**Melanie Cole, MS (Host):** Welcome to the podcast series from the specialists at Penn Medicine. I'm Melanie Cole. And joining me today is Dr. Kendall Lawrence. She's a cardiac surgeon at Penn Medicine. And today, she's here to compare and highlight two treatments for severe aortic valve stenosis: surgical aortic valve replacement, or SAVR, and transcatheter aortic valve replacement, or TAVR. Both procedures are performed at Penn Cardiac Surgery, but in different populations and for different reasons. Can you please start by describing and reviewing some indications for both procedures? Give us a little evolution of how these both have come about.

**Kendall Lawrence, MD:** Sure. Well, thank you so much for having me today. This is a topic I'm really excited to talk about. It's one of the most common referrals that we get, and there's always a little bit of confusion as to the indications for one versus the other. So, traditionally, aortic stenosis, we have treated with surgical aortic valve replacement. Now, surgical aortic valve replacement comes in two flavors, both of the tissue variety or the biologic valves, and then also the mechanical valves. Starting about 10 to 15 years ago, though, we were able to introduce more minimally invasive valve replacement options for patients that had symptomatic severe aortic stenosis, and that is in the form of TAVR or TAVI valves.

Patients that should undergo either a surgical aortic valve replacement or a transcatheter aortic valve replacement are those that have symptomatic severe aortic stenosis. So, common symptoms of aortic stenosis would be shortness of breath, chest pain, or even more worrisome signs such as syncopal episodes.

When we think about which patients should undergo which type of therapy, either with traditional open surgery or transcatheter therapy, we take into account a lot of patient factors. One of the most important patient factors is age and then also their medical comorbidities.

So currently, the American Heart Association has put forth guidelines for which patients we should consider for which types of therapies. The data is pretty clear: for older patients greater than 80, or for patients that are considered high surgical risk, TAVR (or transcatheter aortic valve replacement) is going to be the preferred therapy. Similarly, for young patients, those that are less than 65 and low surgical risk, right now the American Heart Association is recommending that those patients undergo surgical aortic valve replacement.

The patients in the 65-year-old to 80-year-old category, though, is where things get a little bit more complicated. Traditionally, those patients have undergone surgery. But in the last 5 to 10 years, we've now entered into an era of shared

decision-making for those patients, where both SAVR and TAVR are viable options for these patients, and it takes an in-depth discussion with the heart team based on patient factors, anatomic factors, the presence of other comorbid conditions to make a decision about whether or not TAVR or SAVR is more appropriate for those patients.

**Host:** SAVR and TAVR, Dr. Lawrence, may be performed with either mechanical or bioprosthetic valves. I'd like you to speak about the relative advantages of each, why one might be preferred over the other. Speak about those and how that shared decision-making comes into factoring which one you choose.

**Kendall Lawrence, MD:** Great question. And again, this is another question that commonly comes up in the office. When we think about whether or not to place a mechanical or a biologic or tissue valve, it's a really complex decision that's made with the patients. So, some of the factors that go into the decision-making again are age of the patient and then patient's tolerance to blood thinners. So, placement of a biologic or a tissue valve does not mandate lifelong anticoagulation therapy like a mechanical valve does. However, there is limited durability to the tissue or the biologic valves. We often tell patients that they can expect a tissue or a biologic valve should last about 10 to 15 years based on the current data that we have.

There are certain patient factors that may accelerate tissue valves degeneration. Patients that are very young, for example, or patients that are on dialysis may undergo tissue valve degradation at a faster rate than those that do not have those conditions. A mechanical valve, we know, lasts about 30 years or longer. In many cases, a mechanical valve can last the entire lifetime of a patient. However, it does mandate that patients do take lifelong anticoagulation. Many young patients, particularly those that are interested in becoming pregnant or having children do not desire to have mechanical valves, because they do necessitate lifelong anticoagulation.

So, these are things that we have to talk about with patients in the office. And since we are talking about TAVR versus SAVR, one other thing that comes up when we're talking about tissue versus mechanical valves is that if a patient has a mechanical valve placed, they are not a candidate for a valve-in-valve transcatheter procedure later if the valve were to fail.

Alternatively, if the patient has a biologic or a tissue valve placed, and after 10 to 15 years that valve does deteriorate, and they do necessitate another

procedure for valve replacement, those with a biologic or a tissue valve may be candidates for a TAVR replacement.

So, very complex things that go into the decision-making process, lots of conversations with patients to kind of figure out what is most important to them. The American Heart Association does recommend for patients less than 50 that strong consideration be given for placement of a mechanical valve over a biologic valve, given its more long-term efficacy.

**Host:** Do you have a preference or anything you'd like to share with providers on the technical considerations with either?

