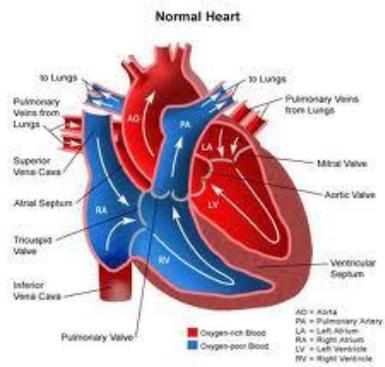
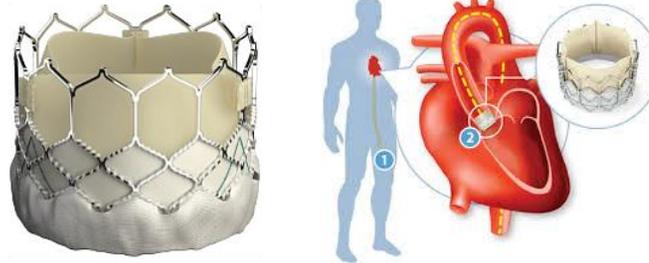


# TAVR



# NEIL E STRICKMAN MD

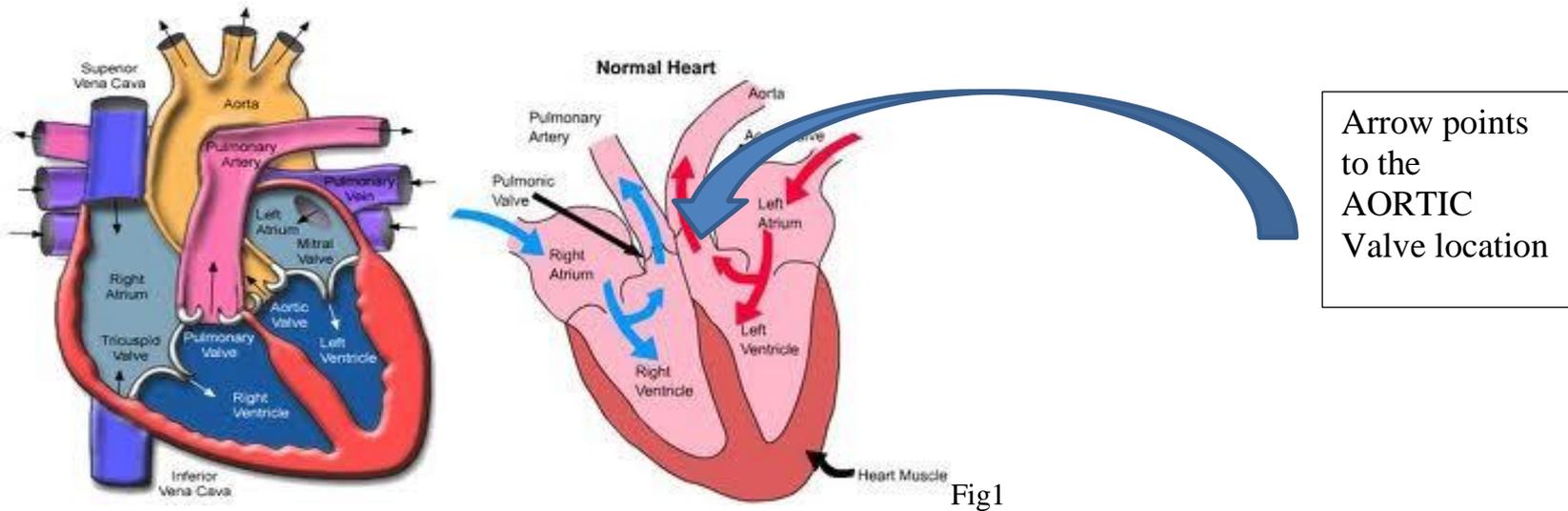
# **T**ranscatheter Aortic Valve Replacement

## **INTRODUCTION**

The heart is a muscular organ located in your chest between your lungs which is designed to pump blood throughout the entire body. The right side of your heart pumps blood through the lungs, where the blood picks up oxygen. The left side of the heart receives this blood and pumps it to the rest of your body out through the **AORTIC VALVE** and into the circulation of the body.

