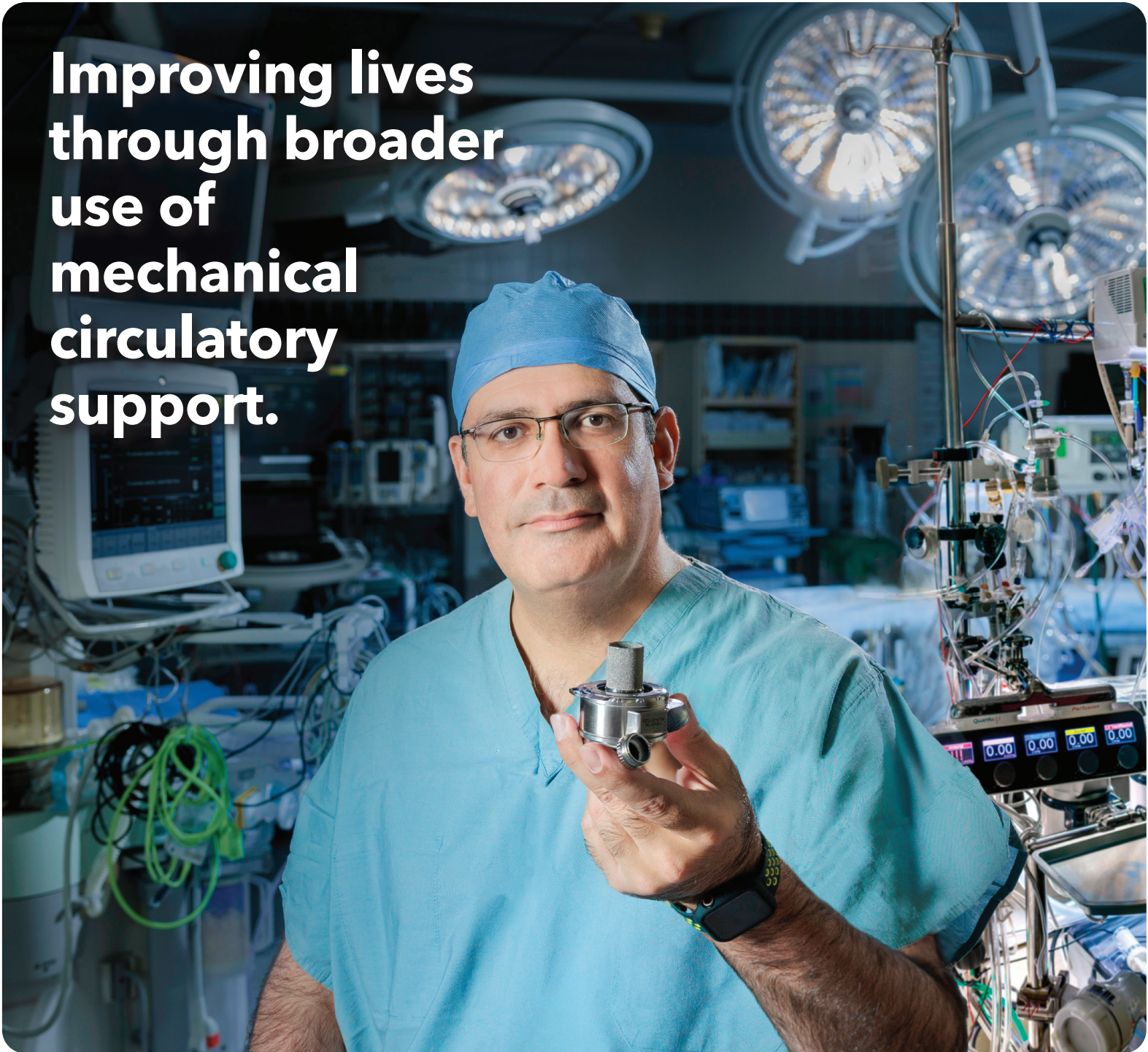


Cardiovascular **Physician**

A clinical practice and research publication.

VOLUME 19 | NO 2 | FALL 2023

**Improving lives
through broader
use of
mechanical
circulatory
support.**



Also inside:

**World's first use of RevCore™
mechanical thrombectomy device**

**New percutaneous alternative
to traditional fem-pop bypass**

**Study links genetic association
with advanced DCM**

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Perspective from Stuart F. Seides, MD, physician executive director, MedStar Heart & Vascular Institute

Approaching common conditions uncommonly.

There is a wellspring of innovation in the cardiovascular research community that provides a proliferation of new tools and techniques. To be successful in selecting which ones best translate to optimal patient care, extensive experience and exceptional clinical judgement is required. In this issue of *Cardiovascular Physician*, we share cases in which our specialists elected to treat common conditions uncommonly—with novel technologies, innovative approaches, new medications, and evidence-based analysis.

We see this in our evolving use of mechanical circulatory support, including ECMO, the Impella® pump, and LVADs. While not new, these tools require a deep understanding in order to use them appropriately and effectively—at the right time, for the right patient, and under the right circumstances. Our advanced heart failure teams continuously revisit how and when these tools are selected, to give patients the best opportunity for meaningful survival. Dr. Keki Balsara and Dr. Farooq Sheikh discuss those nuances on page four.

Similarly, in the case of one patient with an aortic aneurysm, Dr. Christian Shults chose to perform a valve-sparing aortic root replacement. Though technically more complex than simply replacing the valve along with the root, by preserving the native aortic valve Dr. Shults facilitated the patient's return to his active lifestyle with fewer potential complications. This type of procedure requires both surgical expertise and refined judgement. Dr. Shults considered the framework of the patient's life and goals, beyond just the anatomic pathology. You can find the case study on page 14.

To use a new tool effectively, one must be a skilled and experienced craftsman in the first place. Dr. Steven Abramowitz recently became first in the world to use the RevCore™ mechanical device for venous stent thrombosis. Though a relatively common problem, venous stent thrombosis can be a challenge to treat. This new device allows for complete removal of a clot in a single session—a real revolution for affected patients. Read more on page seven.

Yet another common condition where treatment is rapidly evolving is recurrent pericarditis. We are seeing more cases than we did a decade ago, but we are fortunately also seeing the emerging role of novel biologic agents in treating the disease. To meet the increasing needs of patients and to stay on the cusp of research, we have established a new specialty program in pericardial diseases led by Dr. Waqas Haider. A discussion on the program and new drug recommendations is on page eight.

