

CASE STUDY

for U.S. health care providers

How Structural Heart Programs Can Reduce Time to Treatment

Four imperatives to streamline the pre-procedure process
and accommodate demand

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Overview

The challenge

To meet growing market demand, structural heart (SH) program leaders are focused on optimizing workflows to streamline access to treatment. Traditional workup processes for aortic valve replacement (AVR) procedures leads to an average intake to treatment timeline of 42 days. Treatment delays are associated with increased mortality rates.

The organizations

Atrium Health is a 45-hospital, integrated not-for-profit health system based in Charlotte, North Carolina. Its Sanger Heart & Vascular Institute operates from two sites and is currently staffed with three interventionalists, five cardiothoracic surgeons, four advanced cardiac imagers, one APP, four nurse navigators, and two schedulers. They perform ~500-600 SH procedures annually (half of which are TAVRs).

Sarasota Memorial Hospital is an 839-bed, not-for-profit regional medical center located in Sarasota, Florida. Its valve clinic team is currently staffed with four interventional cardiologists, five cardiovascular surgeons, seven cardiac anesthesiologists, one valve clinic coordinator, one patient care rep, nurses, cath lab staff, and echo techs. They perform 300 TAVRs and 500 other SH procedures annually.

The approach

High-performing structural heart programs manage growing procedural volumes while expediting time to treatment. They do this by augmenting their patient intake process, creating streamlined care pathways, tracking and reporting patient throughput, and prioritizing patient accessibility.

The result

Implementation of these approaches has resulted in significantly shorter referral-to-treatment timelines. Enhanced patient throughput also allows for programs to grow their volumes and improve patient experience and outcomes.

Approach

How Atrium and Sarasota ensure access to timely care

These organizations recognize that providing high-quality care starts before patients get to procedure day. This case study highlights four imperatives to optimize pre-procedural processes to ensure timely care and accommodate volumes despite throughput and capacity pressures.

The four imperatives

01 Expedite the screening process with up-front evaluation

02 Standardize pre-procedure workflows

03 Align team members around throughput targets

04 Equip patients to progress through care pathways

01 Expedite the screening process with up-front evaluation

In traditional practice, a patient is referred to a structural heart program and waits up to three weeks for the initial visit with a cardiologist. Then, it takes two to three more weeks to complete the screening and physician consults needed to determine a care plan. This timeline can be further exacerbated for organizations struggling with staffing shortages or burnout, which have increased due to the COVID-19 pandemic.

Programs can expedite this process by performing an initial clinical evaluation upon referral to inform care planning. Information on a patient's disease severity, symptoms, comorbidities, and other risk factors is often available at the time of referral. Advanced practice providers (APPs) can use that information to identify diagnostic needs and schedule testing before the first physician consult. This results in a more streamlined screening process and enables earlier access to test results needed to inform treatment next steps.

How Atrium uses APPs at intake to proactively identify patient needs

Atrium encourages referral of any patient with a valve disease to their Sanger Heart & Vascular Institute. Upon referral an APP reviews existing records to perform a baseline clinical evaluation of the case. This evaluation during intake enables APPs to proactively order tests for Valve Day¹, avoiding long wait times prior to initiating the workup process.

Because Atrium leverages clinical input as a first step, the heart team has a preliminary understanding of the patient's condition and can better prepare for next steps in the workup process. This pre-screening and proactive scheduling can reduce capacity constraints, minimize unnecessary testing, and enhance visibility and predictability of a patient's care journey.

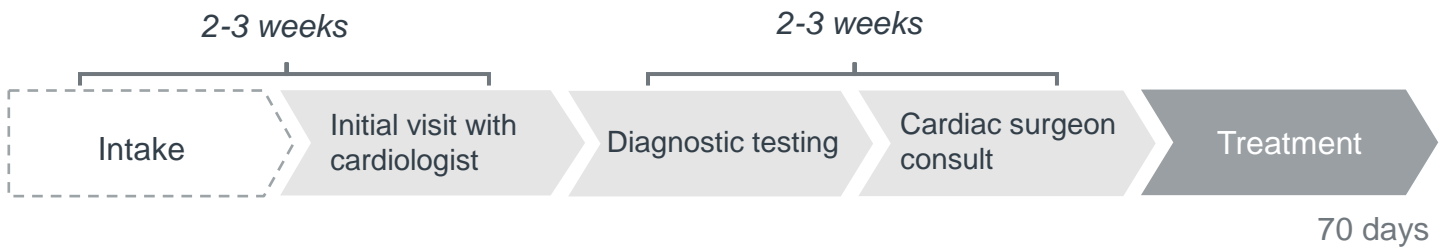
1. Valve Days are specific days of the week reserved for diagnostic testing and physician consults

Source: Atrium Health; Advisory Board interviews and analysis.