### **HEART CHAMBERS AND VALVES**

The heart is divided into four main areas, or chambers – two upper chambers (the left and right atrium) and two lower chambers (the left and right ventricle). These are the 4 valves which regulate the flow of blood through the heart, lungs and subsequently into the body's circulation. They are called the aortic, mitral, pulmonary and tricuspid valves, whereas each is made of flaps of tissue called leaflets. See Figure 1. You can follow the blood flow from the heart into the lungs (**BLUE**); and from the lungs out to the body (**RED**) through the Aortic valve.



As the heart muscle contracts (squeezes), the valves open in one direction which allows the blood to circulate forward. When these valves close, the blood is prevented from flowing backward. There are 2 common problems that can develop in heart valves:

### **VALVE STENOSIS**

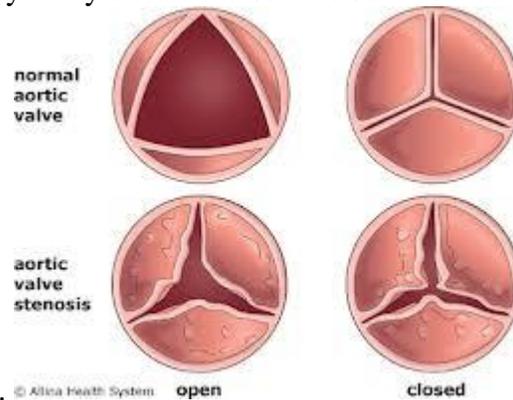
- This occurs when the valve is narrowed and does not completely open secondary to:
  - a build-up of calcium (mineral deposits)
  - high cholesterol (a waxy fat)
  - aging
  - genetics (such as a birth defect)

### **VALVE INSUFFICIENCY / REGURGITATION**

- This occurs when the valve does not fully close allowing blood to leak backward through the valve
  - Torn tendoniae (string-like architecture)
  - Ring dilation (degeneration like an automobile ring)

### **AORTIC STENOSIS-(AS)**

Severe *Aortic Valve Stenosis* (see FIG 1a) occurs when the narrowing of your aortic valve leaflets do not allow normal blood flow outward. It can be caused by many different disorders such as a birth defect, rheumatic fever, radiation therapy; however most are



related to the aging process. © Allina Health System **open** **closed** Figure 1a

The most common presenting symptoms of Severe *Aortic Valve Stenosis* are:

- chest discomfort
- exertional shortness of breath
- easy fatigue
- overall tiredness

Severe *Aortic Valve Stenosis* is often caused by the build-up of calcium (mineral deposits) on the aortic valve's leaflet tips. Over time the leaflets become stiff, reducing the ability to fully open and close. When the leaflets don't fully open, your heart must work harder to push blood through the aortic valve to your body. When Severe *Aortic Valve Stenosis* reaches a critical state it is possible for the heart to weaken thus the terminology of "Congestive heart failure."

## **TRANSCATHETER AORTIC VALVE REPLACEMENT (TAVR)**

This is a less invasive procedure which allows your aortic valve to be replaced with a new valve without open heart surgery. The valve is inserted with the use of your native artery circulation or less commonly through an incision between the ribs. The Transfemoral (groin artery) delivery of the **EDWARDS SAPIEN TRANSCATHETER HEART VALVE** was approved by the FDA in November of 2011 whereas the 3<sup>rd</sup> generation **S3** is now available. This technology consists of using a balloon expandable stent with an integrated Bovine (cow) pericardial valve. The TAVR technology consists of an integrated bovine pericardial valve crimped on a balloon-expandable stent for delivery. This is usually delivered via the Femoral (Groin) artery if those arteries are large enough to accept the catheters.