On page 11, we share details about a novel percutaneous alternative to a well-known vascular surgery procedure: the femoral popliteal or "fem-pop" bypass. Dr. Nelson Bernardo and Dr. Kyle Reynolds have begun offering this new option, which achieves the results of a surgical bypass while providing the benefits of a minimally invasive approach.



Treating common conditions uncommonly is further demonstrated by our pulmonary embolism teams. At MedStar Union Memorial Hospital, Dr. Raghu Vallabhaneni and Dr. Jason Chin are challenging the traditional approach of straightforward systemic anticoagulation in favor of an individualized approach tailored to specific patient circumstances, including direct mechanical extractions when indicated. Details on page 12.

Along with practiced hands and excellent judgement, curious minds empowered by the collaborative use of big data help move us toward better understanding of underlying pathophysiology. To that end, Dr. Mark Hofmeyer recently published a first-of-its-kind study to help advanced heart failure specialists unravel the genetic basis of so-called "idiopathic" dilated cardiomyopathy—and what that may mean for patients and their families. Further exploration of this kind may progressively shrink the number of cases where the etiology is truly unknown. See page 16 for a summary of the research.

At MedStar Heart & Vascular Institute, we are committed to continuing to build on this type of experience—the experience that leads to superior outcomes for our patients—whether that means better or refined use of known methodologies or development of newer methodologies altogether. And, as in all the work that we do, successful outcomes depend heavily on teamwork, a bedrock of our culture. We each rely on our colleagues inside and outside of the MedStar Health system to care for our patients, and we are grateful for your partnership.



Broader use of mechanical circulatory support is saving more lives of advanced heart failure patients.

From performing the first cardiac transplant in the nation's capital in 1987, to becoming one of the first institutions in the world to implant a left ventricular assist device, MedStar Heart & Vascular Institute remains firmly at the forefront of care for advanced heart failure (AHF).

And that's good news for the growing numbers of end-stage heart failure patients, here and elsewhere.

"People in general are living longer today, even with severe heart failure," notes Surgical Director of Cardiac Transplantation and Mechanical Circulatory Support, Keki Balsara, MD. "Yet the number of hearts available for transplant has remained relatively stagnant, despite the United Network for Organ Sharing's (UNOS) expanded criteria for both organs and donors."

Temporary and durable mechanical circulatory assist devices help fill that gap.

When the first line of defense—medical therapy—is no longer effective enough, the mechanical circulatory support (MCS) program offers the optimal available options for each patient's unique condition. That includes everything from sternum-sparing, temporary support devices, to durable left ventricular assist device (LVAD) therapy—all in one program.

"We're now able to offer life-saving support to individuals who, a mere five or six years ago, would have died from lack of appropriate intervention," says Dr. Balsara.

Temporary mechanical circulatory assist devices.

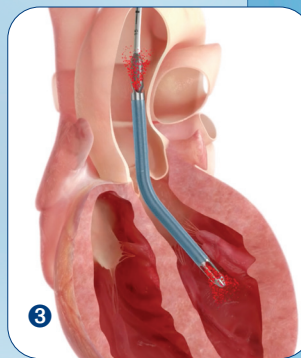
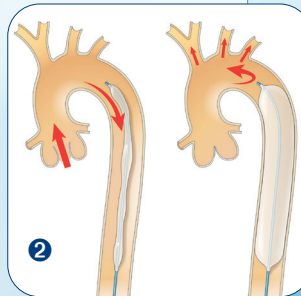
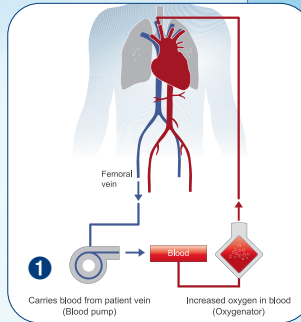
Introduced in the late 60s/early 70s, extracorporeal membrane oxygenation (ECMO) ¹ and the intra-aortic balloon pump (IABP) ² were the original temporary mechanical circulatory support (tMCS). The catheter-based devices are designed to help hearts recover from myocardial infarction, trauma, open heart surgery, and other major cardiovascular events—or to optimize a patient in anticipation of LVAD.

"Initially, the approach for tMCS devices was through the femoral artery, requiring patients to lie flat on their back the entire time they were connected to the device," explains Dr. Balsara. "However, new advances and other recent approaches now allow for limited ambulation; many patients can get out of bed, walk around, and even participate in physical therapy. As a result, they are better conditioned, with more strength and stamina to withstand LVAD implantation or heart transplant when the time comes."

The latest addition to the tMCS toolbox, and the most promising, is the Impella 5.5* ³. Unlike other tMCS devices, Impella sits directly inside the left ventricle, mimicking an LVAD, without need for an open operation. With a more robust pump than either ECMO or IABP, Impella delivers greater support, and allows specialists to gauge how well the heart will perform once the LVAD is implanted.

As the name implies, temporary percutaneous ventricular devices are designed for short-term use. However, some of today's patients may remain on the devices for a fair amount of time.

"During the COVID-19 pandemic, for instance, it was not unusual to have some patients on ECMO for a year or more," Dr. Balsara says. "Currently, we have a young patient who has been on Impella for around four months while she waits for a heart."



(l to r) Farooq Sheikh, MD, medical director of Advanced Heart Failure in the Washington, D.C. region and Keki Balsara, MD, surgical director of Cardiac Transplantation and Mechanical Circulatory Support

Durable left ventricular assist devices.

Our LVAD program is one of the highest volume sites nationwide, having implanted more than 800 durable LVADs to date. Actively involved in clinical research, we have participated in all of the major studies of the technology, including the pivotal HeartMate 3™ (HM3) LVAD clinical trial, the MOMENTUM 3 study. Our Advanced Heart Failure Program has implanted more than 400 HM3 LVADs.

"The HeartMate 3 LVAD is a revolutionary technology associated with improved survival and enhanced quality of life with a marked reduction in adverse events," says Farooq Sheikh, MD, medical director of Advanced Heart Failure in the Washington, D.C. region. "Moreover, long-term analysis of the therapy demonstrates a five-year survival rate of approximately 60 percent with 1- and 2-year survival, now comparable to cardiac transplantation."

People are now living with LVADs for more than 10 years, with fewer complications than ever before. As a result, the criteria for LVAD therapy has been expanded toward extending the life-prolonging option to more patients with advanced heart failure.

"There are estimates that greater than 50,000 people in the United States may derive benefit from AHF therapies today," says Dr. Sheikh. "Yet only 4,000 hearts were implanted in 2022. We are trying to increase the options available to more people, improving both survival and quality of life."