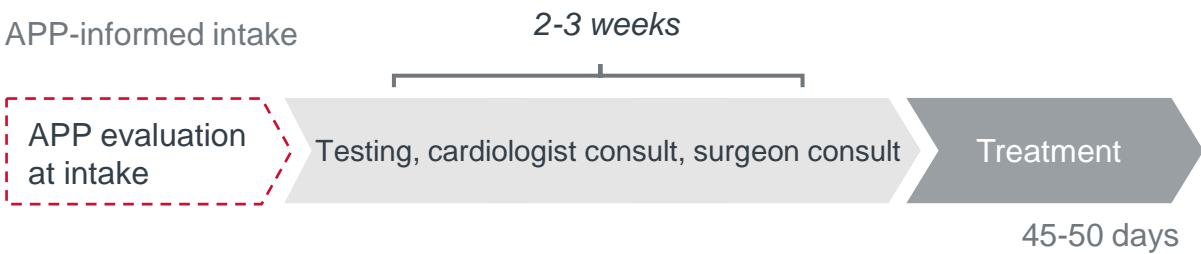
1. EXPEDITE THE SCREENING PROCESS WITH UP-FRONT EVALUATION

Atrium’s time to treatment with and without APP-informed intake

Traditional practice



APP-informed intake



Steps involved in APP evaluation process

1. Gauge appropriateness of the referral based on initial Echo results

Is this an appropriate referral to the Valve Center?

*If **yes**, is this...*

- A straightforward surgical candidate?
- A patient that can be managed via medications?
- An interventional candidate?

2. Determine the best clinical pathway for the patient

Is this a straightforward patient in which further evaluation by an interventional cardiologist (IC) is not needed?

*If **yes**, order necessary testing and proceed with Valve Day visit.*

*If **no** and this is a more complex patient, consult with IC and/or cardiac imager before ordering further testing.*

1. EXPEDITE THE SCREENING PROCESS WITH UP-FRONT EVALUATION

Train upskilled schedulers to operationalize early clinical evaluation

Atrium's process of APP-informed intake is possible only if all the necessary patient information is available. And that depends on the schedulers, who are the patient's first point of contact.

Structural heart programs can train scheduling staff to understand what information is needed for the APPs to make informed care decisions. These schedulers can coordinate with patients and referring physician offices to gather relevant information at intake. Upskilled schedulers are well versed in SH care and can even work with clinical staff to review previous test results, consultation notes from the referring physician, and comorbidities to risk-stratify patients and inform the patient's care plan.



SAMPLE PATIENT INFORMATION CHECKLIST:

- Patient demographics
- Images and clinical records
- Referral notes
- Prior testing history and results
- Insurance information

02 Standardize pre-procedure workflows

Diversified treatment options and expanded eligibility for patients with heart valve diseases has led to a growing demand for care. Given that patients present with a range of conditions and severities, the number of tests and consultations needed to determine the appropriate course of treatment is time and resource intensive. It requires a multi-step pre-procedure process that relies on coordination between departments. To enhance operational efficiency and accommodate volumes, programs create standardized pre-procedure workflows with replicable steps for patient workup.

How Atrium’s standardized pathways optimize pre-procedure care

Atrium’s pre-procedure workflow (see pg. 11) consists of three disease-specific care pathways designed to organize patients based on workup needed prior to Valve Day. Valve Days are specific days of the week reserved for diagnostic testing and physician consults—consolidating everything into two patient visits. This process flow standardizes work to help staff anticipate workloads and allocate time and resources accordingly. As a result, patients have fewer doctor visits, and the heart team gains the predictability needed to manage growing volumes.

ELEMENTS OF THE OPTIMIZED WORKFLOW

Condition specific care pathways

- “Fast track” patients who only need tests ordered and are ready for physician consult
- Mitral and more complex aortic stenosis patients who require additional review
- Straight surgical candidates who follow a predetermined CT surgery pathway.

