications indicated by the nurse practitioner with a small sip of water.

❤ If you are diabetic, do not take your insulin or any oral diabetes medications (pills) on the morning of surgery. Your blood sugar will be checked at the hospital and treatment will be given as needed.

Morning of Surgery

If you are arriving the morning of surgery, proceed to the admissions area for Cardiac Surgery. After your registration and processing have been completed, you and your family will be directed to the surgical area on the ground floor.

All patients will be assigned a patient privacy number. This allows your family to track your location on the TV monitor, from the holding area to the operating room and the Cardiovascular Intensive Care Unit (CVICU).

We realize that the waiting time before surgery is stressful. Please be assured we will do everything possible to keep your wait short. Occasionally, there are emergencies that can cause delays in the surgical schedule. We appreciate your patience in these situations.

After your surgery, you will be cared for in the CVICU. Your family may visit you after you have been evaluated by your health care team.

YOUR OPERATING ROOM EXPERIENCE

The operating room team consists of a diverse group of health care providers. Each team member has received specialized instruction in cardiac surgery and is dedicated to providing you with optimal care.

Your Operating Room Team

The cardiac surgeon is the team leader who performs your surgery.

The anesthesiologist is the surgical team member who administers the medication and general anesthesia that allow you to sleep during the surgery.

Before the surgery begins, the anesthesiologist will place monitoring devices on your body. You will have a small IV inserted into an artery in your wrist to continuously monitor your blood pressure. You will breathe oxygen through a mask and quickly fall asleep as the anesthesia is administered through an IV. Once asleep, a breathing tube (endotracheal tube) will be placed in your mouth to support your breathing using a ventilator. Central lines (IVs) will be used to administer medication and monitor your vital signs during surgery.

The circulating nurse is the primary care nurse in the operating room. Before your operation, the circulating
nurse will interview you and review your chart following specific guidelines developed by the hospital.

There are also two members of the operating room team who assist the cardiac surgeon during the operation. The cardiac surgeon’s primary assistant is the surgical assistant. The scrub nurse or certified surgical technician prepares the sterile instruments, equipment and supplies that are needed for your surgery.

During the operation, your heart and lungs may be supported by a cardiopulmonary bypass machine, also known as a heart-lung machine. The perfusionist is the operating room team member responsible for operating this machine.

**SURGICAL PROCEDURES**

**Coronary Artery Bypass Graft**

Coronary artery bypass graft surgery is commonly referred to as a CABG (pronounced cabbage). The cardiac surgeon improves blood flow to your heart by bypassing the blocked arteries using a vein from your leg and/or internal mammary artery(s) located under the chest wall. The surgeon uses an endoscopic minimally invasive approach to remove a segment of vein from your leg. The sternum or breastbone is then divided to reach your heart. (See Sternal Incision diagram at right, above.) The surgeon can access the internal mammary artery(s) through the sternal incision. The vein and arteries are sewn below the blocked or occluded artery on the heart allowing oxygenated blood to the heart muscle.

CABG surgery may be performed using a cardiopulmonary bypass pump (heart-lung machine) to temporarily take over the function of the patients’ lungs and heart during surgery.

Some CABG surgeries can be performed while the heart continues to beat. This is called beating-heart surgery. A special device is used to stabilize the area of the heart where the surgical team is grafting the bypasses. Beating-heart surgery is thought to have fewer complications, since the heart-lung machine is not used.

**Vessels that are commonly bypassed**

The vessels in the heart that are commonly bypassed are the right coronary artery (RCA), the left anterior descending artery (LAD) and the circumflex artery (CIRC). Often smaller branches of these arteries are bypassed as well. (See Bypassed Heart Vessels diagram below.)
Heart Valve Surgery

Valve Repair
During the surgery for valve repair, an echocardiologist will work closely with your surgeon to assess the valve repair using a special ultrasound called a Transesophageal Echocardiogram (TEE).

Repair procedures can include: sewing in a ring, widening a calcified valve or suturing leaflets of the valve. The mitral valve is the most commonly repaired valve, but these techniques may be used to repair aortic and tricuspid valves.

Valve Replacement
During the surgery for valve replacement, your surgeon will remove the diseased valve and replace it with a tissue or mechanical valve. A tissue valve can be made of tissue from bovine (cow) or porcine (pig) and less often from human tissue, allograft (donated tissue) or homograft (your own tissue). Replacement valves are compatible and will not be rejected by your immune system.

After valve surgery, your doctor may prescribe an anticoagulation medication to prevent blood clots from forming on or around your repaired or replaced heart valve. The dosage will be closely monitored by blood tests.

Some valve repair or replacement procedures require anticoagulation for a few weeks. Mechanical valve replacement surgery requires anticoagulation for life. Coumadin is the most commonly prescribed anticoagulation medication at this time. Coumadin causes delayed clotting of the blood. The most common side effect is bleeding.

It is important to take this medication as prescribed. You will be closely followed by your doctor regarding the dosage and side effects. Your doctor will discuss any lifestyle changes, including diet and activity limitations, the medication may affect. (See Common Medications section for more information.)

Minimally Invasive Surgery
Transcatheter Aortic Valve Replacement
During this type of procedure, the new replacement valve will be inserted through a small incision in your chest wall. This is performed with a team of cardiac surgeons, interventional cardiologists and anesthesiologists. It is done under general anesthesia. Prior to implantation, the valve will be carefully crimped (compressed) and mounted onto a delivery system by a member of the team. The valve will then be inserted into your heart through a tube and delivered directly into your diseased aortic valve. The valve will be expanded to fit across your diseased valve, which will be held open permanently. At the end of surgery, a surgical drain will be in place for a few days.

Mini Mitral Surgery
The incision will be only a few inches long, located on the right side of your chest. You will need to be on heart-lung machine. The surgeon will repair or replace your valve.

Antibiotics after Valve Surgery
Since artificial valves are more likely to get infected than your natural valves, the American Heart Association recommends that patients with valve surgery take antibiotics before certain procedures.

After your heart valve surgery, talk with your doctor about taking antibiotics prior to any dental or other invasive procedure or surgery to protect your valve, a new valve or valve repair.
Before undergoing any of the following procedures, you should talk with your doctor about taking antibiotics to protect your valve.

**Dental procedures requiring antibiotics:**
- Extractions, periodontal procedures
- Implants, root canal, sub-gingival antibiotic fibers/strips
- Initial orthodontic bands (not brackets), intraligamentary local anesthetic
- Cleaning of teeth/implants, if bleeding is anticipated

**Medical procedures requiring antibiotics:**
- Tonsillectomy/adenoidectomy, surgery on respiratory mucosa, rigid bronchoscopy
- Sclerotherapy of esophageal varices, dilation of esophageal stricture, ERCP (endoscopic retrograde cholangiography) with biliary obstruction, biliary tract surgery, surgery on/through intestinal mucosa, prostate surgery, cystoscopy, urethral dilatation

**Surgical Ablation (Maze)**
Surgical Ablation (Maze) is a surgical intervention to treat atrial fibrillation (A-fib) by interrupting the circular electrical patterns that are responsible for an arrhythmia. Strategic placement of incisions in both atria stops the conduction of errant electrical impulses. Scar tissue generated by the incision permanently blocks the travel routes of the electrical impulses that cause A-fib. Since the success of the procedure relies on the formation of scar tissue, the procedure may not be effective for several weeks.

**Myxoma**
Myxoma is a benign tumor in the heart. More than 80 percent of myxomas are in the left atrium, usually beginning in the wall that divides the lower chambers of the heart (ventricles) and growing into the atrium. Treatment is necessary to avoid metastasis and the formation of clots. In addition, untreated growth of the tumor can obstruct blood flow through the heart.

**Convergent Hybrid Ablation**
This is a surgical procedure to correct atrial fibrillation by interrupting the circular electrical patterns that cause A-fib. Incisions in both atria stop the conduction of erratic impulses. Scar tissue generated by the incision permanently blocks the travel routes of the electrical impulses. The success of the procedure relies on formation of scar tissue, therefore it may not be effective for several weeks.

The convergent hybrid ablation procedure for atrial fibrillation is performed in two parts. The epicardial ablation is performed by a surgeon and the endocardial ablation by an electrophysiologist, a cardiologist who specializes in electrophysiology (EP).

During the procedure, a small incision will be made right below the end of your sternum (chest bone). From this small incision the surgeon will insert a catheter (small tube) into the pericardium (sac around the heart), and then using an ablation catheter and a camera to see the outside of the heart, radiofrequency energy will then be used to create lesions on the outside of the heart that will interrupt the circular electrical patterns that cause atrial fibrillation. You will not have to be on a heart-lung bypass machine because the ablation procedure is performed while the heart is beating.

