

## Aortic Stenosis

### *Causes, symptoms, diagnosis, and treatment*

*This handout describes aortic stenosis, a narrowing of the aortic valve in your heart. It explains how this disease is diagnosed and assessed, and what the treatment options are.*

### What is heart valve disease?

There are 4 valves in your heart. Each valve controls blood flow to a different part of your body or heart. Heart valve disease can occur in 1 or more of these valves.

Heart valve openings have special structures called *leaflets*. The leaflets open and close to control the flow of blood.

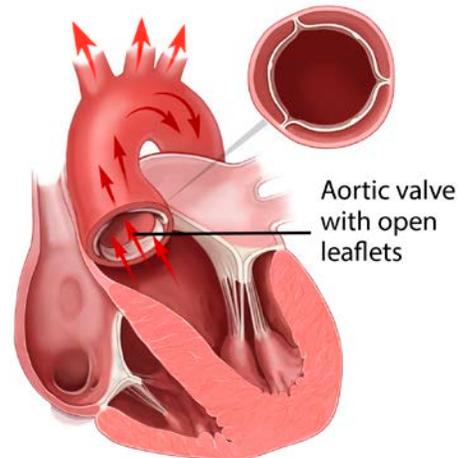
### What is aortic stenosis?

One of the 4 heart valves is the *aortic valve*. This valve controls blood flow from the left upper chamber (*left ventricle*) of your heart to your *aorta*, the blood vessel that delivers blood to the rest of your body.

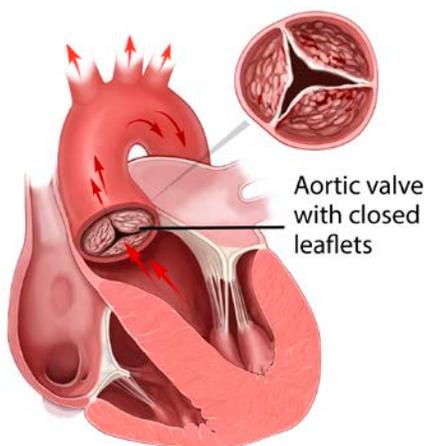
*Aortic stenosis (AS)* is a narrowing of the opening of your aortic valve. In AS, the leaflets cannot open and close normally. This restricts blood flow. (See drawing on page 2.)

### What causes aortic stenosis?

AS is sometimes caused by radiation or birth defects. In older people, the most common cause of AS is calcium buildup on the leaflets of the aortic valve. The calcium makes the leaflets very stiff, so it is harder for the valve to open. When this happens, your heart must work harder to pump blood through the narrow aortic valve, and the blood flow to the rest of your body is limited.



*In a healthy aortic valve, leaflets open and close well.*



A heart with aortic stenosis. The leaflets cannot open and close well, so blood flow is restricted.

## What are the signs of aortic stenosis?

About 500,000 people in the U.S. have **severe** AS. But about half of this group, or about 250,000 people, do not have symptoms.

Over time, people with aortic stenosis can start to have:

- *Heart murmur* (abnormal heart sounds)
- Chest pain
- Fast or uneven heartbeat (*palpitations*)
- Lightheadedness, dizziness, or fainting
- Tiredness that makes it hard to exercise and do other activities
- Shortness of breath
- Fluid buildup in the body

## How common are heart valve disease and aortic stenosis?

More than 5 million Americans are diagnosed with heart valve disease each year. Aortic stenosis affects about 7 out of 100 people over age 65 in the U.S., or about 1.5 million people.

## How is aortic stenosis diagnosed?

Your healthcare provider may first diagnose AS by asking you about your health throughout your life and by doing a physical exam. When listening to your heart with a stethoscope, your provider may hear abnormal sounds, like a heart murmur or an irregular heart rhythm. You might also have other signs of AS, such as difficulty breathing while lying down, fluid in your lungs, or a swollen belly or ankles.

Your provider may order several tests to help diagnose and assess AS:

**Echocardiogram** – This test uses ultrasound waves to make images of your heart chambers and valves. It is done at the bedside and usually takes about 1 hour. You do not need to prepare in any special way for this test. An echocardiogram is the main test to see if you have AS. It will show if you have AS and how severe it is, if you do have it.