Consolidated Valve Days

- Day 1: Diagnostic testing & Interventional Cardiologist visit
- Day 2: CT surgery consult & consults with other subspecialties as needed

Reserved scheduling blocks

- Reserved imaging/testing access on Valve Days
- Blocks on imager calendars to create a work queue for case review

Source: Atrium Health; Advisory Board interviews and analysis.



2. STANDARDIZE PRE-PROCEDURE WORKFLOWS

Atrium operationalizes Valve Days using reserved scheduling blocks

Valve Days are made possible by scheduling blocks that reserve access to necessary imaging and testing. Since capacity restraints can make it difficult to protect access to resources, Atrium had to make a case for why reserved access is crucial to patient outcomes and program success.

Tactics to make the case for reserved imaging and testing access



Use data to demonstrate need and potential impact

- Map out a sample patient pathway and pinpoint areas of inefficiency
- Quantify time lost to scheduling delays and highlight the timeline improvement potential of using scheduling blocks
- Compare current timelines to the 42-day national average
- Frame the ask as a patient-centered solution by explaining the correlation between care delays and adverse outcomes



Demonstrate commitment to a continued partnership

- Commit to monitoring utilization trends on a regular basis and adjust time blocks as necessary
- Guarantee to fill 8 patient imaging/testing appointment slots per week¹ and release any slots that are not filled 72 hours in advance

By demonstrating the mutual benefits of collaboration, Atrium’s heart team was able to establish leadership-buy in and secure reserved access to weekly imaging blocks.



FROM OUR INTERVIEWS

It should save staff time because we’re not playing Tetris trying to figure out what slot fits where with the physician and the team; every single week is predictable.

Cardiovascular director

Atrium’s Sanger Heart & Vascular Institute

1. Each patient gets between 2-4 tests/imaging done, so the heart team can guarantee that 8 patients can get all their recommended imaging done within the secured blocks

Source: Atrium Health; Advisory Board interviews and analysis.



2. STANDARDIZE PRE-PROCEDURE WORKFLOWS

Atrium created an imager queue to enable access to real-time consultation

The heart team uses schedule blocks to hold time for cardiac imagers on Valve Days. They have a work queue in the EMR where imagers review and leave input during these blocks. The queue creates on-demand access to imager review, enabling the heart team to make timely, informed decisions. Many organizations wait until the next multidisciplinary conference to get input from imagers, creating unnecessary delays.

How Atrium continues to adjust processes to enhance efficiency

This work requires trial and adjustment. Programs should continually evaluate and adapt their processes to identify areas for improvement, increase workforce capacity, and continue to meet growing volumes.

Since creating their valve center process flow in August 2021, Atrium has identified areas for improvement and implemented new solutions.

Inefficiencies identified

Used a single-day Valve Day model where patients would complete all testing and consults in one day



Went back and forth with schedulers in different departments to find available time slots



Used an informal e-consult for cardiac imager review that was not billable unless initiated by a cardiologist visit



Solutions implemented

Switched to a two-day model to reduce patient burden and give physicians time to make care decisions

Implemented schedule blocks to guarantee access and create predictable workflows

Moved to using the imager queue to enable on-demand access to imager consultation