Since most of the lesions are created during the epicardial portion of the procedure, the overall procedure time is reduced. This also reduces the time and fluoroscopy (radiation) exposure for the EP endocardial catheter ablation.

After the surgeon completes his or her part of the convergent procedure, the electrophysiologist makes an electrical map of the heart to search for any remaining gaps in the lesions that were created. When the gaps are located, the EP doctor uses a special ablation catheter placed up into the heart through a large vein in the leg to connect them. They are able to create additional lesions on the inside of the heart in locations that the surgeon is unable to reach without stopping the heart and cutting into the chest. These additional lesions further increase the ability to eliminate atrial fibrillation and prevent it from recurring.

**Transmyocardial Revascularization (TMR)**
Transmyocardial revascularization is a surgical procedure that involves using a heart laser system to create very small (1mm diameter) channels through the left side of the heart muscle. The purpose of the procedure is to help decrease chest pain symptoms (angina). The exact mechanism of chest pain relief with TMR is not clearly understood, but it may stimulate the heart to grow smaller blood vessels in the areas treated with
the laser channels. TMR may also be performed in combination with CABG surgery to improve blood flow to the heart muscles.

**Septal Defects**

The atria are the upper chambers of the heart. An atrial septal defect (ASD) occurs when the wall between these two chambers has an opening in it allowing blood to flow between chambers (see atrial septal defects diagram below). An ASD is often a condition that developed before birth.

The ventricles are the lower chambers of the heart. A ventricle septal defect (VSD) occurs when the wall between these two chambers has an opening in it. Over time, the opening in the wall may become bigger. These defects in the heart frequently make patients feel low in energy, sluggish and short of breath. Your surgeon can repair this defect using a patch and/or sutures.

**Surgical Ventricular Restoration (SVR)**

The normal and most efficient shape of the heart is elliptical (the shape of a football). An elliptically shaped heart is the most efficient at pumping blood to the body organs. When a patient suffers a heart attack, some portions of the heart muscle may be permanently damaged.

A permanently damaged heart muscle can form scar tissue that can cause the heart to dilate (stretch out). If the heart dilates and becomes more rounded, it also becomes less effective at pumping blood to the body, which can lead to congestive heart failure. Symptoms of congestive heart failure include fatigue, weakness, shortness of breath, swelling or fluid retention, coughing, loss of appetite and insomnia (inability to sleep).

Surgical ventricular restoration or reconstruction (SVR) is a surgical procedure that structurally helps to reshape the heart. It may also be known as the Dor procedure or left ventricular aneurysmectomy. During this surgery, the cardiac surgeon reconstructs the dilated, rounded heart into a more elliptical shape. This structural change allows the heart to pump more effectively, reducing symptoms of heart failure. In most cases, patients experience a significant improvement of symptoms and activity tolerance. The ability to perform this procedure is restricted to the location and extent of the scar tissue, as well as how well the remainder of the heart is pumping. This procedure may be performed with other cardiac surgeries, such as coronary artery bypass graft surgery (CABG) and/or valve surgery.
Aneurysm

Repair of Aortic Aneurysm /Dissection
The aorta is anatomically divided into the root, ascending, arch, descending and abdominal aorta. The thoracoabdominal aorta includes both the thoracic and abdominal aorta. An aneurysm or dissection can occur anywhere in the aorta. Your surgeon repairs an aortic aneurysm by replacing the diseased section with a synthetic graft. When the dissection or aneurysm involves the aortic valve, the aneurysm will be replaced and the valve will be either repaired or replaced. Both surgical procedures require stopping the flow of blood through the aorta while the graft and/or valve are sewn into place. This requires the use of a cardiopulmonary bypass pump (heart-lung machine). Aneurysms of the descending aorta and/or thoracoabdominal aorta are repaired from the left side of the chest and abdomen as opposed the sternum.

Endovascular Repair
Endovascular repair is a less invasive procedure for the treatment of aortic disease. It involves excluding (sealing off) the aneurysm by placing an endovascular graft inside the diseased aorta, relining and making a new path for blood flow. The endovascular graft consists of a metal stent surrounded by a fabric graft that expands and seals tightly against the wall of the aorta. The graft remains permanently in the aorta. Not all aneurysms are candidates for endovascular repair. Your surgeon will discuss the best options for your aneurysm repair.
Hybrid/Debranching Procedure

When the aneurysm involves major branches a hybrid or combined open and endovascular approach can be performed. First the major branches are ligated and re-routed to an area before or beyond the aneurysm. Then a stent graft is inserted to seal off the aneurysm. This technique can minimize the amount of time the brain will be without blood flow. In most cases this can be done without using the heart-lung machine.

Branched Grafts and Future Technologies

In the near future endovascular grafts manufactured with stents for major arterial branches will be available, allowing more complex aneurysm/dissections to be treated endovascularly.

Blood Transfusion Information and Blood Conservation

More than four million Americans receive safe blood transfusions each year. Blood transfusions may be needed to correct a medical condition or to replace blood lost during surgery. Some cardiac surgery patients may require a blood transfusion. Your health care team will explain the details regarding your transfusion, and will determine the amount and type of blood products you require based on your individual needs.

How safe is the blood supply?

There are many safeguards for our national blood supply. First, blood is donated by volunteer donors who have been screened regarding their health and potential risk factors. Only those passing this screening process may donate blood. Next, blood from each donor undergoes extensive testing, including the blood type and screening tests for hepatitis B, hepatitis C, HIV (AIDS virus), HTLV virus and syphilis. Finally, the donor’s blood is tested against blood from the patient for compatibility (called a crossmatch).

When a blood transfusion is indicated during a surgical procedure or medical treatment, the risk of not receiving blood may far outweigh the risks of transfusion.

What are the risks of receiving blood?
The risks of blood transfusion are usually minimal. Symptoms are mild and, in most cases, can be easily controlled. These include fever, chills, hives and the development of antibodies. More serious risks, which are extremely rare, may include acute hemolytic reaction, transfusion-related acute lung injury and transfusion-related infection.

Infectious complications can occur, but are extremely rare. The potential risk of contracting AIDS from a blood transfusion has received a great deal of attention in recent years. It is important to know that for more than 12 years, all blood donated in the United States has been tested for the AIDS virus, reducing the risk to a negligible level. The risks of transfusion are far less than the risks associated with driving, pregnancy, smoking, some medications and travel.

Any concerns regarding blood transfusion, including refusal, need to be discussed with your surgeon.

Ways to minimize blood loss during surgery

a. Autologous (donating your own blood) blood donation (taken about five business days prior to surgery for a fee)

b. Cell Saver—recycling your own blood

c. Pharmacological agents to help with blood clotting

d. Maintaining normal body temperature

e. Tolerating a lower blood count—your blood count is expected to decrease from normal as a result of cardiac surgery. In the majority of cases, the lower blood count does not have an adverse affect on your recovery. In the past, the lower blood count would likely result in a blood transfusion. As part of our blood conservation strategy, we allow a much lower blood count to occur before a blood transfusion is warranted.
OVERVIEW OF YOUR HOSPITAL STAY AFTER SURGERY

Cardiovascular Intensive Care Unit (CVICU)

Immediately after your surgery, you will be taken to CVICU. Patients stay a minimum overnight on 2NW/2NE. Some patients may begin transferring to the step down unit the following morning. Patients who require additional time in the intensive care environment will remain until transfer to the appropriate stepdown unit.

A nurse from the CVICU will conduct informational sessions for family members at various times throughout the day. The nurse will review patient care routines and family members will have an opportunity to ask questions.

Patient Care

Patient care is provided by a team of nurses, physician assistants, nurse practitioners and respiratory therapists, all under the direction of a critical care physician (intensivist). A collaborative approach to patient care is provided by a team consisting of nurses, nurse practitioners, physicians assistants, respiratory therapists, critical care physicians (intensivist), and your surgeon.

Your vital signs will be monitored as you wake up from anesthesia. You will have a breathing tube in place, which means you will be unable to speak. As the anesthesia wears off, you will be able to breathe on your own, the tube will be removed and you will be able to speak. The surgical drains, temporary pacing wires and urinary catheter put in during the surgery will be removed in about two days. Using a pain scale, you will be asked to describe any pain you may be experiencing. Initially, your pain medication will be administered through a pump (Patient Controlled Analgesia, or PCA) that will allow you to control the timing of administration.

