Penn Heart & Vascular

Pioneering the future of Valve Disease Treatment

Full clinical activity report
Penn Medicine is pleased to provide you with the second in a series of updates on Penn Heart & Vascular activities, outcomes and accomplishments through 2012.

This icon represents online access to videos of Penn experts and additional highlights.

Visit [PennMedicine.org/heart/outcomes](http://PennMedicine.org/heart/outcomes) for more information.

**Wilson Szeto, MD,** reviews the advantages of aortic valve repair vs. replacement in younger patients (<60 yrs).

**Howard Herrmann, MD,** reflects on the current state of transcatheter aortic valve replacement and offers his expectations for the future of the therapy.

**Robert S. Farivar, MD,** provides commentary for a port access mitral valve repair for a patient with ruptured chordae tendinae.

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**Penn PhysicianLink**

For patient consults, referrals, or transfers, call 877.937.PENN (7366) or visit [PennMedicine.org/PhysicianLink](http://PennMedicine.org/PhysicianLink).
The Penn Heart Valve Disease Program
The surgeons and vascular interventionalists of Penn’s Heart Valve Disease Program have mastered the pathodynamics of heart valve injury and the complexities of mitral and aortic valve repair and replacement, and have consistently acquired or developed innovative technologies to complement their skills in the operating room. This combination of technical expertise, experience and vision drives the constant improvement that defines the Program and its future.

A Multidisciplinary Approach Focused on Expertise and Technological Advances
Most valve disease in adults involves stenosis and/or insufficiency of the mitral and aortic valves, with a minority occurring in the tricuspid and pulmonary valves. Because the Heart Valve Disease Program is comprised of both cardiac surgeons and interventionalists, treatments for virtually all disorders affecting the cardiac valves—including combined procedures and valve-sparing procedures—are available at Penn Medicine at every stage of disease.

Consistent Increases in Valve Procedure Volumes
The Penn Heart Valve Disease Program provides single-center access to superior interdisciplinary, patient-specific treatment for patients with valve disease. Since 2001, the number and proportion of mitral and aortic valve procedures has increased consistently at Penn.

In 2012 alone, 1259 mitral and aortic valve procedures (including TAVI, as well as repairs and replacements) were performed at Penn Medicine.

Mitral Valve and Aortic Valve Repair and Replacement Procedures
FY 2005 – FY 2012, N = 11,069

PennHeartVascular directly focuses on providing access to superior interdisciplinary patient-specific treatment for patients at every stage of valve disease.

PennMedicine.org/heart/outcomes
INNOVATION
Cardiac surgeons and interventional cardiologists at Penn Medicine are involved in translational medical device research and the development of novel techniques to treat mitral and aortic valve disease.

INDIVIDUALIZED CARE
The Penn Heart Valve Center provides single-center access to superior interdisciplinary, patient-specific treatment for patients with valvular disease.

INSTRUCTION
Among the world’s most selective institutions, Penn Medicine’s valve disease treatment program is concentrated on clinical research and the practical application of technique in preparation for active careers in cardiovascular surgery and interventional medicine.

The total volume of aortic, mitral, tricuspid, pulmonic and combined valve procedures at Penn has grown by more than 37 percent since 2003, demonstrating the vast experience of our cardiovascular surgeons and the increasing introduction of clinical research and innovative technologies into the operative sphere.

Penn’s Total Valve Surgery Volume
CY 2007 – CY 2012, N= 6,333

- Pulmonic Valve: N=22 • 0.3%
- Aortic Valve: N=3,338 • 52.7%
- Mitral Valve: N=2,040 • 32.2%
- Tricuspid: N=94 • 1.5%
- Combined Valves: N=839 • 13.2%

PennMedicine.org/heart/outcomes
Treatment of Mitral Valve Disease

Between 2007 and 2012, almost 2,900 mitral valve (MV) procedures were performed at Penn Medicine, including isolated MV repair and replacement surgeries.

