To our patients:

The Bluhm Cardiovascular Institute of Northwestern Memorial Hospital is a world-class heart and vascular program that offers comprehensive services and state-of-the-art surgical treatments in all areas of cardiovascular care. Our Center for Coronary Disease provides patients with the most advanced medical and surgical techniques based on the latest research findings.

The highly skilled cardiologists and cardiac surgeons on the medical staff offer a multidisciplinary approach to the diagnosis and treatment of patients with coronary artery disease. The use the most advanced strategies available to diagnose and treat patients before heart disease progresses, often preventing what could be a fatal heart attack.

This booklet has been developed to answer your basic questions and provide information about coronary artery disease including symptoms, causes, diagnostic tests and treatments. It describes coronary artery bypass grafting, how it is performed and how to prepare for surgery and for follow-up after surgery.

At the Bluhm Cardiovascular Institute, we are dedicated to ensuring that you and your family have the best possible experience and that you thoroughly understand your care plan. Please contact your physician or nurse practitioner if you have additional questions or concerns.

Sincerely,

Bluhm Cardiovascular Institute Team
What You Need to Know About Coronary Bypass Surgery

This booklet will help answer any questions you may have about your upcoming surgery by guiding you through the coronary bypass grafting process (CABG), including preparation for surgery and follow-up after surgery.

The Heart

The heart (see Figure 1) is a muscular organ about the size of a closed fist. It pumps blood to the lungs and to all the body tissues. Like any other muscle, the heart needs oxygen to do its work. Coronary arteries deliver oxygen and other nutrients to the heart.

Figure 1

Coronary Artery Disease

Coronary artery disease is the leading cause of death in the United States. As clogging of the arteries—known as atherosclerosis—develops, deposits of fat, cholesterol and calcium build up inside the artery. These deposits are called plaque and cause the wall of the artery to become rough, hard and narrowed. When one or more of the coronary arteries becomes narrow or blocked (see Figure 2) the heart does not get the
nutrients or oxygen it needs, causing coronary artery disease or atherosclerotic heart disease.

**Causes of Coronary Artery Disease (CAD)**

Both males and postmenopausal females are at risk for developing CAD. Family history and age may also increase the risk of CAD.

Certain factors including smoking, high blood pressure and obesity may be controlled or modified, potentially decreasing the risk of CAD.

**Symptoms of CAD**

If you develop CAD, you may experience:

- Chest pain or angina
- Shortness of breath
- Skipped or fast heartbeats (palpitations)
- Weakness
- Dizziness
- Nausea
- Sweating

The most common symptom of CAD is a chest pain called angina, which occurs when the heart muscle is not getting enough oxygen and nutrients. If untreated, angina may lead to a heart attack (myocardial infarction). A heart attack can occur when a piece of plaque loosens from the wall of the artery and becomes wedged, preventing blood flow to the area below the blockage. This is called acute coronary syndrome.

Angina can be felt in the chest and often is described as sharp, crushing pain, heaviness, aching, burning, fullness or a squeezing sensation. Angina pain also may be felt in the shoulders, neck, throat, jaw or back. Some people will have atypical pain or angina, occurring as fleeting or sharp pain in the chest, abdomen, back or arms.
If you have signs or symptoms of coronary artery disease, contact your physician immediately. Your doctor will want to administer specific tests.

**Tests**

Your physician will conduct a thorough physical exam and will review your symptoms and health history, including information about CAD risk factors. Based on your exam, your physician may decide to order additional tests, which may include the following:

- **Electrocardiogram**, which records your heart’s electrical activity. Your physician will be able to tell if you have had any muscle damage to your heart.

- **Exercise stress test**, which records how your heart responds to measured amounts of work (exercise). During and right after walking on a treadmill, your blood pressure, heart rate and rhythm are recorded along with any changes that may occur.

- **Echocardiogram (echo)**, which uses high-frequency sound waves (ultrasound) to look at how the various parts of the heart work. The resulting images show the size, shape and movement of the chambers of the heart and valves. This test tells your physician how strong your heart muscle is and if any muscle damage has occurred.

- **Cardiac catheterization**, which looks at blood flow to the heart. This test helps detect the extent of any blockage or narrowing of the arteries.

During the exam, a thin catheter (tube) is inserted in the femoral artery (in the groin) and is passed to the heart. Contrast dye is injected and X-rays are taken. The contrast dye allows the blood vessels to be seen on the X-ray.

If you have had these or other heart-related tests recently, please obtain copies of the test results and share them with your surgeon. In some cases, this may prevent repeat testing.