You will have a dry mouth from the anesthesia and may feel thirsty. You will be given small amounts of ice chips and a popsicle later on the day of surgery. This will be followed by clear liquids when bowel sounds return, usually by the next morning.

Later, on the evening of surgery, your nurse may help you sit at the side of the bed for a few minutes. Your nurse also will show you how to use your Incentive Spirometer, a simple device to help you breathe better. You will be taking up to 10 breaths every hour while awake to prevent respiratory complications. Once you are stable your nurse will assist you in getting out of bed the next morning. Shortly after that, if appropriate, you will transfer via wheelchair to the stepdown unit.

Visiting Information

Visitors are welcome. Please follow these guidelines:

♥ There is a phone outside every ICU, which will allow you to speak to the unit clerk to determine if it is all right to visit your family member. Please use the phone each time you visit to ensure privacy for all patients.

♥ Family and close friends are permitted to visit, two at a time, between 9 a.m. and 9 p.m. Intervals can be agreed upon with the nurse taking care of your family member. Please keep your visits short so patients can rest and the staff is able to concentrate on caring for your loved one.

♥ Please remember to take care of yourself by taking breaks to get something to eat and drink.

♥ After patients arrive on the unit from the operating room, they need to be evaluated by the CVICU team. The unit is usually busy with admissions and discharges throughout the day. To ensure the privacy of all patients, you may be asked to step out of the unit during admissions, or wait a short time before you can visit.

♥ Please elect one family spokesperson to keep in contact with the nursing staff. When requesting information by phone, a “code word” should be chosen by the spokesperson and shared with the nursing staff to ensure patient privacy. The family spokesperson can call the unit for condition updates at any time of the day or night. The spokesperson may then share this information with the rest of the family.

A friendly reminder: While in any patient care area, please turn off your cell phone. Photographs using cell phones/cameras are not permitted in the CVICU to protect patient privacy.

Cardiac Surgery Step-down Unit

When you are well enough to leave the intensive care area, you will be moved to the step-down unit. You will be cared for by a team of nurses, nurse practitioner, cardiac surgeon, respiratory therapist, patient care technicians, physical therapist, occupational therapist, care manager, diabetic educator and dietitian. A cardiac surgeon and nurse practitioner will have early morning ‘rounds’ on all patients. They will discuss your progress,
review your plan of care and discharge plan. The nurse practitioner managing your care for the day will return to assess your progress, review medications and diagnostic testing and formulate a plan of care.

The discharge planning process begins once you have transferred to the step-down unit. The nurse practitioner will speak to you and your family about your needs at discharge and when you are ready for discharge. Most patients stay in the hospital for three to five days after their surgery.

♥ Your heart rate and rhythm will be monitored on a portable telemetry unit.

♥ Your activity level will increase.

♥ An exercise physiologist will be consulted based on your activity level. I.e., walking, stair climbing, chair exercises.

♥ Surgical drainage tubes, temporary pacing wires, the urinary catheter and IV are removed a day or two after surgery.

♥ You will be helped to sit in a chair for all meals and take a short walk as soon as possible, even with drainage tubes in place.

♥ You will continue to receive pain medication so you can participate in your plan of care.

♥ Based on your tolerance, you will transition from a clear liquid diet to a heart healthy diet, one that is low in fat and sodium. You may initially have a limited appetite—this is normal. Your diet in the step-down unit will consist of a diet low in sugar, fat and sodium.

♥ If you would like individual nutrition counseling, a dietitian is available upon request.

HEALING FROM YOUR STERNAL INCISION

If you have a sternal incision, permanent wires hold your sternum together, which take about six weeks to heal. During the six weeks following your surgery, you should be cautious when using your arms.

Please observe the following sternal precautions during the healing process:

♥ To move from a lying position to sitting position, first roll over onto your side, and then use your elbows to push up.

♥ Avoid pulling on bed rails to position yourself in bed. Use your leg muscles to push up in bed.

♥ To stand, use your leg muscles to push yourself up; use your arms only to guide you for balance.

♥ If you use a walker, bear weight mostly on your legs, not your arms.

♥ Limit arm movement to shoulder height (90-degree angle from body). Your elbows should go no higher than your shoulders.

♥ Avoid lifting, pushing or pulling more than five to 10 pounds with your arms. (For example, no lifting heavy suitcases, boxes or heavy grocery bags, and no pushing a lawnmower or vacuum.)

♥ Avoid pulling on stair rails with your arms when going up and down stairs; use your leg muscles.

♥ Do not reach behind your back except as needed for personal hygiene.

♥ No driving until it is approved by your doctor (typically three weeks after discharge).

♥ Avoid using the arm levers on stationary cycles or rowing exercise machines unless cleared by your doctor.

THE DAYS FOLLOWING YOUR SURGERY

The day after surgery, your nurse will help you into a chair before breakfast and assist you with your bath and hygiene needs. We encourage you to eat your breakfast.

You will be weighed every morning.

♥ Ask for assistance to get out of bed the first few days. You may be unsteady and weaker than you realize. Your safety is a priority.

♥ Use the Incentive Spirometer, a device to improve your lung function.

♥ Deep breathing and physical exercises help prevent respiratory complications.

♥ You will be given a red heart pillow. Holding this pillow firmly over your chest incisions will help protect (splint) the area and decrease pain.

♥ Your vital signs (blood pressure, HR, rhythm, O2 level) will be routinely checked.
The amount of fluids you can consume may be restricted, due to the large amount of intravenous fluids received during and immediately after your surgery.

Your blood sugars will be monitored closely. If you have elevated blood sugars, you will likely be on an insulin drip for a few days.

Your urine output will be measured during the first few days. A container for your urine will be provided so your nurse can measure it.

A small blood sample will be taken so the doctor can check certain blood levels, including blood sugar (glucose).

You will be allowed to shower once the drainage tubes are removed.

You will be shown how to check your incisions for any signs of infection. Check the incisions every day here and at home for increased redness, swelling, tenderness, pus-like drainage or clicking. Notify your doctor if any of these symptoms are present.

Remember not to use any lotions, oils, ointments or powders on your incisions.

Constipation can sometimes be a problem after surgery. Let your nurse know if you feel constipated so you can be given medication to alleviate this problem.

You will go to the Radiology Department for a chest X-ray once your wires and chest tubes are removed.

A member of Mended Hearts, a support group of former heart surgery patients, may visit you after surgery. You may find it helpful to talk with someone who previously had cardiac surgery.

Please let us know who will help care for you after you are discharged. If you and/or your nurse determine you will need some assistance at home, a nurse will schedule a meeting with a social worker or case manager. They are available to help with a variety of services, such as crisis counseling and community resources, that are available for care after discharge.

Your activity level will increase each day until you are ready to leave the hospital.

**WHAT YOU SHOULD KNOW ABOUT GOING HOME**

Most patients say in the hospital three to five days after their surgery.

It takes about six weeks to recover. It is expected that you will initially feel tired and weak, and because you can’t use your arms to help you get out of bed or the car, your mobility may be affected. You should not drive a car until you see your surgeon about three weeks after discharge.

There are three typical discharge plans:

- Home with family or friends.
- Home with services, such as a nurse visit or two, physical and/or occupational therapy.
- Inpatient rehabilitation, either one to two hours a day (sub-acute rehabilitation) or three or more hours a day (acute rehabilitation).

The discharge planning begins once you have transferred to the step-down unit. The nurse practitioner will speak to you and your family about your needs at discharge. Each day the nurse practitioner will review your progress with the surgeon and let you know when they anticipate you will be ready for discharge.

We recommend that as you prepare for your surgery, you think about what arrangements you may need to make in order to return home. We suggest you consider:

- Staying with a family member or having someone stay with you the first week you are home.
- Making arrangements for someone to help with picking up your groceries and getting your prescriptions filled.
Making arrangements for transportation to your follow-up appointment with the surgeon and cardiologist.

Deciding whether you may need to go to a rehabilitation facility prior to returning home. If you think you will need to go to an inpatient rehabilitation facility, come prepared. Look online, talk to family, friends and your physician and come with a short list of places that interest you.

PAIN CONTROL AFTER SURGERY

Pain is your body’s normal response to any discomfort or procedure. With today’s pain treatments, patients can work with their nurses and doctors before and after any procedure to relieve your pain.

Pain control can help you:

Enjoy greater comfort while you heal.

Get well faster. With less pain, you can start walking, do your breathing exercises and get your strength back more quickly. You may even leave the hospital sooner.

Improve your results. People whose pain is controlled seem to do better after procedures or surgery. They may avoid some problems that affect others, such as pneumonia and blood clots.

