PANEL DISCUSSION

Modern Valve Intervention Workflows: Maintaining Efficiency Across Applications and Indications

How top practices are handling high volumes and today's aortic, mitral, and tricuspid applications.

With Mazen Albaghdadi, MD, MSc, and Natalia C. Berry, MD, MBA

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How have structural heart volumes changed at your institution over the last several years across aortic, mitral, and tricuspid applications?

Dr. Albaghdadi: We have experienced growth in all the major forms of adult transcatheter valve intervention. Tricuspid has been one of the leading areas of growth, as we have been fortunate to participate in various pivotal trials in the tricuspid space, which has enabled us to be in a strong position to pivot to scaling commercially after approval. Furthermore, participation in clinical trials for tricuspid (transcatheter edge-to-edge repair [TEER] and transcatheter tricuspid valve replacement [TTVR]) has led to growth in transcatheter aortic valve replacement (TAVR) and mitral interventions given the frequency of multivalvular disease in these patients.

Dr. Berry: Structural heart volumes are growing markedly across all valve subtypes at our institution, similar to what is happening on a national scale. From 2020 to 2025 at our institution, TAVR volume increased by 50% and mitral TEER and tricuspid TEER volumes doubled. In the last year, with the approval of the Evoque system (Edwards Lifesciences) and Sapien M3 system (Edwards Lifesciences), TTVR and transcatheter mitral valve replacement (TMVR) volumes have surged from low (and primarily clinical trial enrollment) to now moderate volumes, and the landscape foreshadows marked further increases. Further device approvals across the aortic, mitral, and tricuspid space also portend further volume increases going forward.

What operational changes have been most important in helping your program scale effectively?

Dr. Berry: Our program has successfully scaled dramatically over the last few years. Daily procedure capacity has increased from three to seven TAVRs

(with a single room/team), accomplished by streamlining procedural steps and prioritizing room turnover. A second procedural day was added in the past year to accommodate additional cases. Operator staffing has also increased, with the addition of one structural interventional cardiologist and several new cardiac surgeons. The hospital added a new pavilion floor, thereby increasing inpatient cardiac bed capacity. From a preprocedural workflow standpoint, additional CT scanners have been added both at our main hospital and satellite institutions. Additionally, we have begun opting for same-day discharge in patients for whom it is clinically appropriate to enable faster throughput.

Dr. Albaghdadi: Having supportive cardiology and hospital leadership has allowed us to be nimble and accept up-front costs for downstream growth. Scaling for procedures without established reimbursement pathways can be challenging for smaller health care systems, but it can also be a key to growth and scaling. We have a robust and very capable structural heart team that includes nursing, navigators, schedulers, and administrators. Operationally, we could not be successful without all of these factors and key stakeholders.

What are the primary operational bottlenecks in contemporary valve programs? What specific valve applications currently place the greatest strain on workflow, staffing, imaging, etc?

Dr. Albaghdadi: Cath lab staffing is an increasingly common and difficult-to-manage operational bottleneck. There are many factors that contribute to shortage of qualified and committed cath lab staff members, including training and compensation. Workflow is also impacted by the operations of the hybrid operating room (OR) wherein a surgical team and cath lab team are often serving in redundant roles.

Dr. Berry: In contemporary valve programs, the major bottlenecks in TAVR have generally shifted from procedural capacity to upstream and downstream workflows such as patient evaluation, imaging, multidisciplinary decision-making, and longitudinal care coordination. For many programs, the largest constraint is preprocedural imaging and planning, relating to delays in scheduling preprocedural CT scans and limited imagers and advanced three-dimensional (3D) reconstruction capabilities.

The heart team coordination process, while critical, has also been a bottleneck for programs, requiring involvement of interventional cardiology, cardiac surgery, and often other specialties such as heart failure, anesthesia, and cardiac imaging. It is worth noting that with the recent Centers for Medicare & Medicaid Services (CMS) National Coverage Analysis proposed decision memo for TAVR (released June 15, 2026), the heart team requirements have become less stringent, with only one heart team operator required to evaluate a TAVR patient in person. This new requirement, if widely adopted and implemented, may reduce bottlenecks in preprocedure access and workflows.

For nonaortic valve procedures, procedural capacity will likely represent an ongoing bottleneck. Tricuspid and mitral procedures are more resource intensive, requiring anesthesia and cardiac imaging support, with longer procedure times and the potential to stress current system capacity, especially as volumes grow.