Surgical Techniques and Options for Patients with Mitral Valve Disease
A selective review of the surgical techniques and options for patients with mitral valve disease at Penn includes:

- Repair via sternotomy
- Minimally-invasive sternal-sparing surgery
- Robotic surgery with three-dimensional endoscopic imaging
- Advanced port access surgery

Mitral Valve Research

OFF-PUMP MITRAL VALVE REPAIR
Penn surgeon Y. Joseph Woo, MD, is performing off-pump coronary artery bypass graft (CABG) plus reduction annuloplasty to relieve symptoms in patients with functional ischemic mitral regurgitation as a participant in the Randomized Evaluation of a Surgical Treatment for Off-Pump Repair of the Mitral Valve (RESTORE) study.

MITRACLIP PERCUTANEOUS THERAPY FOR HIGH SURGICAL RISK PATIENTS (COAPT)
The COAPT Trial is investigating the safety and effectiveness of the MitraClip System for the treatment of functional mitral regurgitation in symptomatic subjects at too high risk for mitral valve surgery. The MitraClip is a percutaneously implanted mechanical clip that creates a tissue bridge between the anterior and posterior leaflets.

Minimally Invasive Mitral Valve Repair
Most MV repairs at Penn are performed as minimally invasive procedures, which are associated with shorter hospital stays, diminished blood loss and less infection risk. Minimally invasive MV procedures at Penn include port access via right mini-thoracotomy and upper and lower hemi-sternotomy.

Port Access Mitral Valve Repair
Penn Medicine is a national leader in minimally invasive port access MV repair, an approach that avoids full sternotomy. Clark Hargrove, MD, of Penn, is a nationally recognized leader in port access surgeries, having performed hundreds of these procedures since 1998.

Reoperative Port Access Surgery
Port access MV surgery in the context of previous cardiac surgery (including CABG, aortic valve replacement, MV repair/replacement and combinations of these surgeries) is routinely performed at Penn with minimal morbidity and mortality.

Bloodless Mitral Valve Surgery
Bloodless MV surgery is performed by Robert S. Farivar, MD, at Pennsylvania Hospital in a specialized center for minimally invasive and conventional bloodless cardiac surgery.

Mitr Valve Repair & Replacement Procedures
FY 2007 – FY 2012, N = 2,897

- Isolated MV Repair
- Isolated MV Replacement
- MV Repair and Other
- MV Replacement and Other
Treatment of Aortic Valve Disease

3,748 aortic valve procedures (including TAVI) took place at Penn Medicine between 2007 and 2012.

Aortic Valve Disease
Historically, Penn cardiac surgeons have advanced the paradigm of aortic valve (AV) surgeries of all types, including:

- Resuspension of the aortic valve in acute-type A aortic dissection
- Valve-sparing aortic root replacement with preservation of the native aortic valve
- Aortic valve cusp repair, including repair of the bicuspid aortic valve

The imperatives driving AV repair at Penn are to avoid the risk of complications (such as thromboembolism, endocarditis, bleeding, stroke and structural deterioration); to eliminate anticoagulation; and to provide the potential for longer (indefinite) durability and a better hemodynamic profile in patients with AV disease.

Valve Sparing Aortic Root Replacement with Hemiarch Reconstruction

Aortic Valve Procedures

- **TRANSCATHETER AORTIC VALVE REPLACEMENT (TAVR) FOR AORTIC STENOSIS**
  Penn Medicine interventional cardiologists and cardiac surgeons are among the most experienced in the country at transcatheter aortic valve replacement (TAVR) surgery for patients with aortic stenosis who are not candidates for open-heart surgery. TAVR uses a biological valve crimped onto a stent, folded inside a large bore catheter and deployed over the calcified native aortic valve, typically eliminating the need for surgical removal.

- **AORTIC VALVE-SPARING ROOT PROCEDURES**
  Penn cardiovascular surgeons continue to treat patients previously thought of as high risk for valve-sparing aortic root replacement procedures. This population includes older and technically challenging patients with previous aortic dissections, patients with bicuspid aortic valve procedures and Marfan’s syndrome patients with significant aortic insufficiency requiring cusp repair.

- **AORTIC ROOT PROCEDURES**
  Penn is actively investigating new bioprosthetic, composite and valve conduits for treatment of aortic root pathology. These devices permit aortic root replacement in a variety of settings, including acute dissection and endocarditis. When evaluated at Penn, all prosthesis types have resulted in favorable hemodynamic and ventricular remodeling.