Both drug and non-drug treatments can be successful in helping to prevent and control pain. Many people combine two or more methods to get greater relief. Don’t worry about getting “hooked” on pain medicines. Studies show that this is rare—unless you already have a problem with drug abuse.

Today, there are two ways to schedule pain medicines to give better results:

Instead of waiting until you feel the pain, request medicine at set times during the day to keep the pain under control.

Patient-controlled analgesia (PCA) is used immediately after surgery. With PCA, you control when you get pain medicine. When you begin to feel pain, you press a button to inject the medicine through the intravenous (IV) tube which is inserted in your vein.

For both methods, your medical team will ask you how well the pain medicine is working and adjust the medicine, dosage and/or timing if you are still in pain.

You will be asked to help the doctors and nurses “measure” your pain by rating your pain on a scale of zero to 10. Reporting your pain as a number helps the doctors and nurses know how well your treatment is working and whether to make any changes. They may ask you to use a “pain scale” like this one:

Be sure to tell the doctor or nurse about any pain that will not go away. Don’t worry about being a “bother.” Pain can be a sign of problems with your procedure and nurses and doctors want and need to know about your pain.

Stick with your pain-control plan if it is working. If it is not working, talk to your doctors and nurses about changing the plan until your pain is under control. Sometimes it is best to combine two or more pain treatments or change treatments slightly to meet your individual needs. Your doctors and nurses will discuss this with you.

Non-Drug Methods for Controlling Pain

Relaxation, deep breathing exercises, listening to music, massage and guided imagery can be beneficial in managing pain and discomfort. These methods may be used along with pain medication to enhance pain control.

You may try slow rhythmic breathing for relaxation:

1. Breathe in slowly and deeply.

2. As you breathe out slowly, feel yourself beginning to relax; feel the tension leaving your body.

3. Now breathe in and out slowly and regularly, at whatever rate is comfortable for you. You may wish to try abdominal breathing. If you do not know how to do abdominal breathing, ask your nurse for help.

4. To help you focus on your breathing, breathe slowly and rhythmically. Breathe in as you say silently to yourself, “in, two, three.” Breathe out as you silently say to yourself, “out, two, three.” Or each time you breathe...
out, silently say to yourself a word such as “peace” or “relax.”

You may imagine that you are doing this in a place that is very calming and relaxing, such as lying in the sun at the beach.

♥ Do steps 1 through 4 only once or repeat steps 3 and 4 for up to 20 minutes.
♥ End with a slow, deep breath. As you breathe out, say to yourself, “I feel alert and relaxed.”

**Additional points:** If you intend to do this for more than a few seconds, try to get in a comfortable position in a quiet place. You may close your eyes or focus on an object. This breathing exercise may be used for only a few seconds or for up to 20 minutes.

### EMOTIONAL RESPONSE TO SURGERY

As you begin your recovery process, you may find that you are experiencing physical changes and a variety of emotional responses as well.

Rapid mood changes are not uncommon. Increased anxiety, restlessness, changes in sleep and eating patterns may also occur. Some people are more prone to depression. This is characterized by feelings of sadness, powerlessness, inadequacy or irritability. Making lifestyle adjustments after surgery can cause you to experience feelings of frustration, anger and apathy at times. Many of these emotions are a normal part of adapting to the changes brought on by surgery. The symptoms usually subside over time.

The support of family and friends can make a dramatic difference in your recovery. Acknowledging feelings and talking about the effects of surgery can help patients reduce their stress and progress toward a new, healthier lifestyle.

If you notice a pattern of symptoms that remain consistent over time and interfere with your ability to manage your normal routine, further medical or psychosocial evaluation may be necessary. In such instances, it is advised that you contact your primary care doctor for advice. Counseling and support groups may also be appropriate. Your social worker/case manager at the hospital may also be a valuable resource for referring you to additional mental health resources in the community.

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### WHAT CAN PROLONG MY HOSPITAL STAY?

Many things can occur as you recover from cardiac surgery that could prolong your stay. These include:

- Pericardial effusion
- Atrial fibrillation
- Pleural effusion

**Pericardial Effusion After Heart Surgery**

Pericardial effusion is an increased amount of fluid in the sac that surrounds the heart. This sac is called the pericardial sac. It is common to have some fluid in the pericardial sac after heart surgery. However, if the amount of fluid is large enough, it may decrease your heart’s ability to pump blood.

**Symptoms**

If a large amount of fluid gathers in the pericardial sac, a patient may experience symptoms including shortness of breath, low blood pressure, chest or back pain/pressure and fast heart rates.

**Diagnosis and Management**

An ultrasound or echo examination of your heart will be performed to determine if you have pericardial effusion.

If fluid is present and appears to be interfering with the pumping function of your heart, your doctor may decide to drain the fluid. Or your doctor may watch the fluid closely instead of draining it. Your body will absorb the fluid with time.

**Atrial Fibrillation**

After heart surgery, about one in four patients experience an abnormal heart rhythm called atrial fibrillation. This may allow blood clots to develop in the heart. These blood clots can travel to the lungs and cause breathing problems or travel to the brain and cause a stroke. This causes an irregular heart rhythm, which can make your heart rate too fast. This irregular rhythm and/or fast heart rate can cause you to feel tired or lightheaded.

**Treatment of Atrial Fibrillation**

It is important to treat this condition. Your nurse may check your blood pressure and heart rate more frequently during this time. You may need to limit your activity while we are treating the atrial fibrillation.
Occasionally, it is impossible to restore a normal heart rhythm. If this happens, it may be necessary to administer a blood thinner that decreases blood clots.

**Pleural Effusion**

A pleural effusion is an increased amount of fluid found in-between the lung and the chest wall. This increased fluid can interfere with the expansion of the lung during normal breathing.

It is not uncommon to develop pleural effusion after cardiac bypass surgery. There are multiple causes for pleural effusion, but most frequently it is related to the operation itself. In most situations, this increased fluid will resolve without any treatment.

**Symptoms**

A pleural effusion may cause you to have shortness of breath, fever, chest pain or a dry cough.

**Diagnosis and Management**

Diagnostic tests ordered to determine if you have a pleural effusion may be a chest X-ray or an ultrasound. Treatment may include oxygen therapy, oxygen saturation checks (done on a machine attached to your finger) or diuretics (fluid pills). A physician may decide to drain the increased amount of fluid. This procedure is typically not painful. You will be given a local anesthetic. A needle will then be inserted through the chest wall to drain the fluid. Most patients breathe easier after the procedure. This procedure is typically not painful. You will be given a local anesthetic. A needle will then be inserted through the chest wall to drain the fluid. Most patients breathe easier after the procedure. You can improve your breathing function by using your incentive spirometer (breathing exerciser) a minimum of 10 times an hour while awake, getting out of bed and sitting in your chair during the day (you may return to bed for rest periods), and walking. It is acceptable to ask for pain medication to accomplish these tasks.

**PHYSICAL ACTIVITIES WHILE IN THE HOSPITAL**

Physical activity is important to your recovery and will help you return to your home sooner. The following are levels of activity that will be advanced based on your progress:

**Immediately After Surgery (Level 1)**

**Deep Breathing:**
Every hour while awake, you will be asked to cough and breathe deeply. This will be accomplished by using a tool called the Incentive Spirometer. This self-use tool promotes healthy lungs, and should be used 10 times during each hour.

**Exercises:**

**Shoulder Circle:**
Slowly raise and move shoulders forward, then down and backward, making a circle; 10 times.

**Ankle pumps:**
Move both feet up and down at ankles; 5 to 10 times.

**LEVEL 1 SELF-CARE ACTIVITIES:**

► Bed rest
► Bathe with assistance while sitting in bed

**First or Second Day after Surgery (Level 2)**

If you had a pre-existing condition that limited your mobility recently (recent hip/knee/back surgery, stroke, Parkinson’s disease), you may benefit from physical and occupational therapy while in the hospital. Your doctor or nurse practitioner will request a consult. Services usually begin within 24 hours. If you used an assistive device (cane/walker) prior to surgery, have your family label it and bring it to the hospital for you to use.

**Deep Breathing:**
Every hour while awake, continue to use the Incentive Spirometer (breathing tool).

**Exercises:** 2 to 4 times per day.

**Shoulder Circle:**
Same as in Level 1.
Knee Kicks:
While seated with knees bent, lift one foot, pointing toes toward the ceiling until the knee is straight; 10 times. Repeat with the other leg.

Knee Lifts or “Marching”:
While seated, elevate knee toward chest (without strain), keep ankle bent up; 5 to 10 times. Repeat with other leg.