See below the  
**EDWARDS SAPIEN S3 TRANSCATHETER HEART VALVE.** see Figure 2



Figure 2

The *TAVR* procedure is not right for everyone. In certain cases, the risks of the procedure may outweigh the benefits, however most patients are candidates for this amazing technology. It is best to let me or your surgeon make this determination with the use of various testing procedures. These would include the use of:

- Physical examination (PE)-We will listen for evidence of a heart murmur, examine your vital signs and check for any other disorders
- Electrocardiogram-. An electrocardiogram (EKG) is used to record the heart's natural electrical currents. This can show the heart's rhythm, the heart's rate, and reviews the electrical currents.
- 2 Dimensional Echocardiography ( 2DE-Ultrasound of the heart)- from the top of the chest wall or Transesophageal Echocardiography (TEE) within the body- These tests use ultrasound waveforms to pick up sound waves that are moving through the heart which are then converted into moving pictures.
- Cardiac Catheterization- invasive procedure to determine whether the heart arteries besides the valve are involved in your particular case.
- CT Scanning of the Chest and Abdomen (CTA) - special x-rays to determine whether your body's arteries are large enough to allow passage of the **EDWARDS SAPIEN S3 TRANSCATHETER HEART VALVE** system as well as the relationship of your coronary heart arteries to the native aortic valve. From this test I can also determine the exact size of the valve that I need to implant in the *TAVR* procedure so as to improve your clinical condition.

The following are general statistics from the Texas Heart Institute (THI) at St Luke's Episcopal Hospital (SLEH) with the use of the **EDWARDS SAPIEN TRANSCATHETER HEART VALVE.**

- Anesthesia- General (with a ventilator )or MAC ( without a ventilator )
- Cardiopulmonary bypass- Usually not required
- Entry Site-Through the Femoral Artery (Groin),
- Average total procedure duration- 3 hours of which the actual valve procedure take< 60 minutes!
- Average hospital stay-1-2 nights

**The Edwards Sapien Transcatheter Heart Valve may not be perfect to use in the following people:**

- Patients whose native aortic valve does not contain an adequate amount of calcium to hold the new valve in place.
- Patients who have a blood clot or an abnormal growth on their native valve
- Patients who have an infection in the heart or infections elsewhere
- Patients who already have a previously implanted mechanical valve that requires the use of blood thinners like Warfarin
- Patients whose aortic valve is either too small or too big for the new prosthesis to fit correctly
- Patients who have severe problems with bleeding or blood clotting
- Patients who cannot take aspirin, heparin, Effient ( Prasugrel ) or Clopidogrel (Plavix )
- Previously have a bioprosthetic valve that will not accept the Sapien S3 valve

