Leading the evolution of cardiovascular care.

The true hallmarks of a world class cardiovascular program are having extraordinary breadth and depth of knowledge extending across intersecting specialties, strengthened by an organization that supports those efforts resulting in superior clinical outcomes. I am pleased to present this MedStar Heart & Vascular Institute Capabilities Performance and Outcomes Report, in which I believe these attributes are demonstrated in abundance.

This report displays our continued dedication to increasing understanding of cardiovascular care across the wide geographic region that we serve. No matter the patient’s point of entry, it is our promise that each will receive the same high-quality care. Additionally, our growing understanding of the connectivity between organ systems and disease states demands an approach that facilitates linkages that span traditional specialty lines, and our “systemness”connectively promotes this kind of collaboration.

This has been no greater test of our system’s personal and professional ability to adapt than the worldwide coronavirus pandemic. We quickly reoriented the way we interact with patients and each other, Virtual patient appointments replaced in-person encounters whenever possible. Conferences turned virtual almost overnight. A robust digital campus was created for continuing education. All of this has been a nearly seamless transition and the experience will no doubt have an impact on how we deliver medical care—and continually educate ourselves—long after COVID-19 is no longer an immediate threat.

A great cardiovascular program is first and foremost built upon a contingent of superior clinicians who interact and collaborate freely with one another. Our success is the result of a talented multidisciplinary cadre of experts—outstanding leaders in their fields. I am delighted to welcome Abeel Mangi, MD, as the system chief of Cardiothoracic Surgery. Dr. Mangi comes to us from his position as professor of surgery and surgical director of the Structural Heart and Cardiac Valve Program at Yale New Haven Health. He takes the helm of a cardiac surgery program that has set the standard in our region for nearly four decades.

Our groundbreaking research enterprise continues to grow exponentially, with dozens of clinical trials underway. Likewise, we continue to enrich physician training, including a recent expansion of our highly selective MedStar Georgetown University-Washington Hospital Center Cardiovascular Disease Fellowship Program, now one of the largest in the nation. All that we do is singularly focused on improving the lives of our patients and the well-being of our community at large. I welcome your comments, feedback, and participation in our programs.

Stuart F. Seides, MD
Physician Executive Director
MedStar Heart & Vascular Institute

Stats at a glance

Through this report, we share our best available data. In many cases, due to the consequences of the COVID-19 pandemic, that data is from calendar year 2019. Please submit any comments to charles.m.gill@medstar.net or jennifer.e.freas@medstar.net.

Visit us at MedStarHeartInstitute.org.
Structural heart disease

Drawing from the collective expertise of cardiac surgeons, interventional cardiologists, cardiac imaging specialists, and others, we offer the widest range of structural heart disease treatments and interventions. We manage the most challenging cases and often provide second opinions, as well as alternative options for treatments and devices.

**Transcatheter aortic valve replacement (TAVR)**

We have pioneered TAVR since its inception in 2007, serving as a clinical testing site for every major clinical trial. TAVR centers around the patient experience. Through expedited workflows, fewer trips to the hospital and dramatically reduced wait times, the entire procedure can be coordinated and conducted on site, and often can be completed in under 24 hours. After the procedure, many patients are discharged home as early as one day post-procedure.

**Mitral and tricuspid valve interventions**

As leaders in aortic valve procedures, we continue to expand options available for patients with mitral and tricuspid valvular disease.

- **MitralValve™** is a transcatheter mitral valve replacement (TMVR) device that is delivered transcatheter. As part of the ongoing, early feasibility study, we are evaluating its use for treatment of degenerative mitral regurgitation in patients considered high risk for open surgery.
- **CoreValve®**, **Evolut™ PRO+**
- **Portico™**
- **Parachute™**
- **Aorta Neuro2™**

**In the CLASP IID clinical trial, the**

- **TRILUMINATE™ Intrepid**
- **Tendyne**
- **AltaValve™**

**Transcatheter Mitral Valve Replacement (TMVR)**

- **SAPIEN S3**
- **Amplatzer™ Para-valvular leak**
- **Astellas Neo2™**

**Transcatheter Pulmonary Valve Replacement**

- **Edwards PASCAL™ Transcatheter Pulmonary Valve System**
- **Amulet™**
- **Occlutech Neo2™**

**Cerebral protection**

- **WATCHMAN FLX™ Trial**
- **Sentinel™**
- **Melody™ Transcatheter Pulmonary Valve**
- **PFO occluder for cryptogenic stroke**

**Stoke prevention and AFib**

- **CHAMPION-AF™ device**
- **AMPLATZER™ Amulet™ device (trial)**
- **FENELON FLX™ trial**

**Dysfunctional RVOT conduit/obstruction-LAMPOON Procedure**

- **APH™ device**
- **ASD occluder**
- **Sentinel™**

**Mitral valve**

- **MitraClip**
- **MitraDock**
- **PFO occluder for cryptogenic stroke**
- **VSD occluder**
- **Sentinel™**

**Comprehensive structural heart options**

- **Aortic valve disease**
  - OPEN-3™ trial
  - CorViva™, Evolut™ PRO+™
  - Portico™ trial
  - Aorta Neuro2™ Aortic Valve System
  - ALGLA

- **Mitral valve disease**
  - In the**
  - **Encore (TMVR) system**
  - **MitraClip**
  - **Transcatheter Mitral Valve replacement (TMVR) system**
  - **ENCIRCLE trial for SAPIEN M3 System**

- **Pulmonary valve**
  - **Transcatheter Pulmonary Valve Replacement**
  - **Amulet™**
  - **Occlutech Neo2™**

**Expedited TAVR procedure**

Initial referral to procedure

- **<2 Weeks**

**National average: 7 weeks**

**MEDSTAR HEART & VASCULAR INSTITUTE**

**Patient-centered TAVR process**

In addition to the clear clinical advantages, our approach to TAVR centers around the patient experience. Through expedited workflows, fewer trips to the hospital and dramatically reduced wait times, the entire procedure can be coordinated and conducted on site, and often can be completed in under 24 hours. After the procedure, many patients are discharged home as early as one day post-procedure.
Interventional cardiology

The specialists in our cardiac catheterization labs see high volumes of patients, affording an elevated degree of experience and expertise to diagnose critical patients and treat complex cases.