As tricuspid and mitral intervention volumes grow, what unique workflow or infrastructure challenges are emerging compared with established TAVR programs?

Dr. Berry: Compared with TAVR, which is highly standardized with 1- to 2-hour cases and frequent next-day discharge, tricuspid and mitral interventions often involve more complex anatomy requiring general anesthesia, extensive intraprocedural imaging support with transesophageal echocardiography (TEE), multiple devices and/or repositioning, and longer procedural times.

This creates challenges for catheterization lab scheduling, as well as staff utilization, anesthesia support demands, and increased room turnover time. Structural heart program pathways designed around shorter TAVR throughput assumptions no longer apply to programs offering the full scope of valvular intervention.

Given that mitral and tricuspid patients often have higher comorbidity levels with multiple valve pathologies, pulmonary hypertension, and right ventricular dysfunction, there is a greater need for multidisciplinary team effort and evaluation to ensure appropriate patient selection. In particular, partnerships with specialties such as heart failure, geriatrics, and palliative care will be paramount to ensuring appropriate timing and delivery of therapies across the spectrum of valvular disease. All of these challenges are unique aspects with which programs growing in the mitral and tricuspid space will need to navigate.

Dr. Albaghdadi: Highly skilled interventional imagers are highly sought after in cardiology today. We are lucky to have a very skilled imager who greatly facilitates TEER and TTVR cases. Furthermore, not all imaging infrastructural components of TEER and TTVR (ie, TEE, angiography, hybrid systems) are created

equally, and having access to the latest technology is key. Contemporary TAVR programs are all about planning, and the preferred intraprocedural imaging modality is fluoroscopy, and so many of these can and should be done in cath labs (not hybrid ORs) in my opinion.

Which aspects of modern valve workflow can realistically be standardized, and where will variability likely always remain?

Dr. Berry: Within the domain of TAVR, referral intake and patient navigation—which involves steps including referral reception, record obtaining, severe aortic stenosis (AS) verification, CT and consultation scheduling, heart team presentation and procedure scheduling—can be standardized with the use of automated referral triage, missing-data alerts, scheduling workflows and checklists, and discharge pathways. CT measurement is already automated to a certain extent and can likely be further standardized, with artificial intelligence (AI) systems able to automate segmentation, landmark detection, measurement generation, and preliminary reports. In addition, software may be able to suggest valve platform/sizing, implant depth targets, and access strategy.

Areas where variability will ultimately persist will be: (1) borderline treatment decisions such as low-flow, low-gradient AS, mixed valve disease, and discordant imaging findings; (2) lifetime valve treatment strategy for younger patients; (3) complex anatomy such as bicuspid AS, valve-in-valve (ViV) procedures, and patients with severe left ventricular outflow tract (LVOT) calcification and/or coronary obstruction risks.

Ultimately, a large portion of TAVR workflow can be standardized, but the highest-value clinical decisions will likely remain variable and patient-specific because they depend on patient anatomic considerations, clinical judgment, and evolving experience/evidence.

Dr. Albaghdadi: Preprocedural workups, which are often streamlined versions emulated from clinical trial protocols, can be standardized, particularly in the mitral and tricuspid space. Periprocedural management of common complications like conduction disturbances for TAVR patients can also be standardized (at least to some degree) to minimize variability in management, set expectations, and achieve excellent outcomes. Variability in timing and modality for treatment of mitral and tricuspid patients (particularly for tricuspid intervention) remains a challenge.

What metrics does your valve program prioritize most closely, and what benchmarks best define an efficient structural heart program?

Dr. Albaghdadi: As with other programs doing structural heart interventions, we participate in the STS/ACC TVT registry and follow our outcomes very closely, with an eye toward targeted quality improvement initiatives. Expediting evaluation and treatment for symptomatic severe AS is also a key priority for our program.

Dr. Berry: Our program prioritizes quality and clinical outcomes above all else, and we are proud of our excellent procedural outcomes and low rates of complications.

An additional metric prioritized is overall procedural efficiency, where our typical skin-to-skin time is near 30 minutes. Shorter procedural times may confer a reduced procedural risk as well as enhance turnover time and throughput capacity. Our catheterization lab has also focused this past year on first-case on-time starts, which has enabled an efficient start to the day and minimized up-front delays in cases.