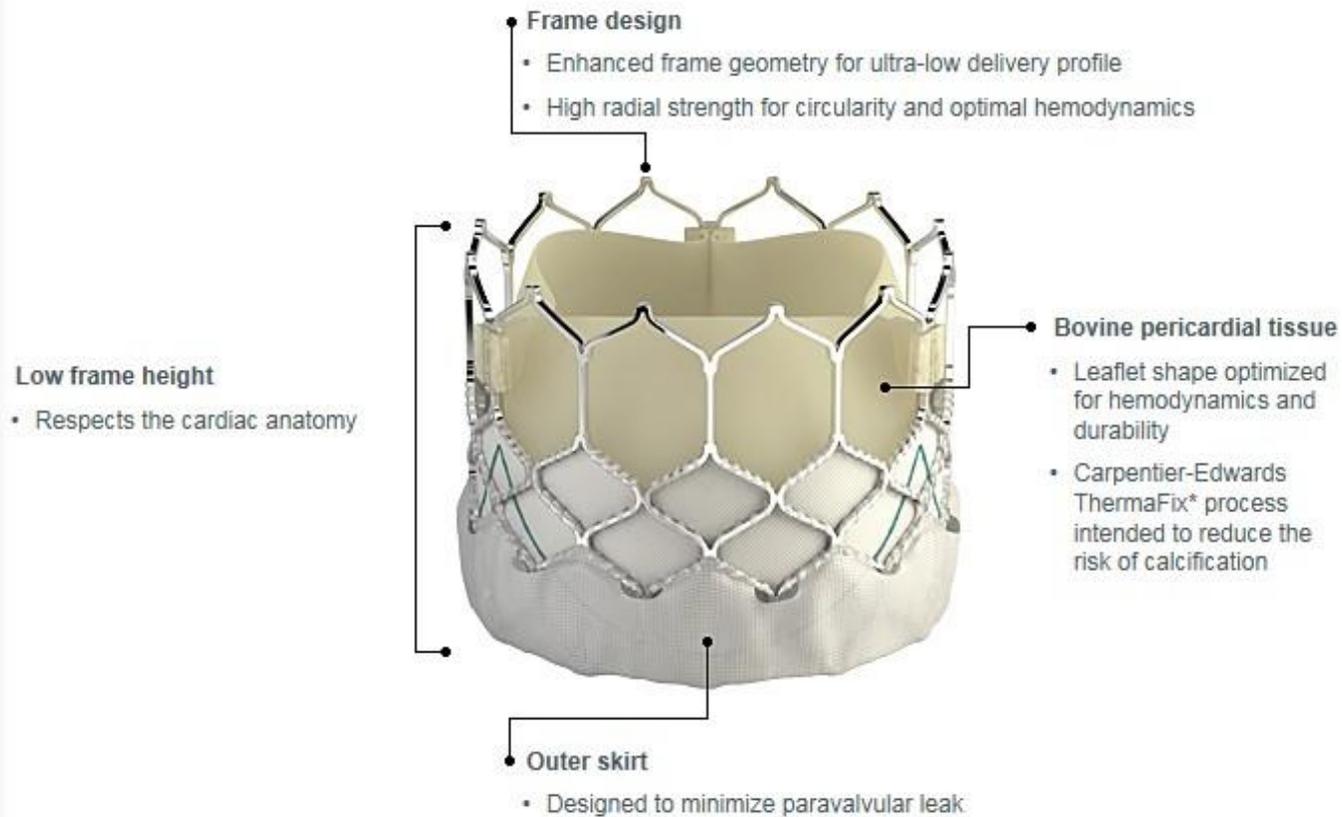


Figure 3

The **EDWARDS SAPIEN S3 TRANSCATHETER HEART VALVE** is a biological (made from animal tissue) valve that replaces your aortic valve. See Figure 3

At the present time, it is provided in four sizes: 20mm, 23 mm 26mm and 29 mm in diameter which fit most individuals who need an AVR. We will determine the right size for you by carefully reviewing all of the tests previously performed.



Figure 4a: Case number 600 done on 2/8/16

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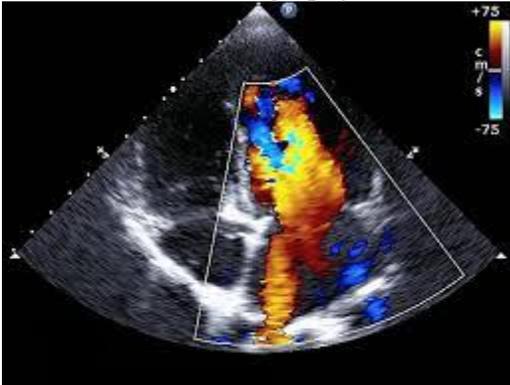
Figure 4b: 17 Our 800<sup>th</sup> TAVR at the Texas Heart Institute (see figure 4b) CHI-Baylor – St Luke’s Medical Center was done in mid 2017, after our program began in 2012

# H

## ow is TAVR performed? Transfemoral (TF), Transaxillary (TAX) or Transapical (TA)

This is done in our cardiac catheterization suite which has both the availability for cardiologists and surgeons to work together with state of the art equipment. **Minimal Anesthesia with Propofol or General anesthesia** will be given to put you into a mild or deep sleep. If you are totally asleep, a tube will be placed inside the trachea (breathing vessel) and promptly connected to a mechanical ventilator (a machine that will help you breathe during the procedure). Otherwise we will use conscious sedation without a ventilator

We may also use Trans esophageal echocardiography-TEE- (a type of ultrasound-Figure 5a) to see your aortic valve inserted while you are asleep and then removed before you are awakened. Patients with minimal sedation will have their valve examined by Trans Thoracic Echocardiography-TTE- (another type of ultrasound).