RESULTS

19%

Growth in TAVR volumes¹

46%

Decrease in referral to workup complete time²

29

Procedures per month, on average

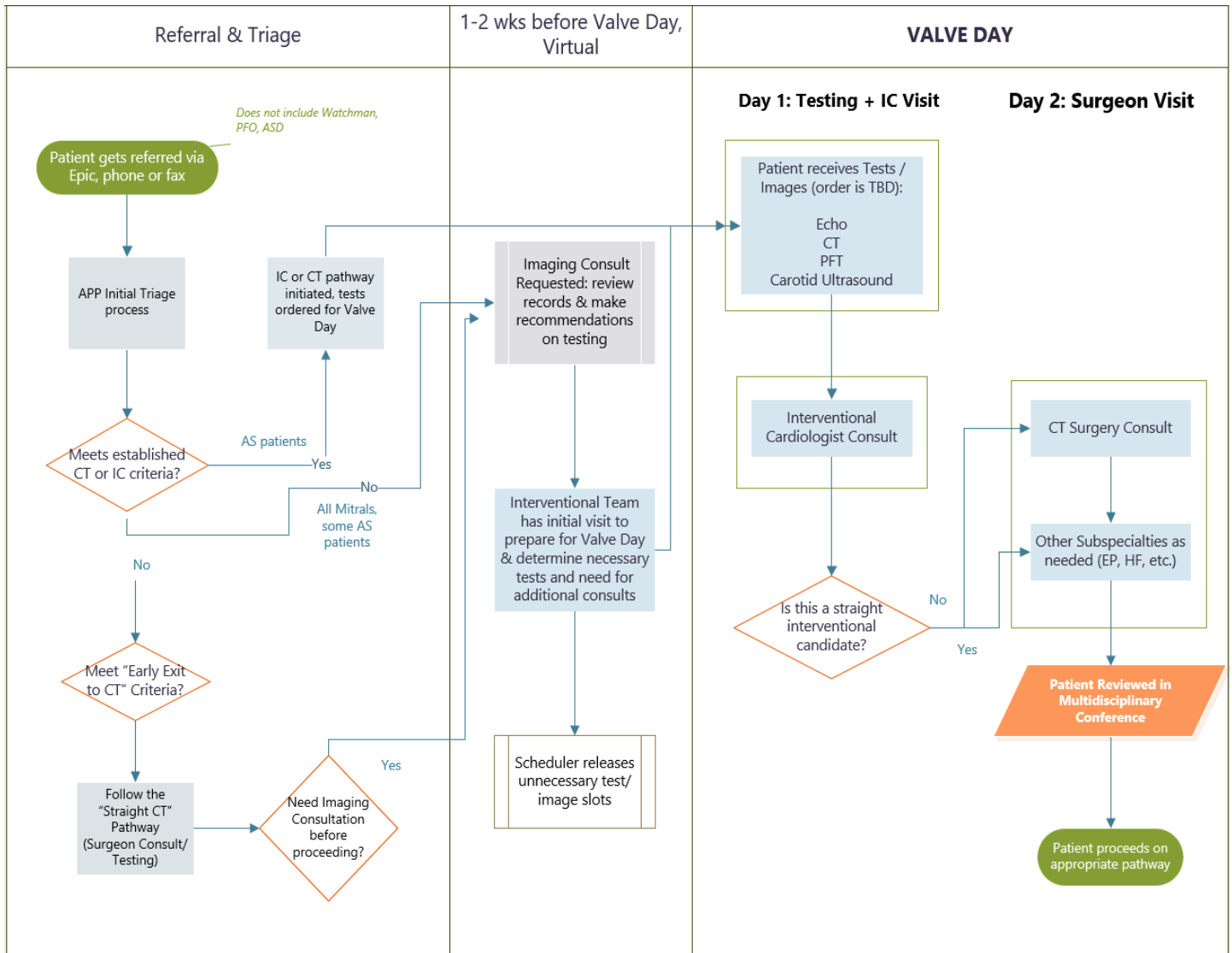
1. 346 cases
2. Time from an average of 70 days to an average of 45-50 days with the launch of this new model

Source: Atrium Health; Advisory Board interviews and analysis.

2. STANDARDIZE PRE-PROCEDURE WORKFLOWS

Atrium Health’s Sanger Heart & Vascular Institute’s Valve Center Process Flow

Atrium Health’s Sanger Heart & Vascular Institute developed the below process flow to optimize pre-procedure patient workup



03 Align team members around throughput targets

Programs can better manage patient volumes and reduce unnecessary wait times by aligning heart team members on their goals. Establishing reliable tracking methods and deliberate communication channels ensures everyone is on the same page, helping the patient to efficiently progress through the workup process and receive timely treatment.

Sarasota tracks active cases to ensure patients progress to treatment accordingly

The Valve Clinic Coordinator (VCC) maintains two systems to track all active cases, update patients position in the care pathway, and prioritize patients based on their health status or urgent needs.

1. List of all patients



- Updated 2-3 times a day
- Documents patient information/preferences that would be pertinent to a performing physician¹
- Lists assigned staff members

2. Calendar that shows where each patient sits in the care pathway



- Shows all active cases
- Color coded by physician
- Provides a visual aid to quickly see each physician's case load

Paying close attention to where each patient is in the workup process ensures patients receive treatment within the target timeframe. Case by case tracking helps individualize care by keeping patient names and their treatment plans highly visible.