Percutaneous coronary interventions (PCIs)

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Volume</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>PCIs</td>
<td>2,631</td>
<td>25-30%</td>
</tr>
</tbody>
</table>

Patients return home same day

Diagnostic catheterizations

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Volume</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>MitraClips</td>
<td>133</td>
<td>7,860</td>
</tr>
</tbody>
</table>

MitraClips to date

PFO closures

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Volume</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>PFO closures</td>
<td>56</td>
<td>61</td>
</tr>
</tbody>
</table>

Average primary PCI door-to-balloon time

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>PCI</td>
<td>61 minutes</td>
</tr>
</tbody>
</table>

National benchmark: 90 minutes

Source: ACC/AHA

Success rate of PCIs for chronic total occlusions

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>PCIs</td>
<td>92.5%</td>
</tr>
</tbody>
</table>

Leading the transradial approach

Throughout the system, our specialists select the site of catheter access—radial or femoral—depending on the specific device and the unique health status of each patient. When appropriate, transradial cardiac catheterization provides less risk of bleeding, lower mortality, and increased comfort for the patient. Patients are often able to return home within hours of their procedure.

At MedStar Union Memorial Hospital, we use radial access for 90 percent of both diagnostic and interventional procedures, more than twice the average reported by the ACC. Patients recover in a dedicated lounge, with WiFi, iPads, and private areas to wait with their visitors.

Some key innovations include:

- A RADLAB unit for IMRCA (infection with no obstructive coronary artery disease). The objective is thorough evaluation and treatment for the newly recognized and often underdiagnosed population.

- The Heart-Brain Team at MedStar Washington Hospital Center, a collaboration between neurologists and interventional cardiologists, initially developed to determine if PFO closure is an optimal treatment for patients with stroke. Teams system-wide performed 56 PFO closures in 2019 and the volumes continue to grow.

- Clinical use of our state-of-the-art imaging abilities, such as fractional flow reserve derived from CT, to better evaluate and treat coronary anatomy and indeterminate lesions. Read more about our imaging technology on page 28.

- Early adoption of the MitraClip®. To date, we have performed 133 transcatheter mitral valve repairs using the MitraClip. Now that the technique has been approved for use in patients with symptomatic moderate-to-severe or severe mitral functional regurgitation, we continue to grow our volumes and offer this expanded pool of patients.

Interventional cardiology physicians

Washington, D.C. region

- Lowell F. Satler, MD
- Ron Wakeman, MD
- Srinivas Adibela, MD
- Malik A. Al-Omar, MD
- Itshik Ben-Dor, MD
- Nelson L. Bernardi, MD
- Eric S. Ginberg, MD
- Hayden Healim, MD
- Scott M. Kayden, MD
- Venkatesh K. Raman, MD
- Toby Rogers, MD

- William O. Suddath, MD

Baltimore region

- John C. Wang, MD
- Antony G. Kalyadan, MD
- David B. Peichert, MD
- Nauman Siddiqi, MD

- William O. Suddath, MD

Interventional cardiology

Lowell F. Satler, MD

Interventional Cardiology

MedStar Washington Hospital Center

MedStar Union Memorial Hospital

MedStar Southern Maryland Hospital Center
Cardiac surgery

Our cardiac surgeons, in addition to producing some of the finest outcomes and strongest volumes in the country, are leaders in professional societies, research, and education. They collaborate with subspecialists across the cardiovascular spectrum, (aortic disease management, vascular surgery, electrophysiology, advanced heart failure, LVAD implantation, transplantation, interventional cardiology, and structural heart disease) nationally and internationally.

They are among the top 5 centers in the country for LVAD implantation volumes.

Our team performed 29 heart transplantations in 2020, making us one of the busiest centers in the mid-Atlantic region.

We are the second highest enroller in the country for the SUMMIT trial, testing the safety and efficacy of the Tendyne™ transcatheter mitral valve replacement system as an alternative to open heart surgery.

The Intrepid™ TMVR system is a new option for patients with severe, symptomatic mitral regurgitation, currently under investigation in the APOLLO trial.

Together with vascular surgery, our Aortic Disease Management program accepts referrals for emergent, urgent, and elective evaluation and treatment of any routine or complex aortic disease. Read more on page 10.

We perform combined endocardial and epicardial ablations and other complex hybrid procedures, including convergent procedures and de novo thoracoscopic ablation for the treatment of inappropriate sinus tachycardia (IST) and postural orthostatic tachycardia syndrome (POTS).

Read more about these collaborations and others on the pages that follow.

Key highlights

2,210 Cardiac surgery procedures
198 CABG + AVR procedures
7.2% CABG readmission rates Compared to STS benchmark of 10.1%
172 Mitral valve surgeries
2.2% Mortality for mitral surgeries Compared to STS average of 3.2%
Aortic disease management

The aortic disease management program is one of the largest in the mid-Atlantic and our teams perform more aortic interventions than any other program in the region. We treat the most complex cases—including patients who have been denied care elsewhere—with the full spectrum of available options, including open, minimally invasive, and transcatheter approaches.

Patients benefit from a team that is truly multidisciplinary, led by cardiac and vascular surgeons. Together, they perform a collaborative assessment to determine the patient’s least invasive, most effective, solution. Procedures take place in a hybrid operating room to allow for both open and endovascular approaches, as well as contemporaneous imaging.