**Figure 5a**

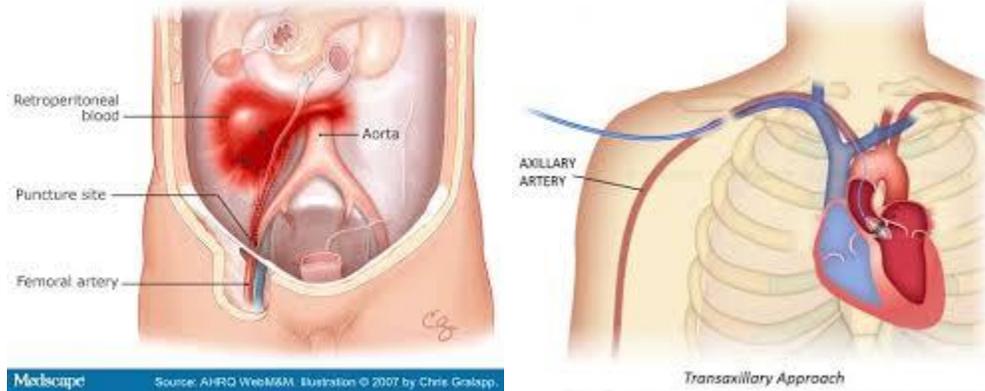


**Figure 5b**

We will place a temporary pacing wire in the heart so we can control the heart rhythm at various times during the TAVR procedure. This will be placed via a vein in the neck area by our anesthesiologist or the groin area by me. This will be turned on and off at various times to allow us to implant the new valve in the perfect exact location without the beating of the native heart getting in the way. After the procedure is done, the temporary pacing wire is removed.

We use fluoroscopy (type of x-ray Figure 5b) during the procedure as well as contrast medium (dye) in order to see your aortic valve.

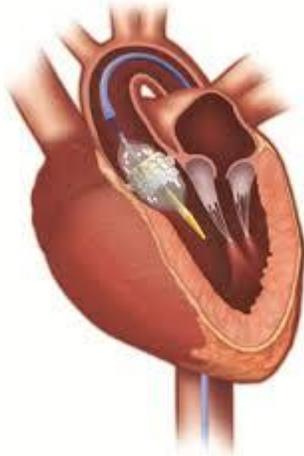
Some patients may have kidney problems or an allergic reaction as a result of the contrast medium thus please inform us before the procedure if this has been a problem in the past.

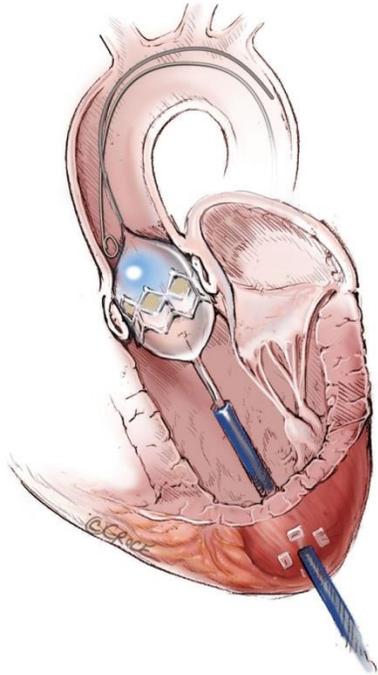


**Figure 6a**

**For the TF (Transfemoral) Procedure:** We will make an incision in the left or right groin artery or artery under the collar bone for the introduction of the catheters as shown above. **Figure 6c below**-final position of the valve