**Electrocardiogram (ECG)** – In this test, electrodes are attached to your skin to record your heart's electrical activity. An ECG shows your heart's rhythm and the strength and timing of electrical currents through your heart muscle. It is done at the bedside and usually only takes a few minutes. You do not need to prepare in any special way for this test.

**Chest X-ray** – This test uses radiation to make images of the inside of your chest. A chest X-ray shows whether your “heart shadow” is normal (a heart shadow shows the shape and size of your heart). An X-ray will also show if you have fluid in your lungs or abnormalities in your chest. It is done in a radiology lab or at the bedside and usually takes only a few minutes. You do not need to prepare in any special way for this test.

**Cardiac Catheterization** – This test uses X-rays to guide small flexible tubes (*catheters*) to your heart and coronary arteries. The test measures both the blood flow and the blood pressures of your heart. It is done in a cardiac catheterization laboratory by a *cardiologist* (doctor who specializes in heart health). This test usually takes 1 hour. You will receive *sedatives* (medicines to help you relax) before and during the test. You will need to follow special instructions for eating, drinking, and taking medicines before your cardiac catheterization. The test may be done during an outpatient visit, or you may need to stay overnight in the hospital. Your healthcare provider will give you more information if you are having this test.

**Carotid Artery Ultrasound** – The *carotid arteries* are important blood vessels in your neck that take blood to your brain. Your healthcare provider would normally use a stethoscope to check this blood flow. But, the heart murmur that occurs with AS makes it hard to hear this blood flow through a stethoscope.

A carotid artery ultrasound will show if there is narrowing or blockages in the carotid artery. It may be done in a vascular imaging laboratory or at the bedside. It takes about 30 minutes to complete. You do not need to prepare in any special way for this test.

**Pulmonary (Lung) Function Testing** – Sometimes shortness of breath is caused by lung disease. Pulmonary function testing checks for a broad range of lung diseases that might affect your healthcare plan. It measures how much air you exhale, and how quickly. For the test, you will use a special mouthpiece that is connected to a device called a *spirometer*. You may also be asked to inhale a medicine to see how it changes your test results.

This test is usually done in a pulmonary function laboratory and takes about 1 hour. To prepare, you will need to avoid heavy meals and not smoke for 4 hours before the test.

**Computerized Tomography (CT) Angiography of the Chest, Abdomen, and Pelvis** – This test uses radiation and a *contrast* dye that is given through an *intravenous* (IV) line. It creates very detailed images

of the inside of your body, including your heart, valves, and arteries. It shows if you have any problems that would affect your treatment options. Two of these problems could be too much calcium or a weakening of your arteries.

CT is usually done in a radiology lab and takes about 1 hour. To prepare, you will need to *fast* (not eat) for 4 hours before the test. You must tell your healthcare provider if you are allergic to contrast, take medicines such as metformin (Glucophage), or have any kidney problems.

## How is aortic stenosis treated?

Medicines can manage symptoms of AS, but the only cure is replacing the aortic valve. About 80,000 to 85,000 *aortic valve replacement* (AVR) procedures are done every year in the U.S.

Even so, severe AS is often “undertreated.” This means that many patients with severe AS are not referred to a surgeon to be evaluated for an AVR. This may happen because they do not have chest pain or symptoms of heart failure. Or, the risks linked with AVR may be emphasized more than the benefits.

But, without an AVR, as many as half of patients with severe AS do not live more than about 2 years after their symptoms begin.

These treatment for AVR are explained in the next few pages:

- Open heart surgery – both *traditional* and *minimally invasive*
- Transcatheter aortic valve replacement (TAVR)

## Open Heart Surgery

Open heart surgery for AVR has been used for many years to treat people with severe AS. But, open heart surgery may not be the best option if the person is too old or too frail, or has other diseases such as coronary disease, peripheral vascular disease, or diabetes.