(top image) HeartMate 3™ LVAD; (middle and bottom images) Implantation of LVAD

—Continued on next page

The future of advanced heart failure care.

With the full range of devices in our armamentarium—and a solid research program as its foundation—we have one of the largest heart failure management programs in the United States. In the latest fiscal year, our team implanted 47 durable LVADs and performed 53 heart transplants.

Such results are the product of comprehensive expertise in cardiology and cardiovascular surgery. Advanced Practice Providers, LVAD coordinators, nurse navigators, and equipment managers are integral. Our multidisciplinary approach—which includes partnering with specialists from interventional cardiology, electrophysiology, clinical cardiology, cardiac imaging, palliative medicine, neurology, gastroenterology, infectious disease, nephrology, dialysis centers, physical therapy and rehab facilities—further contributes to the high quality of care and optimal outcomes for each patient.

Ultimately, the success of both temporary and durable mechanical circulatory assist devices is helping patients live longer with a higher quality of life. Progress in the field has been remarkable, Dr. Balsara says. His goal is to ensure MedStar Health remains on the cusp of that wave.

“We have so many more—and better—options for patients with end-stage heart failure than we had just a decade ago,” he concludes. “I am eager to see what more we can do in the future.”

For more information or for a consult, please call our Advanced Heart Failure program at 202-877-4698.



LVAD management now more convenient and accessible for patients in the Baltimore region.

After implantation, Baltimore-area LVAD patients can now receive much of their care at MedStar Union Memorial Hospital, reducing the need to travel to MedStar Washington Hospital Center for follow-up visits.

This specialty program, along with the full scope of heart failure services in Baltimore, is overseen by Sandeep Jani, MD (pictured above), recently appointed medical director of Advanced Heart Failure for the Baltimore region.

World's first use of a mechanical device for venous stent thrombosis at MedStar Washington Hospital Center.



**Chairman of Vascular Surgery
Steven Abramowitz, MD**

In March at MedStar Washington Hospital Center, Vascular Surgeon Steven Abramowitz, MD, became first in the world to use the RevCore™ thrombectomy catheter, a novel mechanical thrombectomy device for treating in-stent thrombosis. Since then, surgeons have completed more than 25 cases and continue to offer the greatest expertise and experience with the device.

“Thus far, the post-intervention patency rate has been 100 percent and patients with wounds have seen improvements in ulcer size. We have had no device-related complications,” shares Dr. Abramowitz, who is also MedStar Health’s Chairman of Vascular Surgery.

Venous stents are used to treat obstructed or narrowed veins caused by multiple conditions, including deep vein thrombosis and chronic venous insufficiency. Venous stent thrombosis is relatively common and can occur at any time following placement of the device. Symptoms and consequences of stent thrombosis may be severe, including ulceration of a lower extremity and painful swelling and discoloration of a leg. The longer a stent is thrombosed, the more challenging it can be to treat.

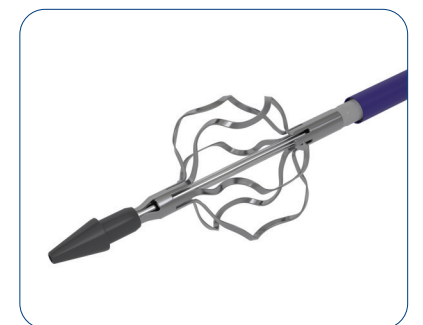
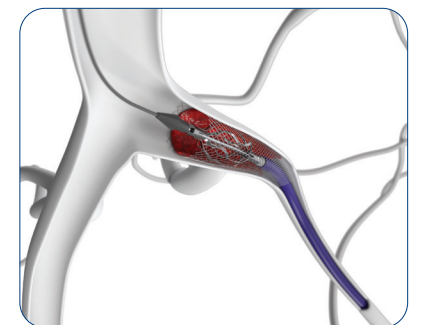
“Until now, physicians have had limited options to offer patients, and many were often relegated to multiple reinterventions that provided only suboptimal results,” explains Dr. Abramowitz. “RevCore is a game changer.”

The first-of-its-kind mechanical thrombectomy device is used to remove clots and restore blood flow for both acute and chronic cases in the peripheral vasculature. It is designed to fully remove clots in a single session, reducing the need for additional intervention.

During the minimally invasive procedure, the RevCore catheter is threaded through the popliteal, femoral, or internal jugular vein, into the occluded stent. The device expands to variable diameters, as needed, and the cutting element at the end of the catheter detaches thrombotic material from within the implanted stents. The procedure is typically completed in less than two hours and patients can go home the same day. Most return to their daily activities within a few days.

“There are a lot of patients out there who may benefit from this approach,” says Dr. Abramowitz. “When evaluating candidates, we consider those who may not have responded well to previous thrombectomies, either open or via catheter. Referring physicians may also request a consult when they suspect symptoms indicating stent thrombosis. We would be honored to assess your patient and discuss options.”

To schedule a consult with Dr. Abramowitz, please call 202-877-0275.



The RevCore™ thrombectomy catheter is designed to treat in-stent thrombosis by fully removing clots in a single session.

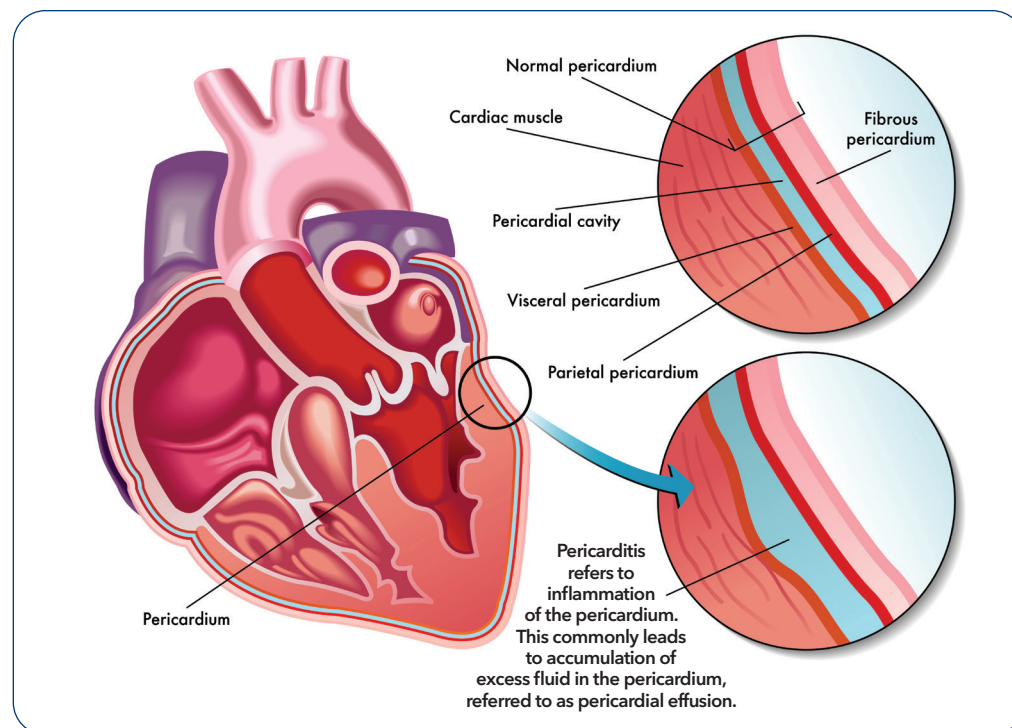
Managing pericardial disease: A changing paradigm.