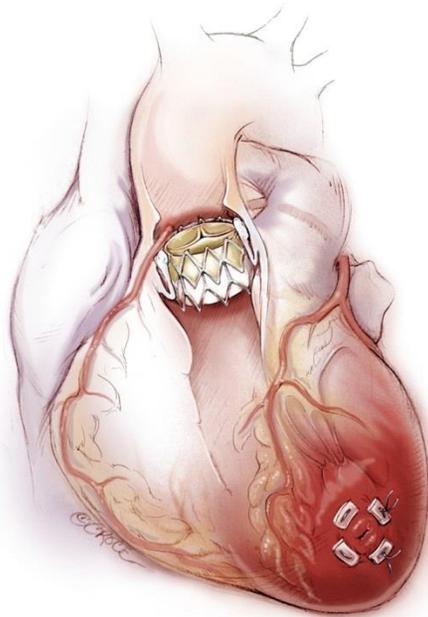
**Figure 6b**





**Figure 6d**  
**For the TA (Transapical) Procedure;**

We will make an incision between the ribs on the left side of the chest for introduction of the catheters. This is rarely used now that the above smaller system is in place. See Figure 6 (Transapical approach). This is rarely done anymore.



**Figure 6e**  
**Final Valve position**

First a balloon catheter will be used to open the diseased native aortic valve in preparation for the introduction of the new valve. The Edwards SAPIEN transcatheter heart valve will be placed on the delivery system (long tube with a small balloon on the end), and compressed on the balloon (using a crimper) to make it small enough to fit through the sheath. It will be about the width of a pencil.

Using our temporary pacemaker, I speed up the heart to in order to decrease the chance of the new valve from moving during its placement. We inflate the balloon holding the new valve in the exact position desired and observe its function using angiography and echocardiography. The pacemaker rate is then decreased, the balloon removed and various pictures are taken to confirm positioning of the **EDWARDS SAPIEN TRANSCATHETER HEART VALVE**.

I will make sure that your new valve is working properly before removing the delivery system and closing the incision in your groin area. In the rare instance that your new valve is not working properly, I may need to do something else which may include insertion of a second new valve inside the newly implanted valve, use a larger balloon or other additional surgery as we determine to be necessary.

There is an 8% chance that I will need to put in a permanent pacemaker with this procedure as the hearts electrical system lies just next to the Aortic Valve

## **W**hat Are the Possible Risks and Benefits Year After the TAVR?

In the United States, The PARTNER Trials studied the safety and effectiveness of the **EDWARDS SAPIEN TRANSCATHETER HEART VALVE** in patients whose doctors had determined them to be unable to undergo open-heart surgery. Half of the patients were treated with the Edwards SAPIEN transcatheter heart valve and half were treated with standard medical therapy. The studies have revealed that patients who received the Edwards SAPIEN transcatheter heart valve lived longer and felt better with greater survival and less complications. Additionally, the study showed that patients who received this new valve had improved heart function and felt much better at up to 5 years compared to patient who did not receive a new valve.

**T**he following risks have been reported to occur in 1 or fewer out of 100 patients:

- Acute kidney injury (renal failure; when the kidneys cannot work properly), which can require hemodialysis
- Allergic reaction to anesthesia contrast medium (fluid used to see your internal structures during the procedure), or medicine
- Anemia (low red blood cell count)
- Damage to the nerves
- Device embolization (movement of the valve after placement)
- Narrowing of the valve
- Syncope (fainting)
- Bleeding into or around the heart sac (pericardium) or groin
- Coronary artery obstruction (blockage in the coronary vessels around the heart).
- Device breakdown or degeneration
- Failure or poor function of the implanted valve
- Mechanical malfunction of the valve delivery system
- Need for valve explant (removal)
- Shortness of breath
- Arrhythmia
- Infection
- Pain at the insertion site
- Permanent Pacemaker

In addition, there is a possibility that you may experience other problems that are not listed above that have not been previously observed with this procedure.