Vascular surgeon Suzanne Knol, MD, cardiac surgeon Ricardo Quarrie, MD, and vascular surgeon Raghuveer Vallabhaneni, MD Cardiac surgeon Christian Shults, MD, and vascular surgeon Javairiah Fatima, MD

GORE® TBE Thoracic Branch Endoprosthesis (TBE Device) for the treatment of lesions of the aortic arch and descending thoracic aorta

GORE® TAMBE Thoracoabdominal Branch Endoprosthesis for the treatment of thoracoabdominal and pararenal aortic aneurysms

CHIVAS parasternal aortic aneurysm repair using aortic root replacement system by Endologix

Physician-sponsored IDE for repair of juxtarenal, pararenal, and thoracoabdominal aortic aneurysms

Clinical trial highlights

0% Mortality rate

Abdominal aortic aneurysm (AAA) elective infrarenal repair

0% Mortality rate

Ascending aortic elective procedures

58 Aortic root elective procedures

Cardiac surgeon Christian Shults, MD, and vascular surgeon Javairiah Fatima, MD

Complex Aortic Centers

Located at MedStar Washington Hospital Center and MedStar Union Memorial Hospital, we offer 24/7 referral for emergent, urgent, and elective evaluation and treatment of complex aortic disease.

Complex referral cases may include:
- Aortic dissection
- Aneurysm
- Occlusion
- Intramural hematoma
- Penetrating ulcer
- Other aortic pathology

Our MedSTAR Transport service provides expedited air and ground access to care, regardless of patient location.

We accept all transfers.

To refer a patient and arrange for a 24/7 transfer, call:
- Washington, D.C. region: 800-824-6814
- Baltimore region: 410-554-2332
Vascular surgery

The MedStar Health vascular program is the largest in the region and among the most sophisticated in the nation. Our team of experts identifies the diagnosis and treatment of all vascular disorders, from the common to the esoteric, from the merely uncomfortable to the life-threatening.

Deep venous disease

We treat all forms of deep venous disease with open and endovascular techniques, including acute and chronic deep vein thrombosis, inferior vena cava occlusive disease, and retained IVC filter.

Cosmetic and varicose veins

MedStar Health Ven Centers are convenient outpatient clinics dedicated to the treatment of venous disease, including cosmetic and functional. These boutique settings offer clients the comfort and luxury of a specialty clinic, paired with the expertise of vascular surgeons who provide comprehensive diagnostics and treatment in the event of a more serious underlying condition. Each center has an on-site, accredited vascular lab, staffed with licensed technologists who can run tests for fast, same-day turnarounds. Services are now available at nine locations in Maryland, Virginia, and Washington, D.C.

Vascular access program

We provide the largest vascular hemodialysis access program in the mid-Atlantic region, an area with some of the highest rates of kidney disease in the United States. With a focus on reduced infection and long-term access, our team manages complex dialysis patients with an array of options to treat and manage percutaneous fistulae, AV fistulae, and bypass grafts. Our prevalent arteriovenous fistula rate is 70 percent, thereby reducing infection and lowering mortality. The Centers for Medicare & Medicaid Services national standard is 66 percent.

The MedStar Health vascular program is the largest in the region and among the most sophisticated in the nation.

Vascular surgery

We are the regional leader in the implantation of ClotHunter™ thrombectomy catheters, which allow for more thorough removal of acute, subacute, and chronic clots with single-session treatment and reduced procedure time.

We are the only provider in the region to offer endovenotomy, a minimally invasive technique combining open and endovascular surgery to treat deep vein post-thrombotic syndrome.

We are part of the ClotTriever Outcomes registry (CLOUT) for treatment of acute, subacute, and chronic lower extremity deep vein thrombosis using the ClotTriever System.

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Peripheral arterial disease

PAD is managed at every stage, beginning with community screenings, to diagnosis in our noninvasive laboratories, through all varieties of therapy and noninvasive laboratories, through

Carotid artery disease

Our expertise covers the spectrum of carotid disease, including treatment for stenosis, tumor, and aneurysm.

Aortic disease

We provide treatment for all aortic pathologies, including stenosis, tumor, and aneurysm.

Deep venous disease

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Vascular surgeons
Washington, D.C. region
Edward V. Woe, MD
Steven D. Abramowitz, MD
Cameron M. Akbar, MD
Kevin A. Brown, MD
Joshua A. Deering, MD
Jawahar Fatima, MD
Arthur Flautau, III, MD
Jessica P. Garcia, MD
Pars Z. Hakim, MD
John Harvey, MD
Ayasha Hait, MD
Geehah Jayabalan, MD
Misaki M. Kiguchi, MD
Geetha Jeyabalan, MD
Ayesha Hatch, MD
John Harvey, MD
Stephen F. Stanziale, MD
Suzanne S. Kool, MD
Javairiah Fatima, MD
Jason R. Crowner, MD
Kevin A. Brown, MD
Maggie W. Arnold, MD
Raghuveer Vallabhaneni, MD

Baltimore region
Raghuveer Vallabhaneni, MD
Maggie W. Arnold, MD
Jason A. Chin, MD
Jason R. Crowner, MD
Susanne S. Koil, MD
Stephen F. Stanislade, MD

Vascular program locations
District of Columbia
MedStar Georgetown University Hospital
3800 Reservoir Rd. NW
Tuquetta Healthcare Centers, 4th Fl.
Washington, DC 20007
P: 202-444-2255
F: 202-376-2434

MedStar Health at Lafayette Centre
1113-21st St. NW
Washington, DC 20036
P: 202-416-2000
F: 202-416-2007

MedStar Washington Hospital Center for Vascular Care
301 7th St. NW
Physician Office Building North, Ste. 315
Washington, DC 20036
P: 202-877-1025
F: 202-877-0456

MedStar Washington Hospital Center-Vascular Access
1113-21st St. NW
Physician Office Building South, Ste. 419
Washington, DC 20036
P: 202-877-3100
F: 202-877-5585

MedStar Washington Hospital Center-Habib Medical Associates
19 Irving St. NW
Physician Office Building, Ste. 408
Washington, DC 20036
P: 202-877-3007
F: 202-443-2278