Forward Arm Lifts:
Sitting, swing one arm forward while raising it toward the ceiling. Repeat with other arm; 10 times. Lift only to shoulder height if you had heart surgery.

Elbow Flex:
While sitting with arms raised forward to shoulder level, bend elbows and touch shoulders with your fingers, then straighten elbows to starting position; 5 to 10 times.

Walking:
You may walk to the bathroom with assistance, and walk 60 to 180 feet in the hallway with assistance. The hallways are equipped with markers in the shape of hearts. The distance between hearts is 60 feet.

LEVEL 2 SELF-CARE ACTIVITIES
▶ Sit in the chair 2 to 3 times a day for 30 to 60 minutes.
▶ Stand with assistance.
▶ Shower with assistance.

Third Day after Surgery (Level 3)
Deep Breathing
Every hour while awake, use the incentive spirometer (breathing tool).
Exercises: 2 to 4 times a day.

Shoulder Circle:
As shown in Level 1. Repeat 10 times.

Forward Arm Lifts:
As shown in Level 1. Repeat 10 times.

Elbow Flex:
As shown in Level 2. Repeat 10 times.

Walking:
Walk in the hallway at least three times a day. Your minimum goal should be the length of the hallway. Start with 180 feet with assistance (3 hearts). On your second and third walks, go 180 to 720 ft. (3 to 12 hearts). If you feel steady on your feet, you may walk without assistance. The distance between hearts is 60 feet.
LEAVING THE HOSPITAL AFTER CARDIAC SURGERY

Congratulations! Today is the day you leave the hospital. Your doctor has discharged you. The following information will help prepare you for discharge and what to expect once you leave. Please keep in mind that it may take six to 12 weeks for you to fully recover.

The day you are discharged will start out much like your other mornings. We will ask that you shower and have breakfast before going to discharge class. Please call your family/friends to let them know you are being discharged, so they can plan their arrival time.

Upon discharge, you will receive your prescriptions and a packet of instructions.

It is common after surgery to:

♥ Not have much appetite. It takes several weeks for your appetite to return. Many patients notice that their sense of taste is diminished or almost absent. It will return. Some patients even complain of nausea at the smell of food for a week or two after surgery.

♥ Have some swelling, especially if you have an incision in your leg. That leg will tend to swell more for some time. Elevating your legs will help.

♥ Have difficulty sleeping at night. You may find it difficult to fall asleep, or you may find that you wake up at 2 or 3 a.m. and cannot fall back to sleep. This will improve with time. Taking a pain pill before bed sometimes helps.

♥ Have problems with constipation. You may use a laxative of your choice. Add more fruits, fiber and juice in your diet.

♥ Have mood swings and feel depressed. You may have good days and bad days. Do not become discouraged. This will get better.

♥ Have a lump at the top of your incision. This will disappear with time.

♥ Experience some numbness and/or tingling in your fingers, elbows or arms. This usually resolves in two to four weeks (possibly months).

♥ Notice an occasional “clicking noise” in your chest in the first days after surgery. This should occur less often with time and go away completely within the first couple of weeks. If it gets worse, or does not resolve, call your surgeon.

♥ Experience muscle pain or tightness in your shoulders and upper back between your shoulder blades. This will get better with time. Your pain medicine will also help relieve this discomfort.

♥ Experience numbness beside your incision if an artery in your chest, called the mammary artery, was used during your surgery. This is normal.

Remember, it can take at least six to 12 weeks to feel recovered.

When Your Cardiac Surgeon Has Released You

Your cardiac surgeon will release you from his or her care generally three weeks after your hospital discharge. It is important for you to visit your cardiologist or primary care physician within four weeks of your hospital discharge.

You also need to establish, or re-establish, a heart healthy lifestyle including a low-fat/low cholesterol diet and a regular exercise program, and control other risk
factors, such as diabetes, high blood pressure or smoking. Ask your doctor about joining a cardiac rehabilitation program and, if you smoke, a stop-smoking program. If you are a woman who is menopausal, discuss estrogen-replacement therapy with your doctor.

Walking Guidelines for Your Recovery
♥ Resume walking the day after you are discharged, or as directed by your surgeon.
♥ Wait one hour after eating before walking.
♥ Set goals for walking. You should begin walking five to 10 minutes twice a day. Increase the time and speed slowly. After about two weeks, you should be walking 20 minutes twice a day. By six weeks you should have reached your goal of walking 60 minutes a day. Do not be discouraged! It may take six weeks or longer to reach your walking goals.
♥ You should be able to walk and talk comfortably at the same time (not breathless).
♥ At your follow-up visit with your surgeon, let your surgeon know how far you are walking and how you are doing.

Warning Signs
These warning signs indicate that you need to stop your exercise program and call your doctor:
♥ Pain, tightness or discomfort in the chest, jaw, arms, neck or back.
♥ Unusual shortness of breath or irregular heart beat.
♥ Lightheadedness, dizziness, confusion.
♥ Excessive fatigue after exercising

Daily Activities During Your Recovery Period
Stop any activity immediately if you feel short of breath, notice irregular heart beat, feel faint or dizzy, or have chest pain. Rest until the symptoms subside. If they do not subside within 20 minutes, notify your doctor.

Showers:
You should shower daily. Avoid soaking in baths until your incisions are healed. Remember: no creams, lotions, powders, ointments or moisturizing soaps.

Dress:
Wear comfortable, loose-fitting clothes that do not put undue pressure on your incisions. Women with a sternal incision should wear a bra to minimize strain on the incision line.

Rest:
You need a balance of rest and exercise for your recovery. Plan to rest between activities and to take short naps as necessary.

Walking:
This is one of the best forms of exercise because it increases circulation throughout the body and to the heart muscle. It is important to increase your activity gradually. Walk at your own pace. Stop and rest if you get tired. Each person progresses at a different rate after cardiac surgery. It is important to pace your activities throughout the day. Do not try to do too many things at one time. In poor weather, or when temperatures are lower than 40˚ or above 80˚, you should walk at indoor shopping malls.

Stairs:
Take stairs at a slow pace. Stop and rest if you tire. When using the handrail, do not pull yourself up with your arms. Use your legs.

Sex:
You can resume sexual relations when you feel comfortable. For many people this is about two to four weeks after discharge. If you have had a sternal incision, you should be in a passive position.

Driving:
You can ride as a passenger in a car at any time. If you had a sternal incision, avoid driving, outdoor bicycling or motorcycle riding until cleared by your surgeon, typically three to six weeks after surgery. This time period is recommended to allow your sternum to heal. Also, your movements might be limited and slow before the six weeks are up. When traveling, be sure to get out of the car every two hours and walk around for a few minutes.

Lifting:
You should not put too much strain on your sternum while it is healing. Avoid lifting, pushing or pulling anything heavier than 10 pounds for six weeks after surgery. This includes carrying children, groceries, suitcases, mowing the grass, vacuuming and moving furniture.

Work:
Check with your surgeon before returning to work, but most patients will begin to feel like returning to work four to six weeks after surgery.
When to Resume Usual Activities

Weeks One through Six*

Light housekeeping:
- ♠ Dusting
- ♠ Setting the table

Light Gardening:
- ♠ Potting plants
  - ♠ Trimming flowers

Light Activities:
- ♠ Needlework
- ♠ Reading
- ♠ Cooking meals
- ♠ Climbing stairs
- ♠ Small mechanical jobs
- ♠ Shopping
- ♠ Restaurants
- ♠ Washing dishes
- ♠ Folding clothes

After Six Weeks

Continue activities of weeks one through six (but you may be able to tolerate more).

Return to work part-time if your job does not require lifting, and your surgeon approves.

Heavy housework:
- ♠ Vacuuming
- ♠ Sweeping
- ♠ Laundry
- ♠ Ironing

Heavy gardening:
- ♠ Mowing lawn
- ♠ Raking leaves

Heavy Activities:
- ♠ Travel
- ♠ Fishing
- ♠ Light aerobics (no weights)
- ♠ Walking dog on leash
- ♠ Driving a car or small truck (earlier if cleared by your surgeon)
- ♠ Treadmill
- ♠ Stationary bike
- ♠ Boating

After Three Months**

Continue activities of weeks one through 12 (but you may be able to tolerate more).

Heavy housework:
- ♠ Scrubbing floors

Heavy gardening:
- ♠ Shoveling snow
- ♠ Digging

Heavy Activities:
- ♠ Football/Soccer
- ♠ Softball/Baseball
- ♠ Tennis
- ♠ Bowling
- ♠ Hunting
- ♠ Jogging
- ♠ Bicycling
- ♠ Golfing
- ♠ Weight-lifting
- ♠ Motorcycle riding
- ♠ Push-ups
- ♠ Swimming
- ♠ Water skiing
- ♠ Skydiving

* If you have a sternal incision, all of these activities should not involve lifting anything heavier than 10 pounds until six weeks after surgery.