### Traditional Open Heart Surgery

Traditional open heart surgery to replace the aortic valve is done by a heart surgeon and a surgical team in an operating room. For this surgery, the patient usually needs:

- *General anesthesia* (medicine that makes the patient sleep and blocks pain)
- A breathing tube and a *ventilator* (breathing machine)
- Blood-thinning medicines (*anticoagulants*) to prevent blood clots

Traditional open heart surgery usually includes:

- An incision called a *sternotomy* at the breastbone (*sternum*)
- A heart-lung machine called *cardiopulmonary bypass* that stops the heart and keeps blood flowing through the body
- Removing the aortic valve, using incisions and sutures (stitches)
- Reconstructing the sternum, usually with wires
- Closing the chest incision

### **Minimally Invasive Open Heart Surgery**

Minimally invasive open heart surgery to replace the aortic valve is done by a heart surgeon and a surgical team in an operating room. It includes the same steps as traditional open heart surgery, but it is done through a smaller incision at the breastbone. This surgery takes less time than traditional open heart surgery.

Some surgeons may do *robotically assisted* minimally invasive valve replacement. In this type of surgery, the surgeon uses a special computer to see the heart and valve, and to control robotic arms.

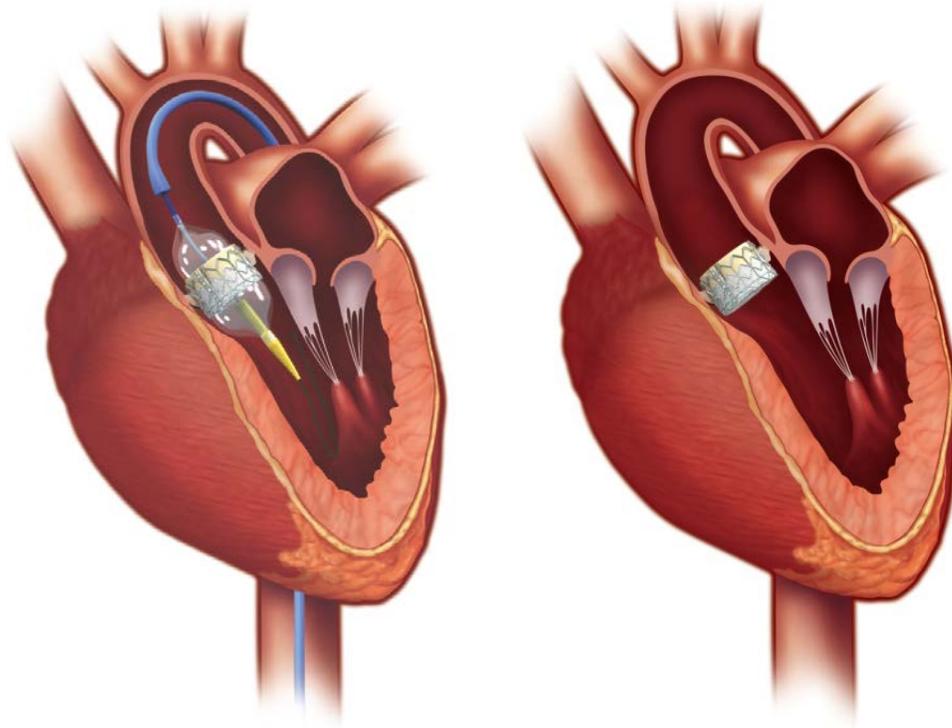
### **Transcatheter Aortic Valve Replacement**

Transcatheter aortic valve replacement (TAVR) is a safe treatment for people who are at **high** risk for or cannot have open heart surgery. Other people also may be able to have TAVR as part of a research study at University of Washington Medical Center (UWMC).

Medicare requires that all hospitals that offer TAVR have a specially trained Heart Team. This team includes a heart surgeon and a heart doctor called an *interventional cardiologist*. The team works together to assess patients with AS and then do the AVR procedure that is best for each patient.

Like open heart surgery, TAVR uses general anesthesia, a breathing tube, and a ventilator. During TAVR, your Heart Team will:

- Place a catheter in an artery that leads to your heart.
- Move a compressed manmade valve through the catheter to your heart. The valve will be inside a deflated balloon as it goes through the catheter.
- Inflate the balloon when it is inside the diseased aortic valve and put the manmade valve in place. The valve will expand to fill this space.