Caring for patients with pericardial disease can be challenging due to the variable presentations of the disease in a context of other associated comorbidities that may influence condition severity and management. At MedStar Washington Hospital Center, a team of specialists led by Cardiologist (Syed) Waqas Haider, MD, MPH, FACC, is addressing these challenges through the establishment of a dedicated pericardial disease program that brings together technology, talent, and new treatments to give patients the best chance for improved longevity and quality of life.

What is pericardial disease?

Pericardial disease comprises a clinical spectrum of conditions affecting the pericardium. Pericarditis, or inflammation of the pericardium, is the most common manifestation. In developed regions of the world, pericarditis is frequently considered 'idiopathic' and related to a viral etiology. In developing countries, pericarditis is more often related to bacterial or fungal infection. Autoimmune disorders can play a role in the pathophysiology of pericarditis, as can other conditions including myocardial infarction, cardiac surgery, or traumatic injury to the chest.



"Pericarditis may be acute, recurrent, chronic, or constrictive," Dr. Haider explains. "Acute pericarditis typically begins suddenly and is often accompanied by sharp and stabbing chest pain that may be exacerbated by breathing, coughing, or lying supine. Unfortunately, 15 to 30 percent of patients with acute pericarditis will go on to develop recurrent pericarditis, with 50 percent of those patients at risk of developing multiple recurrences and possibly constrictive chronic process."

While pericarditis is usually mild and responds well to anti-inflammatory treatment, it can also lead to life-threatening complications such as pericardial effusion or tamponade, the relatively rapid accumulation of fluid between the two layers of the pericardial sac, a potentially fatal complication.

How is pericardial disease diagnosed?

Most cardiologists follow guidelines published by the European Society of Cardiology (ESC) in 2015 to diagnose acute pericarditis. These guidelines require two of the following four criteria to be present:

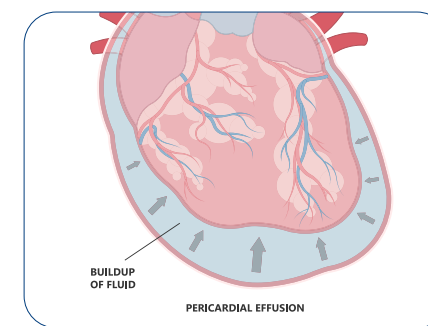
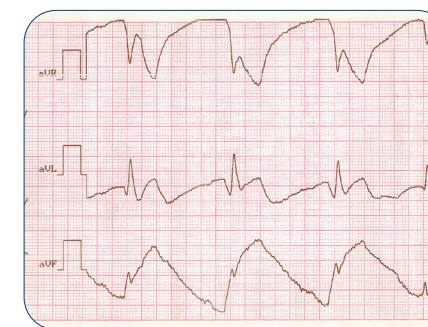
- Chest pain consistent with pericarditis
- Pericardial friction rub
- Suggestive electrocardiogram changes
- New or worsening pericardial effusion

Recurrent pericarditis is diagnosed when a patient meets the following three criteria:

- Documented episode of acute pericarditis
- Symptom-free interval of four to six weeks
- Recurrence based on criteria described for acute pericarditis



Cardiologist (Syed) Waqas Haider, MD, leads pericardial disease treatment at MedStar Washington Hospital Center



Treating pericardial disease.

The treatment for acute pericarditis usually includes high doses of a nonsteroidal anti-inflammatory drug (NSAID) such as ibuprofen, along with another anti-inflammatory agent called colchicine for three months. This regimen works well for most patients, with occasional gastrointestinal side effects such as diarrhea or heartburn.

Recurrent pericarditis is more difficult to manage and has traditionally involved an extended course of NSAIDs and colchicine with consideration of corticosteroids for patients with persistent symptoms or increased inflammatory markers such as c-reactive protein (CRP) and erythrocyte sedimentation rate (ESR). "Though they can provide rapid relief of symptoms, corticosteroids may increase the risk of recurrence, prolong the disease course, and have side effects that may include weight gain and muscle loss. We do not routinely encourage their use for those reasons unless there is a contraindication to NSAIDs and colchicine," says Dr. Haider.

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The changing paradigm.

"We are seeing a lot more pericardial disease than we did 10 years ago. While this may be due in part to improved detection especially with higher use of cardiac MRI, some of it may be related to the trend toward a higher number of percutaneous and surgical cardiac procedures in patients who would not have had intervention in the past. These interventions can cause what's known as post-cardiac injury syndrome (PCIS)," notes Dr. Haider.

Fortunately, there are also broader treatments and better imaging capabilities.

"There has been tremendous growth in our understanding of the pathophysiology of pericarditis and its future sequelae. There has also been great momentum in our practice to rely on cardiac MRI for diagnosis and prognostication of disease. The MRI enables us to better understand the spectrum of a patient's disease, which helps us individualize treatment," Dr. Haider notes.

"For example, if the cardiac MRI reveals that the pericardium is still inflamed after a few months of an anti-inflammatory regimen, we will not taper the treatment. In fact, persistent inflammation may warrant extended duration of treatment, or modification in pharmacologic strategy to provide more potent anti-inflammatory effect," he adds. "Conversely speaking, if the cardiac MRI reveals that the pericardium is thick and calcified without evidence of any active inflammation, that patient likely has 'burnt out' constrictive pericarditis that will probably require surgical intervention. In the past, we relied on symptoms and blood work to make that diagnosis but are now routinely utilizing the crucial information provided by cardiac MRI."