1. Past medical history, list of medications, diagnostic testing that is upcoming/completed, research trial status, etc.



3. ALIGN TEAM MEMBERS AROUND THROUGHPUT TARGETS

Sarasota’s VCC distributes a weekly email to enhance alignment and accountability

The weekly email serves as an at-a-glance resource to inform team members about upcoming procedures and schedules. Enabling immediate access to patient information fosters team alignment and encourages self-service rather than relying on the VCC to be the sole source of information

Team members report knowing what to expect and where to quickly find what they need. This reduces time wasted searching elsewhere for information, gets ahead of hurdles that may prevent patients from moving through the care pathway, and helps Sarasota to reach its 14–21-day time to treatment target.



VCC WEEKLY EMAIL INCLUDES:

- ▶ Procedure schedule including procedure approach, vendor, and device size for each patient
- ▶ Heart team and screening schedules and action items for procedures and screening
- ▶ Integrated documents and templates to support pre- and post-op processes
 - An H&P template¹ incorporating all items for ACC/TVT database collection
 - Order sets for pre-TAVR and post-TAVR
 - Documentation template for billing and coding
 - Printed educational materials given to patients

1. History and Physical Examination

Source: Sarasota Memorial Hospital; Advisory Board interviews and analysis.

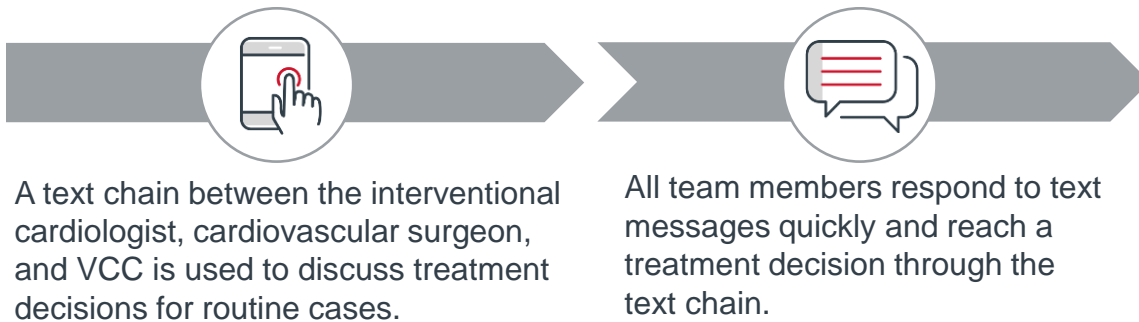


3. ALIGN TEAM MEMBERS AROUND THROUGHPUT TARGETS

Sarasota Heart team’s text message-based consultation

All structural heart programs have some form of a multidisciplinary conference to review and collaborate on cases. At Sarasota, these meetings are bi-weekly, meaning that treatment decisions could be delayed by over a week depending on timing. To make sure this bi-weekly schedule doesn’t delay treatment, Sarasota implemented a text-based consultation approach to collect real-time input from multidisciplinary team members.

How it works:



This enables immediate treatment decisions for routine cases and saves time during in-person meetings to focus on more complex cases.

RESULTS

400%

Increase in case volume

8-12

TAVRs a week, across two dedicated TAVR days

14-21

Day referral-to-treatment timeline

04 Equip patients to progress through care pathways

Hitting time to treatment targets is contingent on a patient's ability to navigate the many steps between referral and treatment. Programs should employ tactics to facilitate timely treatment based on common patient barriers.