** Discuss your activities with your physician, especially if you are on blood thinners.
INTRODUCTION

Commit to changing your lifestyle for a healthier heart. Cardiac rehabilitation is an important tool in the prevention and recovery from heart disease. Formal sessions in education, exercise, nutrition and support can help you keep this commitment. Programs will differ slightly from facility to facility, but all have the same goal of improving your cardiovascular health.

♥ **Who can attend:** Anyone who has a qualifying diagnosis, as defined by his or her insurance carrier. Typically, this includes those who have had a heart attack in the past 12 months, stable angina pectoris (chest discomfort coming from the heart), heart bypass or valve surgery, coronary angioplasty and/or stenting or heart transplant surgery. Additional diagnoses/conditions may be covered based on your individual insurance plan. To participate in a program, you must be referred by your doctor.

♥ **How long is the program?** Patients usually attend the program for one hour of exercise training three times per week. Patients usually participate in 36 visits.

♥ **Exercise training:** Exercise training may include walking on a track or treadmill, different types of stationary cycling, rowing, arm cycling and strength training exercises. Research has proven that exercise helps improve fitness, lower blood pressure, improve the cholesterol profile, reduce stress and manage type 2 diabetes.

♥ Your exercise training is a medically supervised exercise program. An individual exercise prescription will be developed for you at the start of the program, and will be progressed, as is safe and appropriate, during the time you are
in the program. While you are in the program, your exercise will be supervised by health care professionals who will monitor your heart rhythm, heart rate and blood pressure.

♥ **Education and Lifestyle Management.**

Educational information about various risk factors and lifestyle issues related to heart disease is available. This includes information about a healthy diet, cholesterol in the blood, smoking cessation, blood pressure management, diabetes management, increasing physical activity, heart medications, stress management, and other topics. Physicians, nurses, exercise physiologists, physical therapists, nutritionists, diabetes educators, pharmacists and psychologists may all be involved in your specific program.

There are four phases of cardiac rehabilitation.

**PHASE I**

Phase I begins while you are still in the hospital. This phase usually includes exercises, such as walking the halls and stair climbing. Additional education is provided by the hospital nurses and physical and occupational therapists. You should ask the hospital staff about risk factors, diet, medication instruction, sexual activity, exercise and normal life at home.

**PHASE II**

Phase II is two to six weeks after you leave the hospital. This phase requires a physician referral and involves special telemetry monitoring. Most programs meet for one hour, three or more times per week for 12 weeks. As stated before, the usual covered diagnoses include those who have had a heart attack in the past 12 months, stable angina pectoris (chest discomfort coming from the heart), heart bypass or valve surgery, coronary angioplasty and/or stenting or heart transplant surgery. Additional diagnoses/conditions may be covered based on your individual insurance plan. Check with your insurance for other conditions that may be covered.

Phase II aims to return you to a normally active life and put you, not your heart condition, in charge of your life. You may require an exercise stress test to clear you to participate and to establish guidelines for Phase II cardiac rehabilitation.

**The goals of Phase II are:**

♥ Improve your ability to function and increase endurance.

♥ Discuss healthy lifestyle changes.

♥ Discuss fears about increased activity or exercise.

♥ Increase your exercise knowledge and prepare you to exercise safely and effectively on your own.

Education is a major emphasis in the Phase II program and is accomplished through individual or group instruction.

Educational topics include:

♥ Meditations review.

♥ Lifestyle changes and goal setting.

♥ Nutrition counseling.

♥ Stress management.

♥ Safe performance of activities, including sexual activity and vocational and recreational pursuits.

♥ Smoking cessation.

♥ Other educational topics.

Your spouse or other family members are encouraged to attend the education sessions with you.

**PHASE III**

Phase III is a continuation of the Phase II program. As a general rule, Phase III programs include participants who were discharged from the hospital six to 14 weeks earlier. A physician may refer you directly into this program without Phase II participation.

**The goals of Phase III are:**

♥ Providing an ongoing exercise program.

♥ Offer support necessary to make lifestyle changes.

♥ Achieve the desired goal, such as independent lifestyle or return to work.

♥ Prevent progression of heart disease.

These types of programs usually offer monitoring of heart rhythm and blood pressure before, during and after exercise. You may be required to keep records of your exercise routines. You should generally exercise three or more times per week.
Phase IV is a wellness program for those who have completed any of the other phases. Phase IV is a means to continue making changes in your lifestyle. You exercise three or more times per week with minimal staff supervision.

Before you begin outpatient cardiac rehabilitation, or if that is not the best option for you, your medical team may advise other rehabilitation services in different settings.

**OUTPATIENT REHABILITATION**

Rehabilitation your physician prescribes may take place in an outpatient setting. Outpatient physical and occupational therapies are associated with most local hospitals or can take place in private practices.

**HOME CARE**

Rehabilitation and nursing services may be provided in your own home.

- You must require skilled services by a professional nurse or therapist and be housebound. This means that leaving your home takes considerable effort or you are not able to leave the home for an extended period of time.
- You and/or a caregiver must be able to manage your care at home.

**SUB-ACUTE REHABILITATION OR SKILLED NURSING**

Rehabilitation and nursing services may be provided in a nursing facility/center.

- Recommended when you have one or more active or complex medical or rehabilitation conditions which cannot be safely managed at home. Usually, rehab services are one to two hours daily, but can be up to three hours, and at least five days per week.

**ACUTE INPATIENT REHABILITATION**

- Rehabilitation and nursing services provided in a rehabilitation hospital.
- Recommended when you require moderate to maximum assistance of another person in order to perform self-care and mobility skills.

To qualify, you must be able to participate in rehabilitation services at least three hours daily and five to six times weekly (at least two rehab services, either physical therapy, occupational therapy and/or speech therapy).

**MEDSTAR CARDIAC REHABILITATION, PULMONARY REHABILITATION, AND WELLNESS PROGRAMS**

**Washington, D.C.**

MedStar Washington Hospital Center
Cardiac Rehabilitation and Wellness Programs (at Trinity University)
202-877-WELL (9355)

**Maryland**

**Baltimore**

MedStar Franklin Square Hospital Center
443-777-8430

MedStar Good Samaritan Hospital
443-444-3874

MedStar Union Memorial Hospital
410-554-2167

**Clinton**

MedStar Southern Maryland Hospital Center
301-877-7370

**Leonardtown**

MedStar St. Mary’s Hospital
240-434-7143

**Olney**

MedStar Montgomery Medical Center
301-774-8778

**LOCAL OUTPATIENT CARDIAC REHABILITATION FACILITIES**

**Maryland**

**Annapolis**

Anne Arundel Medical Center
443-481-1925

**Baltimore**

Life Bridge Health & Fitness
410-484-6800 ext. 208

St. Agnes Hospital
410-368-2246
Francis Scott Key Medical Center
410-550-0860

Bethesda
National Naval Medical Center
(for active and retired military)
301-295-1840

Suburban Hospital
301-896-2096

Chesterstown
University of Maryland Shore Medical Center
410-778-3300 ext. 2222

Columbia
Howard County General Hospital
443-718-3000

Frederick
Frederick Memorial Hospital
240-566-3300

Glen Burnie
Baltimore Washington Medical Center
410-553-2932

Hagerstown
Meritus Medical Center
301-790-8000

Lanham
Doctor’s Community Hospital
301-552-8692

LaPlata
University of Maryland Charles Regional Medical Center (Formerly Civista)
301-609-4391

Prince Frederick
Calvert County Memorial Hospital
410-414-2778

Rockville
Shady Grove Adventist Hospital
240-826-6662

Salisbury
Peninsula Regional Medical Center
410-543-7026

Takoma Park
Washington Adventist Hospital
301-891-6016

Towson
St. Joseph Hospital
410-337-1366

Delaware
Lewes
Beebe Medical Center
302-645-3514

Virginia
Alexandria
Inova Alexandria Hospital
703-504-3398

Inova Mount Vernon Hospital
703-664-8254

Arlington
Virginia Hospital Center
703-558-6271

Culpepper
Culpepper Memorial Hospital
540-829-4126

Falls Church
Inova Fairfax Hospital
703-776-3635

Fredericksburg
Mary Washington Hospital
540-741-1347

Leesburg
Inova Loudoun Hospital
703-858-6674

Manassas
Prince William Medical Center
703-369-8474

Warrenton
Fauquier Hospital
540-316-5000

Woodbridge
Sentara Northern Virginia Medical Center
703-523-1280

West Virginia
Wheeling
Wheeling Hospital
304-243-3750
SECTION 8

Common Cardiac Medications Prescribed

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The information provided here is meant to be a partial guide, and does not replace advice from your doctor or pharmacist.
ANTICOAGULANT MEDICATIONS

Anticoagulant medications help to reduce clots from forming in the blood. They are used to treat patients with blood clots, certain types of heart valves, certain irregular heart rhythms and other conditions when a doctor thinks it is indicated.