- **ISOLATED BICUSPID AORTIC VALVE REPAIR**
  Bicuspid aortic valve (BAV) is common and clinically significant. Today at Penn, Joseph E. Bavaria, MD, employs advanced reconstructive techniques to spare the native valve in patients requiring BAV repair. Consequently, following the mitral valve paradigm of the past 15 years, it is now possible to repair most purely regurgitant bicuspid aortic valves.
Transcatheter Aortic-Valve Replacement for Inoperable Severe Aortic Stenosis: The PARTNER Trial

Penn Medicine was among the first sites to participate in the Placement of AoRTic TraNscaThetER Valves (PARTNER) trial, which compared the safety and effectiveness of transcatheter aortic valve replacement (TAVR) to standard therapy in inoperable patients with severe aortic stenosis (aortic-valve area of <0.8 cm²). Standard therapy included balloon aortic valvuloplasty.

Post-trial analysis at two years found that the rate of death from cardiac causes among the standard-therapy group was twice that of patients in the TAVR group (62.4% vs. 31.0%, P<0.001). Death from any cause was also significantly higher among patients in the standard therapy group as compared to patients in the TAVR group (68.0% vs. 43.3%, respectively; P<0.001).

PARTNER: Phase II

The second phase of the PARTNER trial is evaluating the treatment of patients with aortic stenosis at high risk for increased operative complications and death randomized to either TAVR with the SAPIEN XT transcatheter aortic valve or surgical aortic valve replacement (SAVR). Delivered through an 18F sheath, the Sapien XT valve has a lower profile than its predecessor, permitting stent placement for the broad population of patients with smaller femoral arteries who were previously excluded from stent therapy. At one year, the rates of death from any cause were 26.8% and 24.2% for SAVR and TAVR, respectively (P = 0.001 for non-inferiority). At two-years, TAVR was similar to surgical replacement for rates of death from any cause.

PARTNER: Significant Increase in Survival Among TAVR Patients Compared to Standard Therapy in the Medical Management of Severe Aortic Stenosis at 2 Years*

Hazard Ratio, 0.44 (95% CI, 0.32–0.60)  
P<0.001

Death from Cardiovascular Cause (%)

Hazard Ratio, 0.93 (95% CI, 0.71–1.22)  
P=0.62

Death from Any Cause (%)

0 Months 6 Months 12 Months 18 Months 24 Months

Standard Therapy – Number at Risk
179 121 85 62 42

TAVR – Number at Risk
179 138 124 110 83

Surgical – Number at Risk
351 252 236 139 65

Transcatheter – Number at Risk
348 298 260 147 67

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An Exclusive Program for Referring Physicians

Penn Medicine is committed to its role as a world-renowned resource for consultation, diagnosis and providing the most advanced treatment options in the region. Penn PhysicianLink simplifies the lines of communication between referring physicians and Penn Medicine. This comprehensive, coordinated collection of support services expedites and facilitates consults, referrals and transfers for all heart and vascular patients.

877.937.PENN (7366) • PennMedicine.org/PhysicianLink
Exclusive, Physician-Only Telephone Line  877.937.PENN (7366)
This single, dedicated physician-only telephone line offers direct access to a special Call Center reserved for medical professionals to facilitate patient consults, referrals and transfers to Penn Medicine. The physician-to-physician phone line is available 24-hours-a-day, seven-days-a-week. All calls will be answered within three rings, helping to expedite referrals, transfers, consults and appointments. By calling just one number, physicians and their staff will have access to any Penn Medicine physician and/or location.

Urgent Transport Services
Rapid access to emergency services including Penn Heart Rescue® and PennSTAR® flight medical transportation are available for referring physicians. PennSTAR provides rapid transport of critical care patients between medical centers, as well as “on-scene” services at the site of accidents and trauma-related incidents. Support for major disasters and organ transplant teams are also provided.

Online Resources  PennMedicine.org/PhysicianLink
Penn Medicine offers referring physicians access to patients’ medical records. An online physician portal on PennMedicine.org grants referring physicians access to a patient’s clinical information and medical records including:

- Patient Encounters
- Procedure Reports
- Physician Correspondence
- Medical History
- Lab Reports
- Cardiology Reports
- Allergies
- Radiology Reports
- Medications
- Problem List