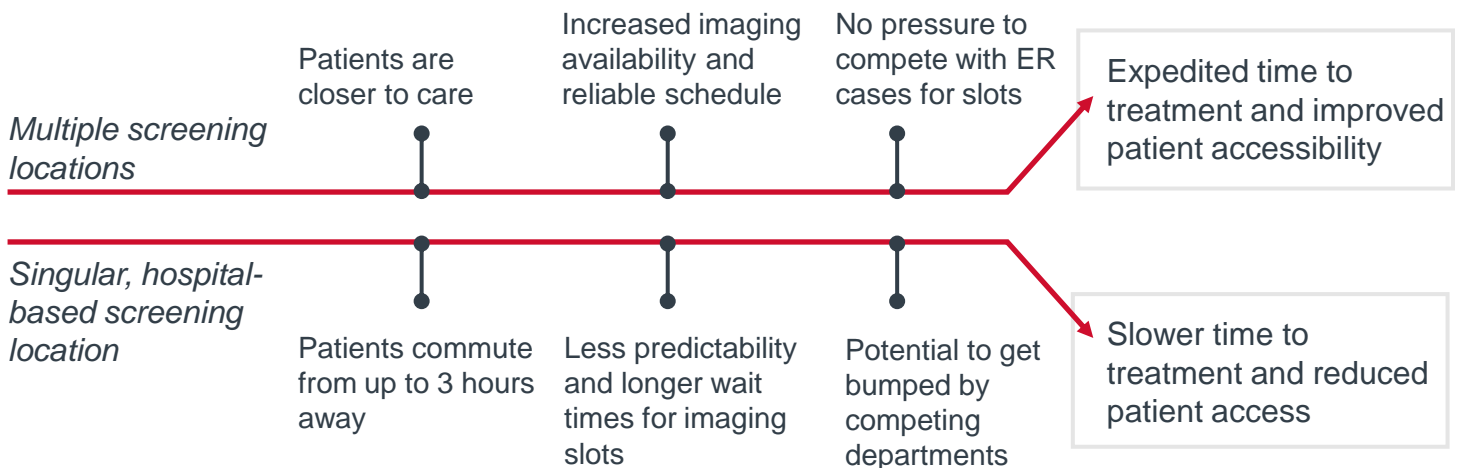


POTENTIAL BARRIERS TO TIMELY TREATMENT

- Long distance to screening facilities
- Unreliable transportation
- Lack of pre-visit preparation
- Unanswered questions about treatment options
- Patient hesitancy to pursue treatment

Sarasota's screening location flexibility improves access

Sarasota utilizes multiple screening locations to increase scheduling flexibility and accommodate patient commutes. Offsite screening locations often have more availability because they're not competing with other, high priority departments. The heart team's access to the CT schedule allows them to prioritize urgent cases by slotting patients into the next openings.



Source: Sarasota Memorial Hospital; Advisory Board interviews and analysis.




4. EQUIP PATIENTS TO PROGRESS THROUGH CARE PATHWAYS

Atrium’s patient resources enhance care quality and efficiency

The team at Atrium recognized that the extensive workup process for SH care can be overwhelming for patients. To alleviate some of that stress and help patients navigate their care, Atrium compiled a patient resource packet to give patients a “map” of what to expect in advance of Valve Day.

Providing educational and decision aid resources in advance of in-person visits saves time on Valve Day by helping patients to develop a baseline understanding of their condition and treatment options. Access to this information helps patients feel more prepared to engage in care decisions and provides the opportunity to identify questions prior to meeting with the heart team. Programs also have the opportunity to answer patient questions outside of visits by offering immediate access to staff. One way is to leverage upskilled schedulers (pg. 7) who are equipped to speak to the process at a high level.

 **PATIENT RESOURCE PACKET INCLUDES:**

- Welcome letter:** to orient the patient to the program
- Valve day itinerary:** includes doctor names (referring physician, SH IC, and surgeon), agenda outlining time and location for tests/consults, and contact information for patient questions
- Educational resources:** an explanation of valve disease (using easy to understand language and diagrams), list and definitions of diagnostic tests, explanation of treatment options, next steps for what the patient should expect during their visit
- A decision aid for shared decision making:** to facilitate patient involvement in treatment decisions and ensure they receive treatment that is the best fit

Source: Atrium Health; Advisory Board interviews and analysis.

4. EQUIP PATIENTS TO PROGRESS THROUGH CARE PATHWAYS

Atrium Health Sanger Heart & Vascular Institute patient itinerary

Atrium Health’s Sanger Heart & Vascular Institute uses the below patient itinerary to give patients an understanding of what to expect prior to Valve Day.



Valve Center Patient Itinerary

August 19, 2021

You have been referred by Dr. XXX to the Sanger Heart & Vascular Institute’s Valve Center. We look forward to caring for you. Below is your itinerary for your valve workup. Please refer to enclosed testing instructions for more details.

When you first arrive, please stop by Guest Services on the 1st Floor with any questions you may have!