**Treatment**

Treatment for coronary artery disease may include a *coronary artery bypass graft* (CABG). This process creates a detour or bypass around the blocked portion of the artery, restoring the blood supply to the
heart muscle. Either arteries or veins are used to create the bypasses, also called **grafts** or **conduits**.

Three types of blood vessels are used as a conduit, including the **mammary artery**, the **radial artery** and the **saphenous vein**.

The **mammary artery** (see Figure 3) lies along your breastbone on the inside of the chest wall below your ribs. There is one internal mammary artery on each side of the breastbone. Using an internal mammary artery to bypass your heart will not affect the blood supply to your chest.

The **radial artery** (see Figure 4) is one of two arteries found in your forearm. Tests are done to check what the blood flow to your arm will be if the radial artery were removed. Let your surgeon know if you have a history of circulation problems to the hands such as Raynaud’s syndrome; repetitive stress or carpal tunnel syndrome; or pain in your fingers when the weather is cold.

A **saphenous vein** (see Figure 5) is located on the inside of the leg from the ankle to the groin. When the saphenous vein is removed, the blood flow to the leg is not affected. It is common, however, for the leg or foot to swell slightly after surgery.
Based on your test results, your surgeon can tell where the blockages are, how many grafts may be needed and which arteries or veins will be used to create bypasses (grafts or conduits).

Prior to your surgery, your surgeon will discuss your plan of care, explain the available surgical options, the type of incision to be used and answer any questions.

**Endoscopic Vessel Harvesting**

Both the radial artery and the saphenous vein are removed using a minimally invasive method called endoscopic vessel harvesting (see Figure 6). These techniques require very small incisions, result in less pain, speed healing and reduce infections.

Based on your test results, your surgeon can tell you where the blockages are, how many grafts may be needed and which arteries or veins will be used to create bypasses.

**Risks**

Every surgery carries some risk. The amount depends on such factors as your age and overall health. Risks may include bleeding, infection and lung or heart problems. In some cases, a pacemaker may be needed. In rare instances, stroke or kidney failure may occur.

**Before Surgery**

**Exams**

You should be in the best possible health at the time of your surgery. Your physician may recommend certain tests to rule out specific health problems prior to surgery. Pre-surgery appointments may include visits with a cardiologist, cardiac surgeon, nurse practitioner, behavioral medicine specialist and preoperative assessment service.

- The *behavioral medicine specialist* will identify your risk factors for coronary artery disease, explain ways to reduce your risk factors and provide assistance with stress management, smoking cessation
and preparation for upcoming surgery.

- The nurse practitioner will review important activities before and after surgery, details about medicines that may need to be discontinued before surgery and your arrival time on the day of surgery.

These visits will include a thorough review of your health history and a physical exam. Staff will assist you in scheduling the necessary appointments and tests.

For each appointment, please bring:

- A list of your current medications and allergies
- Questions for the physician and nurse practitioner
- Your medical insurance card

**Medications**

Certain medicines can increase your risk for bleeding during and after surgery. Talk with your surgeon if you are taking any blood-thinning medicines such as warfarin (Coumadin®), heparin, Lovenox® or Plavix®. You also must stop taking nonsteroidal anti-inflammatory drugs such as Advil® or Motrin® prior to surgery. Please contact your physician to confirm when to stop taking these medicines. This could be as little as two days or as long as 14 days before surgery. You must stop taking any aspirin or aspirin-containing products one week before surgery and any herbal medicines two weeks prior to surgery.

If you are diabetic, ask your physician about taking your insulin on the day of surgery. Do not take any new medication without informing the prescribing physician about your impending surgery.
The Day Before Surgery

If you develop a cold or flu prior to surgery, please call the nurse practitioner. Surgery may be postponed until you are well.

Antibacterial Shower

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

Nail Polish and Makeup

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

Diet

Eat a bland meal for dinner the night before your surgery. Do not eat or drink anything after midnight the night before surgery or the morning of your surgery. This includes gum and hard candy.

Preparing for Your Hospital Stay

Leave your valuables such as money or jewelry at home. Please bring these items with you:

- A photo ID
- Your medical insurance card
- Your Medicare card, if applicable
- A list of your allergies
- A list of current medicines including vitamins and herbal supplements
- Containers for eyeglasses, contact lenses and dentures
- Toiletries

Day of Surgery

At Home

Do not swallow water when brushing your teeth. Unless instructed otherwise, take your regular medicine on the morning of surgery with a small sip of water.

If you are diabetic, follow your physician’s guidelines.
At the Hospital

Please arrive two hours before the time of surgery (unless told otherwise) at the Galter Pavilion, 201 E. Huron St. Parking is available at the garage located across from the hospital facility at 222 E. Huron St. Please bring your ticket with you for parking validation.