*The inflated balloon with the manmade valve inside the diseased aortic valve.*

*The manmade valve in place after the balloon and catheter are removed.*

### **Types of TAVR**

There are several ways to do TAVR. Each uses a different way to reach your heart:

- In *transfemoral* TAVR, the catheter is placed in the *femoral* artery in your groin area. Your surgeon will reach this artery by making a small incision in your upper leg or lower groin to expose the artery.
- In *transapical* TAVR, the catheter is placed in the tip of your heart, which is called the *apex*. To reach the apex, your surgeon will make a small incision in the side of your chest, between your ribs.
- In *transaortic* TAVR, the catheter is placed in your *aorta*, the large artery that is right above your aortic valve. To reach your aorta, your surgeon will make a small incision near your breastbone.

### **Your Evaluation and Consult Visits at UWMC**

Your primary care provider or your cardiologist may refer you for evaluation and consult at UWMC. Our Heart Team will work with your doctors to coordinate your care and treatment plan.

You will have 2 visits at UWMC for your evaluation and consult. Each person's care plan is different, but most people can expect their evaluation to include:

## Tests and Records

**Before** we can schedule your consult, we will need your medical records, test results, and test images on a CD from your cardiologist (or from UWMC if you have your tests done here).

Your primary cardiologist may have done some or all of the diagnostic tests we need. If not, we may ask you to have the ones you have not had. You can have the tests done at UWMC if that works best for you.

Here is a list of what we will need before your first visit with your UWMC Heart Team:

- *Progress notes* (records of your illness and treatment) from your cardiologist and other doctors
- Echocardiogram (see page 2)
- Cardiac catheterization (see page 3)
- Pulmonary function testing (see page 3)
- Carotid artery ultrasound (see page 3)
- Laboratory studies
- A letter from your dentist, stating that an exam has been done in the last 6 months and clearing you from risk of dental infection (unless you have full dentures)

**Getting your dentist's approval** is an important step to prepare for AVR. Dental plaque can be a source of infection for artificial heart valves. If you have not had a dental exam in the last 6 months or if you need dental work, it is best that this done before valve replacement.

## Your UWMC Heart Team Consult

After we have your records and imaging studies, you will be scheduled for consult with the Heart Team. This is usually 2 weeks after we receive your referral. At this visit:

- You will have a **consult** with a cardiac surgeon. You may also see an interventional cardiologist and nurse practitioner.
- You may also have **CT angiography of your chest, abdomen, and pelvis**, if needed (see page 3). This is usually done for people who are at high risk for open heart surgery or who may have TAVR as part of a research study.

**Important:** Before you have a CT scan, you must tell us if you have:

- Any allergy to contrast
- Any problems with your kidneys
- You may also have other tests that have not yet been done by your cardiologist or primary healthcare provider.

## Heart Team Review

If you are at high risk for open heart surgery, or if you may be a candidate for TAVR as part of a research study, our Heart Team will review your health history and studies, and make a treatment plan.

The Heart Team will then talk with you about this treatment plan and explain your next steps. If you need to have more tests, they are usually done at UWMC.

Many factors decide if and when people have TAVR. If more evaluation or treatment is needed, the Heart Team will talk in detail with you about this.

## Your AVR Procedure at UWMC

All patients who have AVR procedures at UWMC need to have a pre-operative visit. This visit usually takes place 7 to 14 days before the AVR. At this one appointment, you will:

- Meet with one of our healthcare providers
- Have lab tests and studies (chest X-ray, ECG)
- Consult with an anesthesiologist
- Receive information to help you prepare for your procedure

## Making Your Treatment Decision

Aortic stenosis is a serious condition. Talk with your doctor or other healthcare provider about what treatment is right for you. Ask questions about anything you do not understand.

### Questions?

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

Cardiac Services: 206.598.4300

*Images in this handout are courtesy of Edwards Lifesciences.*