Date/Time	Appointment Type	Location – SHVI Kenilworth <i>Location Address</i>
Testing / Diagnostics Information		
9am	Transthoracic Echocardiogram (TTE)	SHVI Imaging Center, 2nd floor
10am	CTA Chest / Abdomen / Pelvis	SHVI Imaging Center, 2nd floor
11am	Pulmonary Function Test (PFT)	JE Brown Pulmonary Medicine, 3rd Floor, Suite 3200
1pm	Carotid Ultrasound	SHVI Vascular, 4th floor
Cardiologist / Surgeon Visit		
1pm	Interventional Cardiologist / Dr. XXX	SHVI Structural Heart - 4th floor
1:30pm	CT Surgeon / Dr. XXX	SHVI CT Surgery - 4th floor

Have questions?
Scheduling Coordinator Phone #: Nurse Navigator Phone #: Gues Services:

Results

How we know it's working

Operationalizing these imperatives has demonstrated benefits in the three key areas:

- 1. Appropriate and timely access to treatment:** Reducing the time it takes for patients to receive an AVR procedure is essential to ensure the best possible outcomes. Sarasota was able to cut the national average intake to treatment time in half, while Atrium reduced its intake to treatment time by 25 days.

 - National average: 42 days
 - Atrium: 45-50 days
 - Sarasota: 14-21 days

- 2. Growth in program capacity:** Improving patient throughput allows programs to accommodate higher patient volumes. Standard care pathways help organizations identify and address inconsistencies to relieve capacity constraints. Sarasota Memorial Hospital and Atrium Health both have higher annual TAVR volumes than the national average and their optimized workflows play a role in making that possible.

 - National average: 84 TAVR procedures annually¹
 - Sarasota and Atrium average: 250-300 TAVR procedures annually

- 3. Enhanced patient experience:** Streamlining the pre-procedure process reduces the patient burden by limiting time spent attending doctor visits and gets them on the road to recovery sooner. Patients also know what to expect in their care, which supports a better experience.

1. The number of TAVR procedures performed per site varies, in 2019 sites performed 84 TAVR procedures on average with 161 sites performing less than 50 cases

Source: Glenn, Katie, "Report Finds TAVR is Dominant Form of Aortic Valve Replacement, Outcomes Steadily Improving in the United States," *American College of Cardiology*, 2020; Atrium Health; Sarasota Memorial Hospital; Advisory Board interviews and analysis.

Appendix

Example patient information included in Sarasota's weekly VCC email

Name **MRN¹** **Primary Care MD/ Ref MD/Treating MD** ____ kg ____ cm

- 87 yo DOE, fatigue, O2, weakness, ambulates w walker, SOB
- PMH- atrial fib on Eliquis, OSA, 40 lb wt loss, Stage IV CKD- on HD MWF, Osteoarthritis, Gout, Anemia, uterine CA, mod- severe MR, mod TR
- Low flow/low gradient
- TTE EF 40%, MG 44 mm Hg, PV 4.0 m/s, AVA 0.5 cm², EF 45%
- DSE PV 4.29, MG 46 mm HG, AVA 0.4 cm², EF 45%
- Cath- 6/28- W 35, large V wave, PHTN, CI 2.4, non obstructive CAD
- CTA- 6/30 Annulus 4.5 cm², min access 5 mm on L- loaded
- Creat 5.0 on HD
- STS 11.9% OHS- N
- Edwards 26 TF L CIA dissection
- Conscious sedation/No Foley/No CVL/TTE
- No Sentinel

1. Medical record number

Appendix

Atrium patient brochure

What to Expect from Your Heart Valve Procedure

Before your surgery, you will get a call from a healthcare team member. They will tell you everything you need to do and answer any questions you may have.

You will have to stay in the hospital on the day of your valve repair or replacement. You will have anesthesia, medicines to help you sleep and feel no pain. Your care team will watch you closely while you are in the hospital. They will also help you plan to leave the hospital. Most patients are able to go home after one night at the hospital.

Our team will plan your checkup visits. You will be referred to cardiac rehabilitation to help with your recovery. Your medicines will also be reviewed before you leave to make sure you are safe and feeling better.



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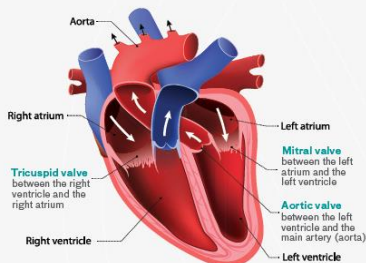
Approved by Atrium Health Cardiac Patient Health Education Committee, July 2021

Atrium Health Sanger Heart & Vascular Institute Adult Cardiology Kenilworth
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Your Heart Valve Plan

What is Heart Valve Disease?