It's an exciting time in the field. In the changing paradigm of pericardial disease management, beyond the higher utilization of cardiac MRI, there has been more and more support for the role of novel biologic agents. These include anakinra, interleukin-1 receptor antagonist (IL-1Ra), as well as rilonacept, which blocks IL-1 signaling by trapping both IL-1 α and IL-1 β .



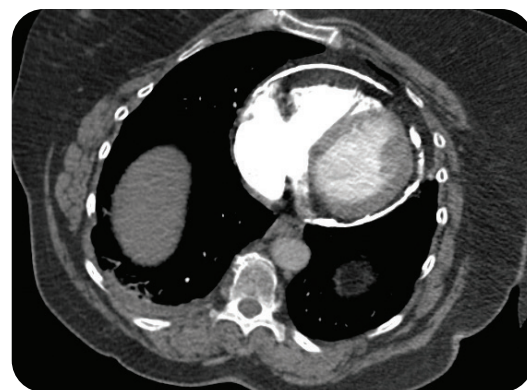
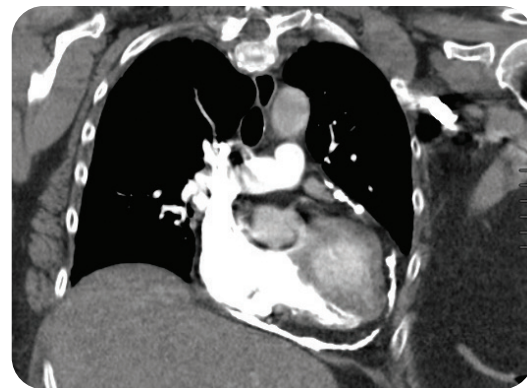
(l to r) Dr. Haider and Gaby Weissman, MD, cardiologist and director of the Cardiovascular MRI and Cardiovascular CT Core Laboratory.

"These biologics lead to symptom relief by decreasing active inflammation, as well as the likelihood of future recurrences," Dr. Haider explains.

In addition, newer therapies continue to be investigated. "I am currently involved as co-primary investigator for a clinical trial at MedStar Washington that is a multi-center, open-label pilot study to assess the efficacy of CardiolRx™ in patients with recurrent pericarditis. CardiolRx is a pure cannabidiol solution, which is known to have anti-inflammatory properties involving the modulation of inflammasome signaling pathway," he explains.

"Pericardial disease outcomes are best when the condition is recognized and treated early and appropriately," he says. "While all cardiologists can care for patients with these conditions, the diagnosis and treatment of complex pericardial disease requires a multidisciplinary approach that brings together a team of cardiac specialists working together to develop treatment plans that are truly individualized. That's what you'll find here."

To arrange a consult, please call 202-877-6801.



Images of the chest revealing thick diffuse pericardial calcification (egg-shell-type) almost entirely encasing the heart. The patient was diagnosed with calcific or "burned-out" constrictive pericarditis and had complete resolution of symptoms after undergoing successful radical pericardectomy by Cardiac Surgeon Thomas MacGillivray, MD.

New percutaneous alternative to traditional "fem-pop" bypass.

Early this summer, the US Food and Drug Administration approved the use of Endologix DETOUR™ System to provide specialists a novel alternative to treating patients with complex peripheral arterial disease, or PAD.

When lifestyle changes and medication fail to help patients with PAD or those at risk of limb loss, specialists turn to revascularization options including minimally invasive endovascular intervention, 'open' surgery, or hybrid approaches. However, in patients with long and complex obstructive disease of the superficial femoral artery (SFA), endovascular procedures have limited success. Surgical bypass has a high complication rate and a prolonged recovery.

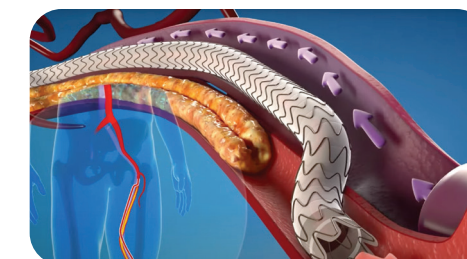
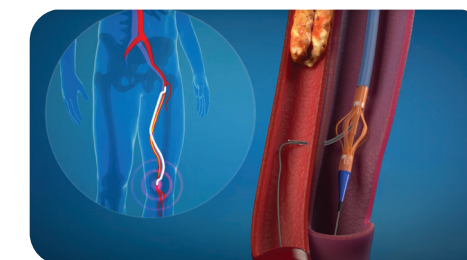
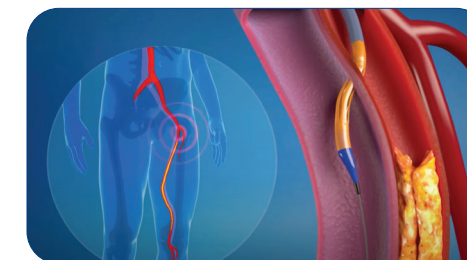
"Percutaneous Transmural Arterial Bypass (PTAB) with the DETOUR System is designed to combine the benefits of surgical bypass with the endovascular approach," says Interventional Cardiologist Nelson Bernardo, MD, one of two MedStar Health physicians offering PTAB. During the procedure, he and his colleague, Vascular Surgeon Kyle Reynolds, MD, detour around a long, calcified blockage of the SFA by percutaneously creating a channel through the adjacent femoral vein. A stent is inserted from the top of the SFA, into the femoral vein, and back into the popliteal artery.

Potential candidates are those with complex, long lesions (20-46 cm), who have already failed other endovascular interventions or previous open bypass surgery. These patients do not have adequate vein conduit, and are not suitable surgical candidates.

Current data indicates that PTAB has longer durability than balloon angioplasty or intravascular stenting alone, which are known to have low patency rates. Dr. Reynolds says patients may find DETOUR preferable



(l to r) Interventional Cardiologist Nelson Bernardo, MD, with Vascular Surgeon Kyle Reynolds, MD



for personal reasons as well. "We understand that some patients may delay care because they are the primary caretaker of a loved one or are unable to miss work due to the financial impact on the household," he explains. "This delay puts them at higher risk of limb loss. With DETOUR, we can mitigate the difficulties associated with long hospitalizations. In a DETOUR-2 IDE study of 202 patients, when compared to the reported 3-to-9-day length of stay with open surgical bypass, PTAB averaged 1.1 days."