Coumadin® (Warfarin) requires frequent laboratory monitoring and dose titration. It is affected by diet, genetics and illnesses.

Novel oral anticoagulants are relatively new medications that do not require frequent monitoring and dose titration. It is not affected by diet.

Coumadin® (warfarin)

LOVENOX® (lenoxaparin sodium)

Novel Oral anticoagulants:
- Pradaxa® (Dabigatran)
- XARELTO® (Rivaroxaban)
- ELIQUIS® (Apixaban)
- SAVAYSA® (Edoxaban)

Side effects:
Bleeding

Call your doctor if:
♥ You cut yourself, and applying pressure does not stop the bleeding.
♥ You have a serious fall or hit your head.
♥ You notice more bleeding than usual when you brush your teeth.
♥ You have more bleeding than usual when you get your menstrual period, or you have unexpected bleeding from the vagina.
♥ Your urine or stool are bloody or your stools are black and tar-like.
♥ You notice unusual bruising.
♥ You vomit blood.
♥ You have a fever or illness that gets worse.
♥ You have dizziness, trouble breathing or chest pain.
♥ You develop nose bleeds.

Helpful hints:
Always take your Anticoagulants at the same time every day.

For Coumadin®:
♥ Your dose of Coumadin® is determined by a blood test called an INR, which is a standardized way of measuring INR. Your doctor will decide how often you need your blood drawn.
♥ Your dose may need to be adjusted, so always check with your doctor after you have your blood drawn.
♥ Diet and activity can affect your INR, so it is important to try to stick to a routine.
♥ Coumadin® can interact with other medications, so it is important to talk to your doctor before taking any new medications, including those bought over the counter. Herbal and homeopathic remedies may also affect Coumadin®, so talk to your doctor before taking them.
♥ It is important to tell anyone giving you medical or dental care that you are on Coumadin®.
♥ If you miss a dose of Coumadin®, do not take an extra dose to catch up; call your doctor.
♥ Limit alcohol consumption.
♥ Avoid any activity or sport that may result in a traumatic injury.
♥ Do not get pregnant while taking Coumadin®.
♥ Obtain a medical-alert bracelet that says you are taking an anticoagulant. You can order these at your local pharmacy or by calling Medic Alert at 1-800-432-5378, or contacting them at P.O. Box 1009, Turlock, CA 95380.

For Lovenox injections:
♥ Your doctor may require blood work.
♥ Read the information given from the pharmacy.
♥ Obtain a medical-alert bracelet that says you are taking an anticoagulant. You can order these at your local pharmacy or by calling Medic Alert at 1-800-432-5378, or contacting them at P.O. Box 1009, Turlock, CA 95380.
ANTIPLATELET MEDICATIONS
Antiplatelet medications help prevent the platelets, which are a component of your blood, from clumping together. Preventing this helps keep arteries open.

Effient® (prasugrel)
Persantine (Dipyridamole)
Plavix (clopidogrel)
Ticlid (Ticlipidine)
BRILINTA® (ticagrelor)

Common side effects:
Stomach irritation, rash and diarrhea

Call your doctor if:
♥ You develop a new rash.
♥ You have diarrhea that lasts for more than two days.
♥ You have any new bleeding.

Helpful hints:
♥ Take with meals to decrease stomach irritation.
♥ Always tell any doctor or dentist that you are taking Plavix.

Aspirin (acetylsalicylic acid)

Common side effects:
Stomach irritation, bleeding and rash

Call your doctor if:
♥ You develop a new rash.
♥ Have any new bleeding.

Helpful hints:
♥ The enteric-coated form of aspirin is less irritating to the stomach.
♥ Take with meals to decrease stomach irritation.
♥ Always tell any doctor or dentist that you are taking aspirin.
♥ Do not take unless directed by your provider.

If you miss a dose, take it as soon as you can. If it is almost time for the next dose, take only one dose. Do not take double or extra doses. If there are any changes in this dosing program, please contact your doctor so that they may review it carefully with you. The side effects of these drugs that might make us change these recommendations to you would include black, tarry stools, skin rash or itching (hives), diarrhea, fever or confusion.

BETA-BLOCKERS
Beta-blockers slow your heart rate. High blood pressure, rhythm disorders, angina and heart attacks are often treated with these drugs.

Betapace (sotalol)
Cardura, Cardura XL (doxazosin)
Coreg (carvedilol)
Corgard (nadolol)
Inderal, Inderal LA (propranolol)
Levatol (penbutolol)
Lopressor (metoprolol)
Sectral (acebutolol)
Tenormin (atenolol)
Toprol XL (metoprolol XL)
Trandate (labetolol)
Visken (pendolol)
Zebeta (bisoprolol)

Common side effects:
Mild drowsiness (this may improve as you take the medicine), lightheadedness, dizziness, fatigue, male impotence, slow heart rate

Call your doctor if:
♥ You have difficulty breathing after taking this medicine.
♥ You develop fatigue or drowsiness that does not improve.

Helpful hints:
♥ Take with food or milk.
♥ Do not drive or operate machinery until you know how you react to this medicine.
♥ Do not take your dose late at night, as it may cause insomnia in some patients.
♥ Do not skip doses of this medicine.
♥ Do not stop taking this medicine unless instructed by your doctor.
COMMON CARDIAC MEDICATIONS

ACE INHIBITORS

ACE inhibitors relax blood vessels. They are used to treat high blood pressure, post-heart attack and kidney disease. Also, they are useful in medical management of heart failure by decreasing stress on the heart muscle and helping to pump more effectively.

ACCUPRIL® (quinapril)
Aceon (perindopril)
Altace (ramipril)
ATACAND® (candesartan)
AVAPRO® (irbesartan)
Benicar (olmisartan)
Capoten (captopril)
Cozzar (losartan)
Diovan (valsartan)
Enalapril (Vasotec)
Hyzaar (losartan plus hydrochlorothiazide or HCTZ)
Lotensin (benazepril)
Mavik (trandolapril)
Monopril (fosinopril)
PRINIVIL® (lisinopril)
Prinzide (lisinopril plus HCTZ)
Ramipril (Altace)
Univasc (moexipril)
Vasotec (enaprilpr)
ZESTORETIC® (HCTZ + lisinopril)
Zestril (lisinopril)

ARB (ANGIO RECEPTOR BLOCKERS)

Like ACE inhibitors, angio receptor blockers relax blood vessels. They are used to treat high blood pressure, post-heart attack and kidney disease. Also, they are useful in medical management of heart failure by decreasing stress on the heart muscle and helping to pump more effectively.

Losartan (Cozaar)
Valsartan (Diovan)
Irbesartan (Avapro)

Common side effects:
Cough, headache, fatigue, loss of taste, rash, itching

Call your doctor if:
♥ You experience lightheadedness.
♥ You experience facial swelling or difficulty breathing.
♥ You experience fevers or chills.
♥ You develop a skin rash after starting the drug.
♥ You notice a decrease in the amount of urine passed.

Helpful hints:
♥ To avoid lightheadedness, change positions slowly.
♥ Do not skip doses of this medicine.
♥ Do not drive or operate machinery until you know how you react to this medication.

CALCIUM CHANNEL BLOCKERS

Calcium channel blockers work by relaxing blood vessels. They are used to treat high blood pressure, irregular or fast heart rates and angina and may be used to prevent spasm of arteries.

Adalat (nifedipine)
CAUDET® (amlodipine)
Calan (verapamil)
Dilacor (diltiazem)
DynaCirc, DynaCirc CR (isradipine)
Lotrel (amlodipine)
Norvasc (amlodipine)
Plendil (felodipine)
Procardia, Procardia XL (nifedipine)
Sular (nisoldipine)
Tiazac (diltiazem)
Vascor (bepridil)
Verelan (verapamil)
Diltiazem (Cardizem)
Amlodipine (Norvasc)

**Common side effects:**
Headache, facial flushing, constipation (these may diminish over time), swelling of ankles

**Call your doctor if:**
♥ You develop swelling of the feet or hands.
♥ You notice an irregular heartbeat.
♥ You develop dizziness after starting the drug.