Maryland
Annapolis
MedStar Health Cardiology Associates
The Vascular Institute
2002 Medical Pkwy., Ste. 520
Annapolis, MD 21401
P: 410-573-8342
F: 410-573-5181

Baltimore
MedStar Franklin Square Medical Center
9101 Franklin Square Dr., Ste. 212
Baltimore, MD 21237
P: 443-777-1900
F: 443-777-1901

MedStar Good Samaritan Hospital
5661 Loch Raven Blvd.
Smyth Blvd., Ste. 303
Baltimore, MD 21239
P: 443-444-3431
F: 443-444-3435

MedStar Harbor Hospital
3001 S. Hanover St.
Outpatient Center, Ste. 216
Baltimore, MD 21225
F: 410-554-2950
F: 410-615-8262

MedStar Union Memorial Hospital
3333 North Carolina St.
Johnson Professional Building, Ste. 325
Baltimore, MD 21218
P: 410-554-2950
F: 410-615-8262

MedStar Health Bel Air Medical Campus
13 MedStar Blvd., Ste. 175
Bel Air, MD 21014
P: 410-386-6600
F: 410-386-6600

MedStar Health Cardiology Associates
Kemp Island
5001 Wisconsin Ave., Ste. 1010
Chevy Chase, MD 20815
P: 202-415-4022
F: 202-415-4022

MedStar Health Cardiology Associates
Kent Island
1838 Greens Tree Rd., Ste. 245
-301-774-8963
F: 301-774-8963

MedStar Health at Prince Frederick
100 Shoreline Dr., Ste. 107
Prince Frederick, MD 20678
P: 410-335-7291
F: 410-335-7291

Northern Virginia
McLean
MedStar Health at McLean
5800 Fairview Rd., Ste. 210
McLean, VA 22102
P: 703-288-7070, Option #5
F: 866-990-5516

MedStar Health at McLean
1600 Elm St., Ste. 200
McLean, VA 22101
P: 703-386-7270, Option #5
F: 866-990-5516

MedStar Health \& Vascular Institute | Vascular Surgeons and Locations
Cardiac electrophysiology

The Section of Cardiac Electrophysiology (EP) aims to provide comprehensive, cutting-edge and personalized heart rhythm care for every single one of our patients, close to home and work. MedStar Health offers one of the largest and most geographically expansive EP service lines in the country, with 23 convenient locations in Maryland, Washington, D.C., and Virginia.

We manage the full spectrum of heart rhythm conditions and are the region’s leading referral center, offering highly technical procedural care along with longitudinal outpatient management in concert with and in support of our referring physicians. High-volume experience and concentrated expertise, coupled with state-of-the-art technology, distinguish this program.

WATCHMAN™
MedStar Health pioneered development of the original WATCHMAN left atrial appendage occlusion device over 15 years ago and was the first institution in the region to implant it. Today, we are among the country’s highest volume implantation programs for this device.

563 WATCHMAN procedures to date
1,637 Cardiac ablations

Innovative highlights
• We collaborate with cardiac surgeons for combined electrophysiological and surgical ablation and other complex hybrid procedures. Most recently, we were first in the region, and among only a few in the country, to offer thorascopic ablation for the treatment of inappropriate sinus tachycardia (IST) and postural orthostatic tachycardia syndrome (POTS). This procedure minimizes patient hospital stay and offers a new therapeutic option for patients with drug-resistant conditions.
• Left-sided thoracoscopic ablation is now performed by an internationally recognized senior consultant,centers in the country’s highest-volume centers for his methods, and he personally developed specialized tools and techniques to facilitate and optimize the success of transaxillary left ventricular (LV) lead implantation. He championed the commercially International Heart Resynchronization Therapy, and he regularly treats patients from all over the world who have had prior unsuccessful attempts at LV lead implantation.

Clinical highlights
• Testing the effectiveness of the latest devices and approaches, including these recent highlights.
• Enrolling patients as one of the world’s select centers in the OPTIONS study, which compares left atrial appendage closure with the WATCHMAN FLX™ device and Coherex WaveCrest vascular closure device to medical therapy for AFib by electroporation. This novel technology enables pulmonary vein isolation with greater efficiency and selectivity, sharply reducing the potential for unintentional damage to surrounding tissue.
• Testing the effectiveness of the latest left atrial appendage occlusion systems, including the AMPLATZER™ Amulet and Cohere V WaveGard.
• Enrolling patients as one of the world’s select centers in the OPTIMA study, which compares left atrial appendage closure with the WATCHMAN FLX™ and Coherex WaveCrest vascular closure devices.
• Ongoing study of an extracorporeal ICD system, in which defibrillation therapy is delivered by a lead placed outside of the heart and veins.
• Harnessing our partnership with the Cleveland Clinic’s Miller Family Heart, Vascular, and Thoracic Institute, we worked closely to redesign the EP Labs and Coherex systems, enabling our large team to provide cutting-edge care to patients from across the region.

Cardiologists
Sarafraz Durrani, MD, Manish Shah, MD, David Strouse, MD, Athanasios Thomaides, MD, Mohamed Dervishi, MD, and Sung Lee, MD, are among a small and select group of physicians globally with high-volume experience with left atrial appendage occlusion systems.

MedStar Health is a trusted, internationally recognized leader in evaluating and implementing new cardiac technologies. As one of the country’s highest-volume centers for left atrial appendage closure, we are poised to continue our leadership in advancing heart rhythm care.

Cryobalation
Our cardiac electrophysiologists also contributed to the development of cryoballoon ablation for atrial fibrillation and continue to be among the country’s highest-volume experts employing this technology.

As an internationally recognized contributor to advances in the field, our team continues to play a critical role in the development of devices and approaches, including these recent highlights.