The patient experience is also critical, with priorities placed on expedient times from referral to consultation, imaging, and procedural scheduling where possible. Expanded CT imaging capabilities, new structural team hires (interventional cardiology and cardiothoracic surgery), as well as inpatient bed expansion have provided the necessary infrastructure support for streamlined workflows. On the postprocedure front, next-day discharge is prioritized, with a more recent shift toward same-day discharge when clinically appropriate and possible.

How are leading structural programs optimizing imaging workflows across valvular interventions, particularly with regard to CT planning, intraprocedural imaging, and multidisciplinary imaging view?

Dr. Berry: Historically, cardiac CT planning focused on annular sizing, coronary relationships, and iliofemoral analysis for TAVR. Leading centers now can use CT as comprehensive procedural planning across aortic, mitral, and tricuspid interventions. Current and evolving best practices include:

- Dedicated structural CT protocols with physician-led segmentation and interpretation
- Routine 3D reconstruction of valve anatomy, landing zones, calcium distribution, and vascular access
- Prediction of procedural risks such as coronary obstruction, LVOT obstruction in TMVR, annular rupture, device malposition, and access complications
- CT-derived fluoroscopic projection planning before the patient enters the lab
- Virtual device implantation and procedural simulation for complex mitral and tricuspid cases

Many leading centers have dedicated structural imagers performing CT segmentation rather than relying solely on radiology workflows. Intraprocedural imaging has evolved to rely on CT-derived deployment views, real-time multiplanar reconstruction, fusion of preprocedural CT, intraprocedural TEE, and/or 3D intracardiac echocardiography (ICE). In tricuspid intervention especially, ICE adoption alongside TEE has improved visualization, allowing optimized procedural times and outcomes.

Dr. Albaghdadi: Cardiology ownership over CT is key for optimizing imaging workflows, and incorporating the cardiac imager into the heart team meetings is also key. Intraprocedural imaging for TEER and TTVR, as noted previously, is critical to the success of these cases, and knowing when to integrate ICE is paramount to success.

In what ways do structural heart programs need to evolve over the next decade to adapt to new technologies, an aging population, and expanding indications?

Dr. Albaghdadi: I think the main areas are technology integration and iteration (eg, when to adopt next-generation TAVR platforms), TEER evolution toward more complex anatomy, and lowering the learning curve for TEER, particularly for tricuspid interventions, through training, imaging evolution, and device developments. Furthermore, expanding indications to lower-risk patients requires a more careful and thoughtful approach to patient selection that will likely see greater incorporation of modeling technology to predict things like durability or coronary hemodynamics. Lastly, screening and detection need to continue to evolve to identify and treat eligible patients through community outreach and screening partnerships. Obtaining an echocardiogram is fairly easy to do. Patients should not always have to come to the hospital to get one.

Dr. Berry: Ongoing evolution of structural heart programs to support wider indications and broader device pipelines will be critical moving forward. Expanding procedural throughput from an efficiency standpoint requires dedicated TAVR blocks, reserved anesthesia support where appropriate, and deliberate staffing models. Outpatient pathways need to prioritize expedited workflows that may leverage the less burdensome TAVR National Coverage Determination posited by CMS last month.

It is likely that more TAVR centers will be able to open with less stringent procedural volume requirements, which will offload some of the volume of straightforward TAVRs from current large-volume centers. However, these existing high-volume centers need to be able to absorb higher proportions of more complex TAVR, including the estimated 15% of TAVR expected to be ViV TAVR by 2035. Additionally, with the advent of multiple new mitral and tricuspid options, capacity will need to be expanded for more complex procedures.

At existing centers, standard TAVR procedures are likely to shift to ambulatory surgical centers, with a greater emphasis on nurse-led conscious sedation and same-day discharge.

The highest-performing structural heart programs of the future will look less like procedural services and more like integrated valve care platforms with centralized imaging and planning, AI-assisted case preparation, dedicated multidisciplinary teams, longitudinal patient management with robust patient monitoring, high procedural capacity with shorter lengths of stay, and formal lifetime valve strategy planning. ■

Disclosures
Dr. Albaghdadi: Consultant to and speakers bureau for Edwards Lifesciences; consultant to Boston Scientific.
Dr. Berry: None.