Heart valve disease is when one or more of your heart valves does not work. There are 4 valves in your heart that keep blood flowing the right way. They are the aortic, mitral, tricuspid and pulmonary valves. Sometimes the valves do not open and close the right way. This makes it hard for blood to flow through your heart.



If you have heart valve disease, you may have these signs:

- Chest pain, fast or skipped heartbeats
- Shortness of breath, or trouble catching your breath
- Feeling tired and weak
- Feeling dizzy or faint
- Swollen ankles, feet or stomach

You are not alone! Millions of Americans are treated for heart valve disease each year.

Diagnosis and Testing

Your heart doctor will check your heart and listen for a murmur. A murmur is a swishing sound caused by rough blood flow. It can be a sign of heart valve disease. Your doctor may also order tests like:

- Echocardiogram – A sound wave test that shows your moving heart.
- Transesophageal echocardiogram – A thin tube is placed from your mouth to your stomach. It shows pictures of your heart without the ribs or lungs getting in the way.
- CT – A machine that takes detailed pictures of different parts of your heart.
- Heart catheterization – A thin tube is placed in your artery or vein. It looks at strains and blood flow in your heart.

Based on your tests, you may have one of these heart valve problems:



Source: American College of Cardiology

- Aortic or mitral valvular stenosis – Stiff or narrowed valves that lower the amount of blood that can flow through.
- Aortic or mitral valve regurgitation – A leaky valve that does not close all the way. This causes blood to move backward through the valve.
- Bioprosthetic aortic valve insufficiency/stenosis or prosthetic paravalvular leaks – Problems with or failure of surgical valves.

Treating Heart Valve Disease

When heart valves are damaged, diseased or do not work, they should be repaired or replaced. Finding out and getting care early are of great value. You can stop further harm to your heart. Your care plan depends on how bad your heart is.

- If you are having signs ...
- If you are getting worse ...

You will get great care from our heart care team. Here are a few ways we can treat your heart:

- **Medicine.** In some cases, your sickness may be able to be treated with medicines. Your doctor will order medicines to treat you. They will lower the risk of more harm to your heart valves.
- **Minimally invasive or catheter-based treatments.** We offer treatments other than surgery. They use less cutting, allow faster healing and shorten your hospital stay. These include:
 - o Transcatheter aortic valve replacement (TAVR) – We can replace the aortic valve through your leg arteries, instead of open-heart surgery.
 - o Transcatheter mitral valve repair – This is a fix of the mitral valve using a clip-like device to allow blood to keep moving through the heart.
- **Surgery.** Repair or replacement of a valve by open-heart surgery or minimally invasive surgery, which involves a cut in the chest.

Deciding to repair or replace valves depends on things like your age, overall health, how bad your valve is and whether you have other heart problems. The treatment you have will depend on your situation, as well as the expertise and experience of your heart team.



Appendix

Atrium welcome letter

Atrium’s welcome letter includes a page to orient patients to the program and set expectations for their visit (included below), and a page that includes photos and job titles to introduce the members of their heart team.



Atrium Health Sanger Heart & Vascular Institute Valve Center

What makes our program stand out?

- Welcome to our Valve Center!
- You can expect the best care from our team of heart doctors, surgeons and imagers.
- Our advanced practice providers (APPs) and nurse navigators will also be a vital part of your care team. They will be with you from your first visit to your last health exam.
- We will make sure your main doctor or heart doctors know about your care.
- Our care will be *centered around YOU, our patient*. We set up your care based on your health needs.
What that means is, most tests and visits with your doctor and surgeon should take 1 to 2 visits.
- Our program offers you new technology through clinical studies that other centers do not have.
- *What does that mean for you?* This means you can expect to get the best care from expert doctors.



What can you expect from your visit?

- We will look at your records to make sure you get the testing you need.
- You may need to first see a heart doctor for a video visit. They will choose the best tests for you.
- On your Valve Day, you will have all your tests done. You meet with your heart doctor and surgeon on the same day.
- If tests were done before your Valve Day, you will only meet with your doctors. They will share your care plan with you.
- While you are here, our team will review the results of your tests and decide the best care for you.
- We will work with your main doctor and give them updates throughout your care with us.

Your Valve packet will have a Valve Day Itinerary with your schedule for the day. It will also have Your Heart Valve Care Plan.

Source: Atrium Health; Advisory Board interviews and analysis.

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