**Kendall Lawrence, MD:** Sure. Well, one thing I do want to mention kind of along those technical lines is that the field of aortic valve replacement has come a long way in the past 10 years. So when a patient comes to me, particularly a patient with symptomatic aortic insufficiency or aortic stenosis, my toolbox is not limited to just valve replacement. In patients that have favorable anatomy, we can oftentimes repair aortic valves. We can also perform things like the Ross procedure, which is a procedure in which we take the patient's pulmonic valve and we transpose it into the aortic location. Both of these options, aortic valve repair and the Ross procedure, can be performed with good long-term efficacy and do not mandate the need for long-term anticoagulation.

So, there are important technical considerations to all of these operations, but I just wanted to make sure to point out that in a young patient with symptomatic aortic insufficiency and aortic stenosis, our toolbox has expanded over the past 10, 15 years, and we oftentimes are able to offer them other things besides valve replacement.

**Host:** Dr. Lawrence, TAVR has a long history at Penn Medicine, with Doctors Bavaria and Herrmann taking part in the landmark Placement of Aortic Transcatheter Valves, or the PARTNER, trial. What did this trial establish? What does an extensive history of single-center TAVR procedures contribute to outcomes?

**Kendall Lawrence, MD:** Sure. So, the PARTNER trial is one of the most important trials that has looked at the efficacy of TAVR valves as it relates to valve replacement to surgical aortic valve replacement. In this trial, patients were randomized to either undergo SAVR or TAVR valve. In the first iteration of the study, it primarily looked at older, more high-risk patients, but subsequent iterations of the study have looked at both intermediate and low risk

patients. And the trial has been instrumental in demonstrating the safety and efficacy of TAVR valves. Penn has played an important role in that trial, as you mentioned, with Dr. Herrmann and Dr. Bavaria playing very critical roles in the planning and execution of this study and enrolling patients throughout the trial.

**Host:** Dr. Lawrence, TAVR, with well-documented advantages in diminished pain, blood loss, length of stay has additional benefits for patients at high risk for surgery and particularly elderly patients. Can you discuss this as it relates to conscious sedation?

**Kendall Lawrence, MD:** Absolutely. So at Penn and nationally, over 95% of our TAVR procedures are performed under twilight anesthesia. So, they do not require general anesthesia. Patients are woken up in the operating room. We're able to do a very quick neurologic examination immediately after the procedure to make sure that there was no incidence of stroke. Also, it helps speed up the recovery immensely for elderly populations that can have a difficult time coming out of anesthesia and associated delirium issues from it. So, I think it does offer a huge advantage, particularly for elderly patients that were able to do this procedure under conscious sedation.

There are a few times when we are not able to perform the procedure under conscious sedation, most notably if we're doing things like alternative access TAVR, where we have to access the axillary artery or the carotid artery. But again, more than 95% of the time we're able to do this under conscious sedation.

**Host:** And you touched on this a little bit briefly before. I'd like you to speak about the multidisciplinary team that you work with, interventional cardiologists, cardiac surgeons, and how you all work together to determine that optimal approach.

**Kendall Lawrence, MD:** Sure. This is hugely important. So at Penn, we have the Penn Valve Center. Any patient that is coming to us with a diagnosis of aortic stenosis is going to be considered for both TAVR and SAVR. Any patient that enters into our system is going to be worked up. That's going to include evaluation by both a cardiac surgeon and an interventional cardiologist. Together, we will work to review the patient's pre-operative studies including their echocardiograms, their CT scans, the heart catheterizations that are performed, and together with the interventional cardiologist, the patient, the patient's primary cardiologist, together we will all make a decision about the best approach for the patient. It's a very individualized approach that we take to

valve disease, particularly aortic stenosis here at Penn.

**Host:** And finally, Dr. Lawrence, can you speak to our referring clinicians about Penn Cardiac Surgery and when you feel it's important that they refer for SAVR or TAVR and how might they contact the program directly?

**Kendall Lawrence, MD:** Sure. Any patient that has documented severe aortic stenosis should be referred. A lot of times patients, particularly our elderly patients, don't realize that they are having symptoms. It's important for us to see them when they meet that criteria for severe aortic stenosis so that we can really discern whether or not they would be candidates for either TAVR or SAVR. We're very interested in seeing all of these patients. We end up seeing a lot of patients that come with heart failure symptoms already in place. It is our goal to try to reach patients prior to the onset of heart failure. For anyone that would like to refer any patients, they can contact the Penn Valve Center and we would be happy to see them in our heart team clinic.

**Host:** Thank you so much, Dr. Lawrence, for joining us today. To refer your patient to Dr. Lawrence at Penn Medicine, please call our 24/7 provider-only line at 877-937-PENN. Or you can submit your referral via our secure online referral form by visiting our website at pennmedicine.org/referyourpatient. That concludes this episode from the specialists at Penn Medicine. I'm Melanie Cole.