• Performing some of the country’s highest-volume cryoballoon ablation procedures. Most recently, we were first in the region, and among only a few in the country, to offer thorascopic ablation for the treatment of inappropriate sinus tachycardia (IST) and postural orthostatic tachycardia syndrome (POTS). This procedure minimizes patient hospital stay and offers a new therapeutic option for patients with drug-resistant conditions.
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MedStar Health is a trusted, internationally recognized leader in evaluating and implementing new cardiac technologies. As one of the country’s highest-volume centers for left atrial appendage closure, we are poised to continue our leadership in advancing heart rhythm care.

Cryobalation
Our cardiac electrophysiologists also contributed to the development of cryoballoon ablation for atrial fibrillation and continue to be among the country’s highest-volume experts employing this technology.

As an internationally recognized contributor to advances in the field, our team continues to play a critical role in the development of devices and approaches, including these recent highlights.

• Performing some of the country’s highest-volume cryoballoon ablation procedures. Most recently, we were first in the region, and among only a few in the country, to offer thorascopic ablation for the treatment of inappropriate sinus tachycardia (IST) and postural orthostatic tachycardia syndrome (POTS). This procedure minimizes patient hospital stay and offers a new therapeutic option for patients with drug-resistant conditions.
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As the most comprehensive advanced heart failure program in the area, our multidisciplinary team provides regional coverage across hospitals and outpatient clinics, bringing sophisticated disease management closer to patients.

We offer advanced drug therapy, mechanical circulatory support, and heart transplantation—often for patients whose case complexity or advanced disease state precludes them from receiving care at other centers. This program intersects with other subspecialties across our system. Our patients have access to:

- A dedicated cardiogenetics specialist (more on page 25)
- Pulmonary hypertension expertise (more on page 26)
- Early identification and diagnosis through specialized cardiopulmonary stress testing
- Delivery of home-based, intravenous, inotropic drugs, for patients with end-stage disease
- Palliative care planning, embedded with symptom management and family support

Our multidisciplinary team meets weekly to discuss details of each patient’s plan of care. More than 75 professionals participate, including:

- Cardiologists and cardiothoracic surgeons
- Internists
- Hospitalists
- Advanced practice providers
- VAD and transplant coordinators
- Nurse navigators
- Clinic and home health nurses
- Nutritionists
- Medical ethicists
- Palliative care specialists
- Social workers
- Physical and occupational therapists
- Pharmacists

Innovative new medications and phase 3 clinical trial may offer treatment options that can reverse the difference between life and death for patients:

- HELIOS-B, a worldwide, multicenter study, we are evaluating the efficacy and safety of Evotec in patients with transthyretin amyloidosis with cardiomyopathy (ATR-AMYloid cardiomyopathy—ATTR-CM).
- CARDIO-TTR study, we are investigating the use of AKCEA-TTR-LRx (ION-682884) compared to placebo in patients with transthyretin-mediated amyloid cardiomyopathy (ATTR-CM).

Infiltrative cardiomyopathy

We are the region’s premier program for diagnoses and management of all forms of infiltrative cardiomyopathy, including two of the most common and challenging forms: cardiac sarcoidosis and cardiac amyloidosis.

- Observed/expected ratio
  - 2019: 1.00
  - 2018: 0.82
  - 2017: 0.93
  - 2016: 0.88
  - 2015: 0.73
  - 2014: 0.59

**Clinical highlights**

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In 1988, we became one of the first centers in the world to implant a ventricular assist device (VAD). The program has grown continuously with multiple devices and superior survival rates for even the most critical, highly complex patients—those who are often denied treatment at other centers.

- 80% of implantations are currently performed through a minimally invasive technique.
- Studies of this approach continue through participation in the SWIFT trial with the HeartMate 3 VAD. The approach results in less bleeding and need for transfusion, shorter ICU and hospital stays, and possibly reduced risk of right ventricular failure.
- Our VAD longer track facilitates treatment for patients with minimal family support by providing the critical medical and social care needed.
- Through a robust ECMO and Impella 5.0/5.5 program, patients presenting with urgent or shock refractory cardiogenic shock can be stabilized, opening the potential for durable VAD implantation after a period of acute mechanical circulatory support.
- Coming soon, we will explore ways to reduce post-LVAD arrhythmias through a collaboration with our electrophysiology colleagues.

Since performing the first heart transplantation in Washington, D.C., in 1987, we remain committed to expanding our program with the ultimate goal of offering this life-saving procedure to more patients.

- Through our use of the Paragonix SherpaPak™ Cardiac Transport System, the ischemic window of a donor heart may be extended without damage to the organ. This provides our patients with greater opportunities for transplantation by allowing retrieval of donor hearts from further distances.
- We are able to transplant hearts from Hepatitis C positive donors without an adverse impact on recipient outcomes. The expectation is that the number of transplantable hearts may increase by more than 15 percent per year.
- We are one of the five regional heart transplant programs participating in an NIH research project to evaluate novel methods to non-invasively assess rejection obviating the need for biopsy.

Heart transplantation

In the spring of 2020, as many hospitals had to limit cardiovascular surgeries, our team at MedStar Washington Hospital Center performed a record-breaking 13 heart transplantations between March and May. Extraordinary precautions were taken to minimize the risk of virus transmission among providers, recipients, and families.

Ventricular assist devices

Among the top 5 centers with highest volumes of VAD implants in the country:

- TOP 5
- Among the top 5 centers with highest volumes of VAD implants in the country
- 700+

VAD implants

<table>
<thead>
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<th>Year</th>
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<th>HeartMate-3</th>
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<td>2020</td>
<td>82</td>
<td>79</td>
<td>82</td>
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</tbody>
</table>

Heart transplantation one-year survival

- 350+ Heart transplants since 1987

Heart transplantation volumes

Record number of heart transplantations during onset of COVID-19 pandemic.
Clinical cardiology and specialty programs

Across our acute care hospitals and advanced outpatient clinics, cardiologists deliver comprehensive, integrated care to our patients—whether for prevention and screenings, or complicated treatment of the very ill.