While Drs. Bernardo and Reynolds can do the procedure on their own, they prefer to collaborate. Dr. Reynolds says, "What we consider 'complex

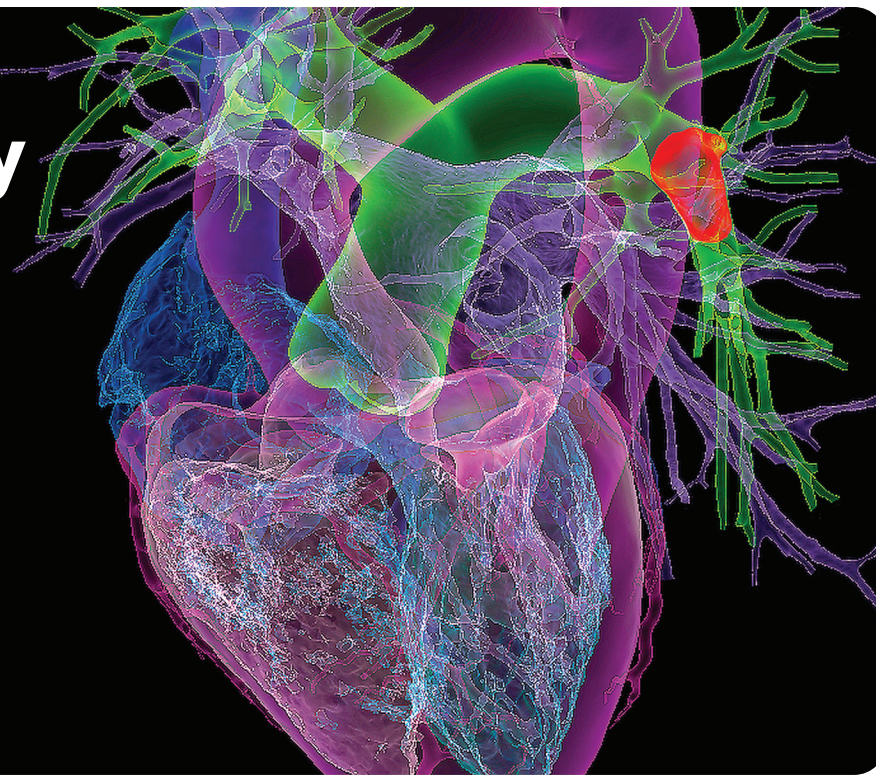
PAD' is frankly subjective. Each patient is different, so we ask: how long is the blockage, is it calcified, are there previous treatments that failed, are there comorbidities? We come from two different perspectives that include both open and endovascular surgical options, so we look at all the factors and tailor our treatment plan to each individual."

"It's another addition to the endovascular toolbox," adds Dr. Bernardo. "This is an excellent option to treat long segment and complex SFA disease without 'burning the bridge' for a future, surgical bypass."

For more information or to request a consult, call 202-877-0275.

During the procedure, Drs. Bernardo and Reynolds detour around a long, calcified blockage of the superficial femoral artery (SFA) by percutaneously creating a channel through the adjacent femoral vein. A stent is inserted from the top of the SFA, into the femoral vein, and back into the popliteal artery.

Multidisciplinary teams at the forefront of pulmonary embolism treatment.



A man in his forties with rheumatoid arthritis and spondylosis presented at the Emergency Department of MedStar Union Memorial Hospital with acute shortness of breath.

Initially, the patient's oxygen saturation on room air was 77 percent, his troponin was elevated, he was tachycardiac at 125 beats per minute, had a respiratory rate of 29 breaths per minute, and blood pressure of 114/60. Suspicious of pulmonary embolism, the team began anticoagulation and started a high-flow nasal cannula.

The hospital's Pulmonary Embolism Response Team (PERT) was activated. The multidisciplinary cohort convened to discuss the case, order an advanced workup, confirm diagnosis, and determine the best course of action.

The patient was determined to have a intermediate-high-risk, submassive, bilateral pulmonary embolism. He was transported urgently to the operating room where Director of Vascular Surgery for MedStar Health's Baltimore region, Raghu Vallabhaneni, MD, performed a percutaneous mechanical thrombectomy in both sides of the lung by common femoral vein access.

Within one hour post-procedure, the patient's respiratory rate stabilized at 12 breaths per minute, his heart rate decreased to 96 beats per minute, and his blood pressure increased to 138/80.

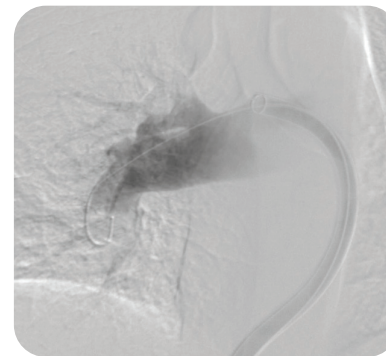
The team was able to take him off oxygen within 24 hours and his echocardiogram soon showed only mild enlargement of his heart. After a few days in the step-down unit, he was discharged without supplemental oxygen.

Three weeks later, at his first follow-up visit, the patient's respiratory rate was normal. He was referred to cardiology for monitoring of potential pulmonary hypertension and heart failure, as is standard practice with all PE patients.

This patient presented to the hospital later than ideal, as he assumed his symptoms were due to a simple virus. Unfortunately, this delay in seeking care is common. Symptoms of PE can be nonspecific, diffuse, or reasonably attributed to other causes. When not treated, acute PE can be fatal, responsible for up to 300,000 deaths annually, with in-hospital mortality rates approaching 30 percent in the highest-risk cases. Patients who survive may need to manage the dangerous risk of PE recurrence, as well.



Before imaging:
Patient with significant thrombus in right main pulmonary artery and interlobar artery.



After imaging:
Image after successful thrombectomy of right pulmonary artery a few minutes later.

Despite these grim statistics, the diagnostic and treatment landscapes are changing, providing good reason for hope. MedStar Health's high-volume PE teams are standardizing protocol, using advanced treatment technology, and relying on the collaborative decision making of multidisciplinary specialists to produce better patient outcomes.

Advanced PE care starts with a multidisciplinary approach.

At MedStar Health, our well-established Pulmonary Embolism Response Teams include specialists from vascular surgery, interventional radiology, cardiothoracic surgery, critical care, and cardiology. When a PE is suspected, the team convenes to follow a protocol for expedited diagnostic workup and a collective approach to treatment.

There's a clear advantage of the PERT approach, explains Vascular Surgeon Jason Chin, MD, who leads the PERT in Baltimore. "By streamlining clinical decision-making with multidisciplinary expertise around the table, we are better equipped to make the right diagnosis and select the best treatment plan possible—and do so expeditiously. This leads to better outcomes for our patients."

Early expertise in minimally invasive interventions.