**Helpful hint:**
♥ To avoid lightheadedness, avoid sudden position changes.

**CHOLESTEROL AGENTS**
Statins are cholesterol-lowering agents frequently used after cardiac surgery and monitored by your cardiologist or primary care physician.

Advicor (nicotinic acid/lovastatin)
COLESTID® (colestipol)
CRESTOR® (rosuvastatin)
Ezetimibe (Zetia)
Ezetimibe/Simvastatin (VYTORIN®)
Lescol (fluvastatin)
LIPITOR® (Atorvastatin)
LOPID® (gemfibrozil)
MEVACOR® (Lovastatin)
Niacin (nicotinic acid)
Pellagra (niacinimide)
Pravachol (pravastatin sodium)
Questran (cholestryamine)
Rosuvastatin (Crestor)
Tricor (fenofibrate)
Welchol (colesevelam)
ZETIA® (ezetimibe)
ZOCOR® (Simvistatin)

**Common side effects:**
Constipation, diarrhea, gas, heartburn, headache, muscle soreness and aches

**Call your doctor if:**
♥ You develop blurred vision or dizziness.
♥ You develop muscle pains or cramps.
♥ You develop a rash after you start taking the drug.
♥ You develop yellowing of the skin or eyes.

**Helpful hints:**
♥ You still need to follow a low-cholesterol diet, even though you are taking these medicines.
♥ Take these medicines in the evening.
♥ Limit your intake of alcohol when on these drugs.
♥ Your doctor will monitor your cholesterol levels and your liver function tests.

**DIURETICS**
Diuretics are used to remove excess fluid from the body. They are used to treat high blood pressure and swelling after surgery or from heart failure.

Aldactone (spirolactone)
Aquatension (methyclothiazide)
Bumex (bumetanide)
Demadex (torsemide)
DIURIL® (chlorothiazide)
Dyrenium (triamterene)
Edecrin (ethacrinic acid)
Enduron® (methyclothiazide)
Hydrochlorothiazide (HCTZ)
Inspira (eplerenone)
Lasix (furosemide)
Lozol (indipamide)
Midamor (amiloride)
Naturetin (bendroflumethiazide)
Renese (polythiazide)
THALITONE® (chlorthalidone)
Zaroxolyn (quinazoline)
**Common side effects:**
Dizziness, lightheadedness, nausea and fatigue

**Call your doctor if:**
♥ The dizziness does not improve.
♥ You develop a new rash.
♥ You experience muscle pains or cramps.
♥ You develop vomiting or loss of appetite.
♥ You develop dry mouth or unusual thirst.

**Helpful hints:**
♥ Weigh yourself each day at the same time.
♥ Take your diuretic in the morning, so you will not be awake at night. If you do take your medication in the evening, take it at least four hours before you go to bed.
♥ Some patients may need to take potassium pills while on diuretics.

**NON-STEROIDAL ANTI-INFLAMMATORY DRUGS**
These drugs are used to treat pain and inflammation. Ibuprofen (Motrin) is contraindicated or to be avoided for post-op pain management in patients undergoing coronary artery bypass surgery.

**MOTRIN® (ibuprofen)**

**Toradol (ketorlac)**

**Common side effects:**
Nausea, diarrhea, gas, constipation, dizziness, drowsiness, stomach irritation

**Call your doctor if:**
♥ You experience swelling of the lips, face or eyes.
♥ You experience vomiting, especially if blood is present.
♥ You develop stomach pain.

**Helpful hints:**
♥ Take this medicine with food to minimize stomach irritation.
♥ Do not take unless directed by your provider.

**NARCOTIC ANALGESICS**
Narcotic analgesics are usually a combination of acetaminophen (Tylenol) and a narcotic agent. They help to provide pain relief by acting on pain receptors in the brain.

**TYLENOL® #3 (acetaminophen and codeine)**

**PERCOCET® (acetaminophen and oxycodeone)**

**Common side effects:**
Constipation, drowsiness, confusion, gas, nausea or vomiting, dry mouth, itching

**Call your doctor if:**
♥ You develop difficulty breathing.
♥ You develop unusual weakness.
♥ You have persistent vomiting.

**Helpful hints:**
♥ Do not drive or operate machinery when taking these medicines.
♥ Do not take with alcohol.
♥ Use an over-the-counter laxative if you develop constipation.

**CENTRALLY-ACTING SYNTHETIC ANALGESIC**
This prescription medication is indicated for the management of moderate to moderately-severe pain.

**Ultram® (tramadol hydro-chloride tablets)**

**Common side effects:**
Constipation, nausea, dizziness, headache, sleepiness and vomiting

**Call your doctor if:**
♥ You have a seizure.
♥ You have persistent vomiting.
♥ Your headaches are severe.

**Helpful hints:**
♥ Pain medication is only one way to manage pain effectively. There are some changes you can make in your daily life to help keep your pain under control, such as a simple exercise program, breathing and relaxation, and body massage.
NITRATES
Nitrates relax the blood vessels. They may be used for angina and after cardiac surgery. They are often used for patients who have arteries removed from their arms to prevent the arteries from having a spasm.

IMDUR® (isosorbide mononitrate)
ISMO (isosorbide mononitrate)
Isordil (isosorbide dinitrate)
Nitrolingual Spray (nitroglycerin lingual aerosol)
Nitro-patch
Nitrostat (nitroglycerin tablets)

Common side effects:
Headache, dizziness

Call your doctor if:
♥ Your headaches are severe.

Helpful hint:
♥ The headaches that occur with these drugs may get better after the first several weeks of taking the drug.

ANTI-ARRHYTHMICS
Anti-arrhythmics are medications that help to keep the heart beating in a regular rhythm. Some patients require anti-arrhythmics after cardiac surgery. Most patients can be taken off these drugs one month after surgery. Check with your doctor.

Amiodarone (Cordarone)
Betapace (sotalol HCL)
Digoxin (lanoxin)
Cordarone (amiodarone)
Corvert (ibutelide)
Ethmozine (moricizine)
Mexitil (mexitetine)
Multaq (dronedarone)
Norpace (disopyramide)
Procanbid (procainamide HCL)
Quinidex (quinindine sulfate)
Rythmol (propafenone)
Tambocor (flecainide acetate)
TIKOSYN® (dofetilide)
Tonocard (tocainide)

Common side effects:
Nausea and vomiting, constipation, muscle weakness, photosensitivity, visual disturbances

Call your doctor if:
♥ You have persistent nausea or vomiting.
♥ You become dizzy or lightheaded.
♥ You develop visual disturbances.
♥ You develop yellow coloration of the skin or eyes.
♥ You develop shortness of breath with exertion.

Helpful hints:
♥ Use sunscreen and avoid excessive sun exposure.
♥ If you are on this drug more than six weeks, talk to your doctor about lung and thyroid testing.

SLEEP MEDICATIONS
Patients may have trouble sleeping after cardiac surgery or invasive procedures and may be sent home with a prescription for a sleeping medication.

AMBIEN® (zolpidem)

Common side effects:
Daytime drowsiness or dizziness

Call your doctor if:
♥ You continue to have daytime drowsiness.
♥ You have trouble sleeping even when taking the medication.

Helpful hints:
♥ Do not take with alcohol.
♥ Take immediately before you go to bed.
♥ This medication should only be used for short-term treatment of insomnia.
CARDIAC GLYCOSIDES (DIGITALIS)

These agents help the heart maintain a normal rhythm and rate. They also help in heart failure by strengthening the heart muscle to be more effective. They are often used to treat rapid heart rhythms.

Lanoxin (digoxin)

**Common side effects:**
Nausea, weakness, visual changes (especially seeing yellow or green halos around objects), irregular heartbeat, very slow heartbeat

**Call your doctor if:**
♥ You develop visual changes or slow heart rate (less than 50 to 60 beats per minute).

**Helpful hints:**
♥ Notify your physician if you have any decreased kidney function.
SECTION 9

Cardiac Diagrams

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HEART VALVES

Aorta
Pulmonary artery
Right atrium
Pulmonary valve
Tricuspid valve
Left atrium
Aortic valve
Mitral valve
Left ventricle
Right ventricle
SEPTAL DEFECTS

Atrial Septal Defect

Ventricular Septal Defect
MAJOR BLOOD VESSELS

- Arteries
- Veins
MAJOR HEART BLOOD VESSELS

- Left Main
- Left Anterior
- Diagonal
- Posterior Descending Artery
- Left Circumflex
- Right Coronary
- Marginal