For more than 60 years, we have served as a major referral site locally, across the mid-Atlantic region, and the country. Our providers are embedded in each subspecialty detailed in this report, as well as the unique programs highlighted here.

Cardio-oncology
Cardio-oncology is a medical subspecialty dedicated to minimizing the effects of cardiovascular morbidity and mortality in people with cancer. Chemotherapy and radiation therapy, along with new cancer treatments, can contribute to a number of cardiovascular complications including heart failure, coronary artery disease, heart rhythm disorders, peripheral vascular disease, valvular heart disease, and more.

We are committed to supporting effective methods for fighting cancer while minimizing the impact on heart function. Our multi-site consultative practice can establish a comprehensive cardiovascular treatment plan before, during, and after a patient’s cancer treatment.

From the program’s initiation in 2012, we have been a national leader in this field, pioneering and participating in progressive research to develop new cardiovascular diagnostic and treatment protocols that are compatible with evolving oncologic approaches. Ana Barac, MD, PhD, director, served as the founding chair of the American College of Cardiology’s new Cardio-Oncology Council from 2015 to 2019 and is the director of the ACC Live course on Advancing Cardiovascular Care in Oncology Patients. She also is an associate editor of the JACC: Cardio-Oncology.

Cardiogenetics
Our cardiogenetics practice offers genetic testing and counseling to patients and their family members. Monisha Kailing, our dedicated genetic counselor, works across cardiovascular subspecialties to provide early detection and insights into optimal treatment for patients, including particularly complicated diagnoses such as transthyretin amyloid, Long QT, hypertrophic cardiomyopathy, dilated cardiomyopathy, Brugada syndrome, and familial hypercholesterolemia.

For a consultation, please call 202-877-GENE (4363).
Sports and Performance Cardiology

MedStar Sports & Performance Cardiology is one of the few formal programs in the nation to focus on heart disease in the athlete. Our director, Ankit Shah, MD, is a graduate of the Massachusetts General Hospital sports cardiology fellowship program—the only one in the nation. With one foot firmly planted in cardiology and the other in sports medicine, his training ties the two disciplines tightly together. The program focuses on:

- Preventing sudden, unexpected cardiovascular-related death among athletes
- Helping “weekend warriors” and professionals return to play after myocarditis, myocardial infarction, and other serious heart conditions
- Assisting top athletes enhance cardiovascular performance

We offer specialized cardiopulmonary exercise testing, which provides each athlete with personalized data and insight into potential conditions. Dr. Shah also works with professional teams such as the Baltimore Orioles, Baltimore Ravens, Washington Capitals, and USA Swimming, to help the athletes maximize their performance.

For a consultation, please call 410-554-2201.

Pulmonary hypertension

Despite major advances in our understanding of pulmonary hypertension (PH) and the availability of 14 FDA-approved medications to treat it, survival remains poor. Our PH program offers comprehensive evaluation and diagnosis of all forms of PH, plus the full range of management options including the most advanced therapy—prostacyclin infusion. We collaborate with other internationally recognized programs to provide access to lung transplantation and other specialized surgery applicable to treating chronic thromboembolic PH. Through our partnership with the National Institutes of Health PH program and participation in other clinical trials, we can offer unique therapy options to our patients. We work closely with the Pulmonary Hypertension Association to provide support to patients and their families in coping with this complex disease.

Washington, D.C. region: 202-877-2339
Baltimore region: 410-554-6550

6% 30-day readmission rate
to a MedStar Health hospital
Compared to 24% hospitals not using clinic

5.2 day decrease
in length of stay for hospitalizations

Palliative care

Palliative care specialists are always brought into the process of developing patient care plans when clinically appropriate. These specialists are embedded in our multidisciplinary teams to support patients and their families, and to co-manage goals for care and management of symptoms. This full integration of palliative care into heart failure treatment in particular, is an essential element of patient care. We are proud to have pioneered this personalized and holistic approach.
Medical and surgical specialists across MedStar Heart & Vascular Institute rely on cardiovascular imaging in the diagnosis and treatment of patients. Our patients also benefit from the use of sophisticated and appropriate images in determining their risks and improving their outcomes. Our long-term collaboration with researchers and clinicians from the National Institutes of Health further advances our capabilities.

If you have an image you’d like to discuss, you may upload it to MedStarImageShare.com or call 202-877-5975.

Echocardiography in the cloud
Secure digital repositories house all echocardiogram data regardless of where patients undergo a test within MedStar Health. Their results will be available to our clinicians anywhere in their respective regions. The technology enhances real-time collaboration among our cardiovascular specialists, and provides the free flow of information by putting studies and images in the hands of the most experienced readers, wherever they may be located. Patients have the benefit of quicker turnaround times, flexible testing locations, and fewer test duplications.

New cardiovascular imaging options
Expanding upon previous imaging abilities, the new Thoma Advanced Cardiovascular Imaging Center at MedStar Washington Hospital Center provides pioneering cardiac imaging technology. Baltimore-area patients may have their imaging completed at MedStar Union Memorial Hospital, and read at MedStar Washington, reducing their need to travel.