Stop at the reception desk in the main lobby of the Galter Pavilion, where your family can check in and obtain visitor passes. Then go to the fifth floor registration desk in the Same Day Surgery Unit.

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

Once in the pre-op room, a nurse will review your medical history, take your temperature, blood pressure and pulse. An intravenous (into the vein) line will be inserted into the vein in your arm or hand.

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

During this time, your family can relax in the waiting area on the seventh floor. They will be able to visit once the nurse has you prepared for surgery. You may have two adult visitors at one time.
The wait time before surgery is about two hours. If your wait is extended, your nurse will provide you with updates. When you are in the operating room, your family will be shown to the waiting room on the seventh floor. Family members should check in with the volunteer, who will provide updates on your progress during surgery.

**During Surgery**

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

Next, you will be given general anesthesia. It includes intravenous medicine and anesthetic gases mixed with oxygen delivered through the face mask.

An intravenous line then will be placed to deliver medications and fluid and measure the pressure in your heart and lungs. A transesophageal echocardiogram probe will be placed in your throat. The probe allows the surgeon to look at your valves before and after the surgery. A breathing tube will assist you during surgery and may cause a slight sore throat afterward.

The surgery involves a 6- to 8-inch incision down the middle of your chest; your breastbone (sternum) is opened (sternotomy) *see Figure 7*.

Most CABG surgery is performed using the heart-lung machine, which takes over the work of your heart and lungs. This machine provides oxygen-rich blood to all parts of the body using two tubes. The first tube is placed in your heart to carry blood to the machine; the second tube returns the blood to your body.

Once all of the coronary vein or artery bypass grafts are in place, you will be taken off the heart-lung machine. Then, your breastbone will be wired together and your incision(s) will be closed with dissolving sutures.
Off-Pump Coronary Artery Bypass

In certain circumstances, CABG is performed without the use of the heart-lung machine. Your surgeon will let you know if this is an option for you.

Your surgery can take four to six hours or longer if you have had prior heart surgery.

After Surgery

You will go directly to the Intensive Care Unit (ICU). Your surgeon will speak with your family by phone and answer any questions they may have.

After surgery you will have many tubes and wires attached to your body that will:

- Help you breathe
- Empty your stomach
- Remove blood or fluid that may build up near your incision
- Provide fluid and medicines
- Measure blood pressure and oxygen levels
- Monitor your heart rate
- Drain urine

As you recover, the tubes and wires will be removed.

You can expect to be in the hospital for five days following surgery. Most patients recover fully in six to eight weeks.

It is common to have swelling in the leg where the saphenous vein was taken. Following surgery, some patients find that their leg incision feels hard and swollen. Often, these post surgical effects decrease over time. To reduce discomfort and swelling, elevate your feet while you are resting. Continue to observe your incision and call your physician if you note redness, increased swelling and drainage.
The booklet, *After Heart Surgery What to Expect* provides more detailed information about your hospital stay, homecare guidelines and long-term follow-up care. Please ask your nurse practitioner for a copy if you do not have one. After bypass surgery, long-term follow-up includes reducing your risk for coronary artery disease, which requires:

- A diet low in salt, fat and cholesterol
- A routine exercise program starting with cardiac rehabilitation
- Weight management
- Smoking cessation
- Stress reduction

It also is important to follow your physician’s guidelines to control your blood pressure and diabetes. Our behavioral medicine specialists can help you make any necessary lifestyle changes.
At Northwestern Memorial Hospital, a comprehensive range of inpatient and outpatient services are provided in a healing environment where patients and their caregivers are supported by advanced technology and an organizational commitment to quality and patient satisfaction. We are a major referral center for the Midwest and beyond with a longstanding tradition of providing patient-focused care.

As one of the country’s premier academic medical centers, Northwestern Memorial serves as the primary teaching hospital for Northwestern University’s Feinberg School of Medicine. We are committed to the advancement of healthcare through clinical innovation, medical education and scientific research. The medical staff represents virtually every specialty and is comprised of more than 1,460 affiliated physicians who also serve as faculty members of the Feinberg School. At Northwestern Memorial, physicians and nurses are supported by the efforts of more than 6,000 employees and hospital volunteers who work to advance our mission of Patients First.

Northwestern Memorial’s heart and heart surgery specialties are ranked among the nation’s best by U.S. News & World Report magazine.
For More Information

Please contact us with any questions, for consultations or to request additional materials:

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At night or on weekends, call 312-695-4965 and ask for the Cardiothoracic Surgery fellow to be paged.

To learn more about the Bluhm Cardiovascular Institute, please visit www.heart.nmh.org.

If you would like additional information about Northwestern Memorial, please visit www.nmh.org.