Anticoagulants are still used for all PE patients, but more trials now show the benefits of mechanical thrombectomy (a minimally invasive procedure using an image-guided catheter to aspirate the thrombus in the pulmonary artery), and catheter-directed thrombolysis.

"This is newer technology, and our team has been among the early adopters," states Dr. Vallabhaneni. "In the first half of this year, 50 patients were treated with these advanced therapies in our Baltimore hospitals."

Dr. Chin explains the difference that the use of these treatments makes. "Patients with certain PE may have previously required prolonged observation in the hospital on IV heparin, risking deterioration to the point of requiring systemic thrombolytics or open surgical thrombectomy. But now, we're often able to offer swift, percutaneous therapy. Patients have come in with massive PEs and we're able to treat them—usually within 2-24 hours, depending on urgency of the case—and often send them home the next day."

Furthermore, Dr. Vallabhaneni believes these approaches should no longer be reserved for only the sickest patients. "These PE extraction procedures have become a really effective option for treating young patients with physiologically significant PE, even if it's not life threatening," says Dr. Vallabhaneni. "Extracting clots in this manner is safer and has less bleeding risk than the use of pharmacological agents. Most times, we see a near immediate improvement following surgery."

For the higher-risk patients, there is promising evidence that these interventions reduce mortality when compared to medical management, improve quality of life, decrease length of hospitalization, and potentially reduce the risk of pulmonary hypertension and heart failure.



Raghu Vallabhaneni, MD
Director of Vascular Surgery, Baltimore region



Vascular Surgeon Jason Chin, MD

These procedures have been fine-tuned such that they can now be done safely under local anesthesia in the endovascular lab. Higher risk, sicker patients are still treated in the OR as a precaution.

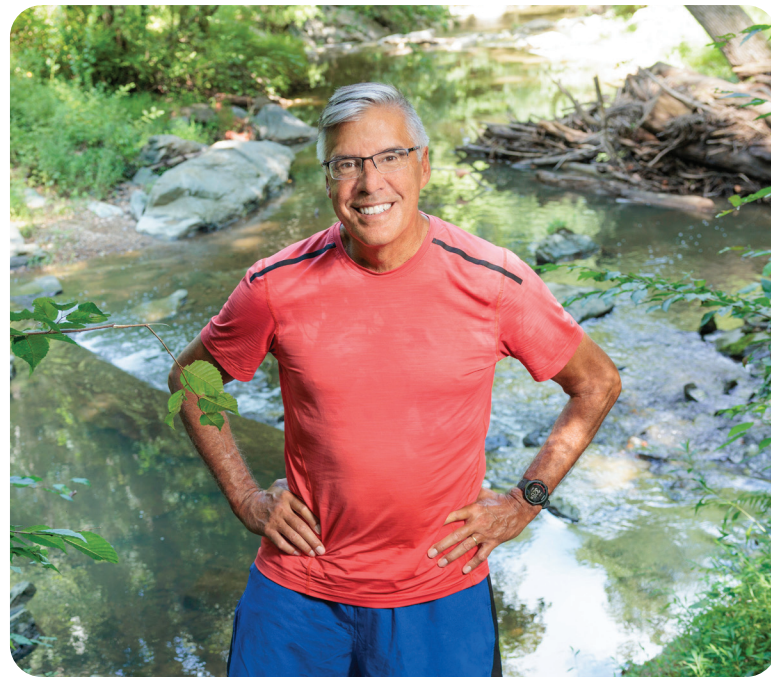
Looking ahead.

While significant strides have been made in diagnostics and treatment protocol, there remain a number of complexities related to PE. At MedStar Health, our teams continue to contribute to the body of research through involvement in clinical trials aimed at delineating optimal approaches.

For more information or to discuss a case, please call 410-554-2950. To transfer a patient, call 410-554-2332.

Aortic root replacement preserves patient's native valve:

Treatment that considers the whole person.



Patient Phil Snare, three months post-procedure

While at work one afternoon in March 2023, Phil Snare experienced sudden pain and extreme pressure in his chest. The 66-year-old technology executive initially thought he was having a heart attack, but as he made his way to an emergency care center, Snare found it curious that he wasn't experiencing any of the other traditional symptoms. His breathing was normal, and the pain did not extend into his arm.

"I had no history of heart disease at all," Snare says. "What's more, I work out regularly, and go running when I can, including a marathon just a few months earlier. There was never a problem, certainly not like this."

Tests confirmed that Snare had not suffered a heart attack, and by evening, he felt fine. When Snare consulted with a local cardiologist later that week, they thought that the pressure might well have been the result of viral pericarditis, or even just stress. Snare put it out of his mind, until he had another, more serious episode a month later.

Urged by family and friends to get a second opinion, Snare recalled that his company previously had supported a clinical trial led by Allen Taylor, MD, regional chair of Cardiology for MedStar Health's Washington, D.C. region.

"I reached out to him and he responded right away, inviting me to make an appointment to see him," Snare recalls, adding that Dr. Taylor minced no words about what might be going on.

"He told me that it actually was not viral pericarditis," Snare says. "But he was also encouraging and confident they would find the problem."

More extensive tests revealed that Snare had a 5.7-cm aortic aneurysm, with pericardial fluid suggesting the possibility of rupture and dissection in the aorta. It was a complex condition that needed attention to not only replace the damaged aortic root but also manage the nearby aortic valve.

"Tissue and mechanical replacement valves work well, but neither one is perfect," explains Cardiac Surgeon Christian Shults, MD, who would join Dr. Taylor in handling Snare's case. "A tissue valve might last 15 years or so, without requiring lifelong anticoagulants. A mechanical valve, though more durable, requires the anticoagulants."

A more promising possibility for a patient of Snare's age and condition was valve-sparing aortic root replacement, a reimplantation approach pioneered in 2001 by noted cardiac surgeon Tirone David, MD. Familiarly known as a David procedure, the technique replaces damaged portions of aorta with a collagen-coated polyester graft, but preserves the patient's native aortic valve.

"Anytime you can save the native valve is a plus for the patient," Dr. Shults says. "Though the procedure itself is technically more complex, it lowers the risk of post-surgical complications, the need for additional surgery, and eliminates the need for lifelong medication."

Fortunately for Snare, the cardiac surgeons at MedStar Health have high-volume expertise in complex aortic procedures. Dr. Shults estimates that more than 530 cases were performed within the system during 2022 alone.

"Another hospital may have done a valve replacement on Mr. Snare," Dr. Shults says. "That's not inherently wrong, but as a very experienced, complex aortic center, we have the expertise to identify and offer other options."