Siemens Dual Source CT scanner SOMATOM® Force
This state-of-the-art scanner provides:
- Higher temporal resolution at faster heart rates
- Significantly lower radiation dosing
- Reduced contrast dosing
- Intelligent automation
- More accurate scanning, especially in technically challenging cases

Siemens MAGNETOM® Sola 1.5T MRI
This new, recently approved scanner platform delivers de novo applications and elevates MRI capability plus:
- Larger magnet bore for increased patient comfort
- Faster sequences to support improved imaging in technically challenging situations (e.g., arrhythmias)
- Advanced tissue characterization
- Expanded non-contrast and contrast technique for MRI angiography
- Stronger collaboration with the NIH/NHLBI for advanced cardiac MRI

HeartFlow® FFRCT Analysis
New software offers visualization and physiologic evaluation of coronary stenoses, providing:
- More accurate evaluation of coronary anatomy and stenoses
- A reduction in unnecessary catheterization
- Greater operator perspective and planning prior to intervention

Cardiovascular imaging

- 3,500 Cardiac MRI and cardiac CT images annually
- 1,200 Transesophageal echocardiograms (TEE) annually
- 13,200 Transthoracic echocardiograms (TTE) annually

Siemens MAGNETOM® Sola 1.5T MRI

Siemens Dual Source CT scanner SOMATOM® Force

HeartFlow® FFRCT Analysis

MEDSTAR HEALTH | Cardiovascular Imaging

MEDSTAR HEALTH | Cardiovascular Imaging
Cardiovascular critical care

In keeping with our overall mission, our cardiovascular critical care service continues to meet the increasingly complex needs of our patients. We provide post-operative care for those who have undergone surgical procedures, along with cardiac medical conditions and treatments.

Comprehensive services for high-acuity, complex patients

- 24/7 coverage by a multidisciplinary team of providers
- 80 beds for complex surgical and medical patients
- Rooms with ceiling-mounted booms carrying medical gases, and electric and data outlets allow ultimate flexibility and unrestricted access from all four sides of the bed
- Capability to provide temporary circulatory support, including veno-arterial (VA) ECMO, intra-aortic balloon, as well as temporary percutaneous ventricular assist devices (LVAD, RVAD, BiVAD, Impella)
- Recent expansion of CV critical care at MedStar Union Memorial Hospital increases its ability to provide specialized care for complex patients with multi-system organ dysfunction

Multidisciplinary, specialized team

- Cardiac intensivists uniquely trained in both cardiology and critical care
- Physicians specialized in critical care medicine with primary board training in internal medicine, anesthesiology, surgery, and emergency medicine
- Advanced practice providers (APP), including nurse practitioners and physician assistants, specialized in the unique care of cardiac and vascular patients
- Nurses with specialized training in CVICU care

Holistic, family-focused care

- Interdisciplinary rounds are made with family members and all members of the care team, including physicians, APPs, nurses, and other clinicians
- 24/7 family visitation is encouraged
- Palliative care is fully integrated

In-house training and continuing education

- The care team undergoes a rigorous in-house training program that includes simulation training in high-acuity situations, such as emergency revascularization and Cardiac Advanced Life Support, intra-aortic balloon pump placement, and transvenous pacemaker placement

Advanced practice providers

Our advanced practice providers (APPs) are an integral and growing group of cardiovascular specialists. They provide care throughout the system—in acute settings, outpatient sites, and ambulatory care locations. Thirty-five years ago, we were on the leading edge of APP utilization and we continue to support the expansion of their focus areas today.

Nursing

The high-acuity and case complexity of our patients requires sophisticated nursing expertise. Our nurses play a critical role throughout the patient journey, and are involved in niche medical and surgical therapies including:

- ECMO technology
- Medication titration
- Electrophysiology procedures
- Pulmonary hypertension therapies

Continuing education and advanced certifications are major focuses for our nursing teams. Recent highlights include:

- The first acute care hospital in Washington, D.C. to receive the Pathway to Excellence designation from the American Nursing Credentialing Center
- Certification of our nursing residency program by the Commission on Collegiate Nursing Education
- Certification of a high percentage of our CVICU nurses by the American Association of Critical-Care Nurses
- ECMO technology
- Medication titration
- Electrophysiology procedures
- Pulmonary hypertension therapies

Cardiovascular APPs

80

Beds

for complex surgical and medical patients

Cardiac hospitalists

Our hospitalists are dedicated to cardiovascular care and provide 24/7 coverage. This team manages care for patients of admitting cardiologists and may serve as a liaison to community physicians upon discharge. They are also involved in quality improvement initiatives across the inpatient service.

Cardiac anesthesiologists

Fellowship-trained anesthesiologists manage the unique challenges of cardiovascular patients. These patients often have multiple comorbidities and undergo complex, sophisticated procedures. This anesthesiology team provides critical pre-, intra-, and post-operative management.

MedStar Health Cardiovascular Critical Care
We are committed to developing new technologies and strategies to advance clinical knowledge and provide optimal outcomes for all patients. Our research extends throughout MedStar Health, taking place at many of our hospital locations. Ongoing collaboration with the National Institutes of Health, the U.S. Food and Drug Administration, the Centers for Medicare & Medicaid Services, and other leading institutions advances our participation in some of the world’s most progressive cardiovascular investigations.

The MedStar Cardiovascular Research Network, part of MedStar Health Research Institute, is the infrastructure for clinical studies. Research is further enhanced by our state-of-the-art pre-clinical evaluation, cardiovascular core laboratories, and academic Clinical Research Organization (CRO). World-renowned investigators, basic and translational scientists, interventional cardiologists, research nurses, technicians, sonographers, and support staff comprise the network.

Research

Ron Waksman, MD
Director
Cardiovascular Research and Advanced Education

John C. Wang, MD
Scientific Director
Cardiovascular Research
Baltimore region

CRT: Cardiovascular Research Technologies

CRT, supported by and located on the campus of MedStar Washington Hospital Center, is designed to provide access to the world’s leading clinicians and the latest research in order to improve practice and treatment outcomes.