## **W**hat Happens After the Transcatheter Aortic Valve Replacement Procedure?

After the procedure, you will be moved to our recovery area and then to a regular bed for an overnight stay. You may be given blood-thinning medicine. These typically include Plavix (Clopidogrel), warfarin, Eliquis or a similar agent.

While in the hospital after the TAVR procedure, the following examinations are performed for further assessment of the new valve:

- Physical exam
- Chest X-ray
- Blood tests
- Electrocardiogram (EKG)
- Echocardiogram
- Early Ambulation and discharge is expected

You will receive a temporary then permanent card showing the type of valve implanted by me. It is expected that I will see you as an outpatient at 1 month and 1 year. Regular check-ups are very important with your private physician. It is easier for patients with a replacement heart valve to get infections, which could lead to future heart damage. You will need to take any medicine as prescribed and have your heart checked from time to time with the ultrasound echocardiogram.

Always inform other doctors about your heart valve replacement before any medical or dental procedure.  
This valve is MRI compatible

## Complete Range of Valve Sizes Expands the Treatable Patient Population



Valve Size	20 mm	23 mm	26 mm	29 mm
Native Annulus Size By TEE	16-19 mm	18-22 mm	21-25 mm	24-28 mm
Native Annulus Area (CT)	273-345 mm <sup>2</sup>	338-430 mm <sup>2</sup>	430-546 mm <sup>2</sup>	540-683 mm <sup>2</sup>
Area-derived Diameter (CT)	18.6-21 mm	20.7-23.4 mm	23.4-26.4 mm	26.2-29.5 mm

## Safety Warnings and Precautions

The safety of the valve implantation has only been established in patients who have senile degenerative aortic stenosis. Antibiotic medicine is recommended after the procedure in patients at risk for infection. Patients who do not take antibiotics may be at increased risk of infection. Patients who receive a transcatheter heart valve should stay on blood-thinning medicine for a minimum of 12 months after the procedure and aspirin for the rest of their lives, unless otherwise specified by their doctor. Patients who do not take blood-thinning medicine may be at increased risk of developing a dangerous blood clot after the procedure which may result in a stroke. Blood-thinning medicine may increase the risk of bleeding in the brain (stroke).

## **H**ow may TAVR procedures have been performed worldwide?

As of March 2017, > 160,000 patients have been implanted with this valve procedure by multi-disciplinary heart teams worldwide.

## **H**ow Long Will This New Valve Last?

How long your new valve will last is unknown at this time. Edwards Lifesciences has tested the valve in the laboratory to replicate 5 year durability. All valves tested for 5 year durability passed the test. The first Edwards transcatheter heart valve was implanted in 2002.

The most common reason that a biological valve may fail is a gradual build-up of calcium (mineral deposits). In this situation, the valve may not work properly, which may cause your aortic stenosis to return, and possibly chest pain, shortness of breath, irregular heart beat and fatigue. Talk to your local doctor or me if you experience any of these symptoms.

## **F**ollow-up?

Our goal is your continued well health. If there is any problem associated with this valve or any other medical condition, we want to be involved to help manage the situation. Regular medical follow-up is essential to evaluate how your valve is performing. You will be asked to have a 2 Dimensional echocardiogram (2DE), Chest X-Ray (CXR), blood-work, and physical examination at regularly spaced intervals with either your local physician or at our office. We expect to see you at 1 month and 1 year after the procedure. Other interval exams should be done with your local physician.

# Hall-Garcia Cardiology Associates At the Baylor College of Medicine

I thank you for allowing us to discuss this extremely important topic with you and your family. If any questions arise please call our office to speak with Ms. Caroline McIntosh my Registered Nurses who will be your liaison before and after the in the TAVR

A handwritten signature in black ink that reads "Neil E. Shidman MD". The signature is written in a cursive, flowing style.