- **CRTonline** provides exclusive interventional cardiology content to keep physicians up-to-date on the latest developments in the field. Visit CRTonline.org.
- **CRTmeeting** is one of the world’s leading interventional cardiology conferences, attended by more than 2,000 cardiovascular specialists. At the 2020 meeting, the 24th annual, more than 1,300 presentations and 20 live procedures from eight locations around the world were presented. Held each year in Washington, D.C., the conference serves as a forum for physicians and health-care professionals on new cardiovascular technology and interventional procedures in the field. Visit CRTmeeting.org.
- **CRTvirtual** is a weekly virtual conference on timely topics across the cardiovascular spectrum, including women in heart disease, valve and structural disease, and cardiovascular imaging and physiology. For more information or to register, see page 35 or visit CRTvirtual.org.
- **Cardiovascular Revascularization Medicine (CRM)** is the official journal of the CRT meeting and is an international, peer-reviewed journal that publishes original laboratory and clinical investigations related to revascularization therapies in cardiovascular medicine.
Graduate medical education

MedStar Health’s graduate medical education program is one of the largest in the United States. Candidates have access to elite clinical programs and faculty, plus some of the most advanced technology and complex patients in the region. We are committed to a rich and rigorous learning environment for our cardiovascular fellows.

Research and innovation
Fellows are provided unique opportunities for involvement in research, clinical trials, and publication through our numerous ongoing studies, as well as those at partner programs, including the National Institutes of Health and Cleveland Clinic Heart, Vascular & Thoracic Institute.

Subspecialty opportunities
Fellows have the opportunity to train in a variety of cardiovascular subspecialties:

- General cardiology
- Interventional cardiology
- Heart failure
- Electrophysiology
- Echocardiography
- Cardiac CT and MRI
- Cardio-oncology

Diverse experience
Fellows gain experience with a diverse population through rotations at:

- MedStar Washington Hospital Center
- MedStar Georgetown University Hospital
- Washington DC VA Medical Center
- Children’s National Hospital

Location in the nation’s capital
Our location in Washington, D.C. allows fellows the opportunity for proximate involvement in healthcare advocacy and policy. For example, fellows have joined the American College of Cardiology in discussions with lawmakers on Capitol Hill about issues related to cardiovascular health.

Continuing medical education

Peer collaboration and continuing education are paramount. Our courses and conferences attract hundreds of weekly attendees from across the globe. We invite you to join us.

CRVirtual
Virtual course
Saturdays, 8 a.m. to noon
Each session will include a deep dive into devices, clinical techniques, and research data, as well as case review and challenging issues in coronary, structural heart, and endovascular procedures. Register at CRVirtual.org.

DMV Cath Lab Case Review
Virtual course
Monthly, evenings
Colleagues from hospitals in D.C., Maryland, and Virginia (DMV) engage in thought-provoking discussion regarding interventional cardiology cases.

To request an invitation, please email lmowell.f.sadler@medstar.net.

Regularly scheduled series
Please visit MedStar.Cloud-CME.com or call 202-780-1655 for information on all regularly scheduled series, including:

- Cardiac catheterization
- Echocardiography
- Electrophysiology
- Cardiac surgery
- Cardiology
- Cardio-oncology
The Nancy and Harold Zirkin Heart & Vascular Hospital

The Nancy and Harold Zirkin Heart & Vascular Hospital is a state-of-the-art facility on the campus of MedStar Washington Hospital Center. Serving as a cornerstone of MedStar Heart & Vascular Institute, it unite virtually the entire heart and vascular care team in one central location that drives more effective, streamlined care.

The Nancy and Harold Zirkin Heart & Vascular Hospital was named to recognize longtime Washingtonians Nancy and Harold Zirkin for their generosity and extraordinary philanthropic support. Their $10 million leadership gift was the largest single contribution in the history of MedStar Health.

MedSTAR Transport

MedSTAR Transport service sets national standards for the care of critically ill or injured patients. The transfer center operates 24/7, covering the mid-Atlantic region with helicopters and critical-care ambulances.

Since its inaugural flight in 1983, MedSTAR Transport has been on the scene for the most dramatic and traumatic events to affect the national capital area, both natural and man-made.

Flights are staffed with a critical care nurse and paramedic, providing tertiary-level care in the air. Patients can be transported on multiple vasoactive medications, ECMO, IABP, LVAS, and pressure control ventilation. Nearly 50 percent of transports involve cardiovascular patients.

Cleveland Clinic alliance

Now in its ninth year, our clinical and research alliance with Cleveland Clinic’s Miller Family Heart, Vascular & Thoracic Institute offers coordinated collaboration between two of the largest cardiovascular programs in the United States.

At the operational level, our clinicians work closely with quality and safety experts to implement quality improvement initiatives, evaluate treatment protocols, and validate and report outcomes. The alliance facilitates fluid communication between the scientists and clinicians at both Institutes, resulting in a collaborative approach to research. We share individual expertise and large and diverse patient populations in the pursuit of innovative cardiovascular therapies.

MedStar Heart & Vascular Institute has a dedicated quality and safety improvement department operated by approximately 20 physicians, nurses, and support staff. This team monitors more than 150 processes and outcomes metrics across the spectrum of care.

A comprehensive review of our quality metrics against internal goals and national benchmarks is performed monthly. In-depth analysis into each of our cardiovascular subspecialties and surgical departments occurs on a rotating basis.

Enhancing internal processes is our long-standing, collegial, and transparent relationship with Cleveland Clinic, which helps facilitate rapid-cycle quality improvements. The ability to learn from one another benefits patients and expedites dissemination of successful quality improvement interventions.

We publicly share our performance data with the following registries:
- STS/ACC TVT Registry
- STS
- ACC/NCDR (CathPCI, Chest Pain/MI; ICD)
- AHA Get With the Guidelines™
- AFib
- LAAD
- Vascular Quality Initiatives (VQI)
- INTERMACS

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MedStar Health

MedStar Franklin Square Medical Center
MedStar Georgetown University Hospital
MedStar Good Samaritan Hospital
MedStar Harbor Hospital
MedStar Montgomery Medical Center
MedStar National Rehabilitation Hospital
MedStar Southern Maryland Hospital Center
MedStar St. Mary's Hospital
MedStar Union Memorial Hospital
MedStar Washington Hospital Center

MedStar Heart & Vascular Institute
110 Irving St., NW
Washington, DC 20010

MedStarHeartInstitute.org

MedStar Washington Hospital Center awarded