Snare's age, heart function, and other factors made him an excellent candidate for the David procedure. After discussing the options with Drs. Shults and Taylor, he readily agreed to the surgery.



Christian Shults, MD, cardiac surgeon and co-director of the Complex Aortic Center at MedStar Washington Hospital Center

"I was expecting it to be a few months before they would get to me, but they wanted to schedule it for the following week," Snare says. "Things got very real very fast. I was thrilled that we could get this taken care of so quickly."

During a seven-hour surgery, Dr. Shults performed a David-V procedure—the most recent version of Dr. David's original procedure, which uses a graft that is dilated at its base to accurately recreate the normal anatomy.

"We found no aortic dissection or other issues," Dr. Shults recalls. "Overall, it was a very smooth procedure." He adds that genetic testing of the

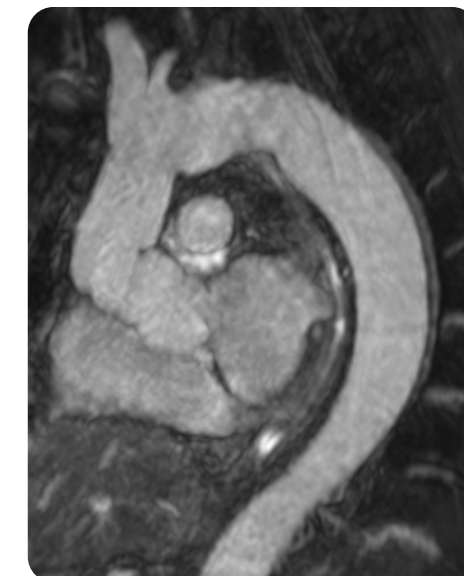
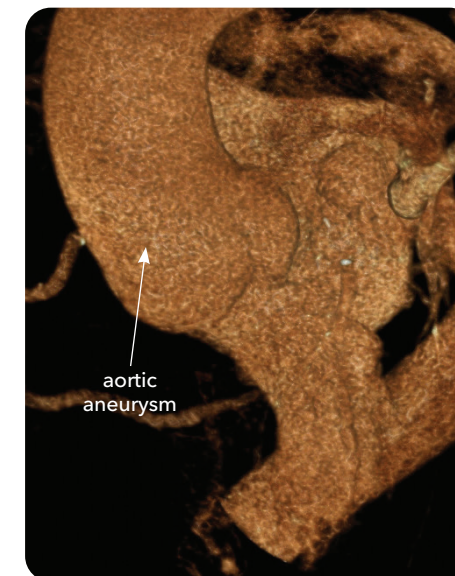
damaged aortic tissue may provide some clues as to how Snare's condition originated.

Now, three months after surgery, Snare has progressed in his recovery to five-mile walks and has resumed jogging.

"From the start, the communication and coordination from Drs. Taylor and Shults has been amazing," Snare says. "They always gave me the facts, answered my questions, and really put me at ease. I still have a way to go, but this whole experience has been great, and really underscores the importance of getting a second opinion while finding the right expertise."



Allen Taylor, MD, regional chair of Cardiology for MedStar Health's Washington, D.C. region



Before imaging (left): Cardiac CT demonstrating an aortic root and ascending aortic aneurysm

After imaging (right): MRA (magnetic resonance angiography) post valve-sparing aortic root and ascending aorta repair

Study links genetic association with advanced dilated cardiomyopathy:

What this could mean for patients and their families.



Mark Hofmeyer, MD, medical director of the Advanced Heart Failure Intermediate Care Unit at MedStar Washington Hospital Center, and first author of the DCM Precision Medicine Study

Recently published in the American Heart Association's journal *Circulation*, the DCM Precision Medicine Study links patients' genetics to advanced dilated cardiomyopathy (DCM) and considers the benefits of routine genetic testing for their at-risk family members.

Cardiologist Mark Hofmeyer, MD, medical director of the Advanced Heart Failure Intermediate Care Unit at MedStar Washington Hospital Center, and first author of the study, along with colleagues at 25 leading academic U.S. heart failure and heart transplant programs, analyzed clinical and genetic sequence data from 1,198 patients over a five-year period.

Three DCM severity groups were compared: those with left ventricular assist devices (LVAD) or heart transplant (HT); those with an implantable cardioverter defibrillator (ICD) only; and those with neither ICD nor LVAD/HT.

The results were significant: those with advanced disease (LVAD and transplant patients) were more than twice as likely to carry a pathogenic or likely pathogenic variant than patients with only an ICD or with no device, implant, or transplant.

"This analysis provides highly relevant, actionable information for clinical practice," explains Dr. Hofmeyer. "Genetic findings in more than one in four patients with advanced DCM is a compelling basis for testing first-degree relatives."

This research marks the first time that the concept of genetic association has been systematically studied, but it's something that Dr. Hofmeyer has been considering for many years. "In my practice, I often help evaluate a patient's candidacy for an LVAD or transplant," he says. "Assessing their social support is a key piece in eligibility. While thinking of these family members, I started to wonder if there could be a genetic component—if perhaps there were other DCM patients in the family. Now we know that it likely may be the case."

Importantly and uncommonly, the study population was very diverse: 42 percent of patients were of African ancestry and 44 percent were female. The researchers also controlled for confounders such as other demographic factors, major comorbidities, geographic location, and social determinants.

Looking ahead, Dr. Hofmeyer hopes that this work will serve as a foundation for future studies. There are already ideas for potential follow up, including a longitudinal study to follow family members, an expanded demographic pool to further examine minority populations, and continued re-analysis as more variants of uncertain significance emerge.

Dr. Hofmeyer says that the ultimate goal is to see if progressive medical therapy can begin earlier, perhaps avoiding the need for mechanical circulatory support or transplant altogether.

"Just like with mammograms, we want to know if we should recommend an echo every year for those at risk," he explains. "If we catch the abnormality early, can we then blunt the progression of the disease with proactive drug therapy? If caught early, DCM is manageable."

There may also be indications for treating the patient more aggressively when genetic mutations are found. "For example, many of these genes are associated with arrhythmias. So, in those cases, we might consider moving the patients toward a transplant sooner, since it is difficult to manage VADs with arrhythmias."

"Bottom line," he concludes, "the more information we have, the better equipped we are to plan the best course of action."

To learn more about his research, or to refer a patient who may benefit from genetic testing or advanced heart failure care, please contact Dr. Hofmeyer at 202-877-4698.

News and notes.

MedStar Washington among nation's highest ranked cardiovascular centers.



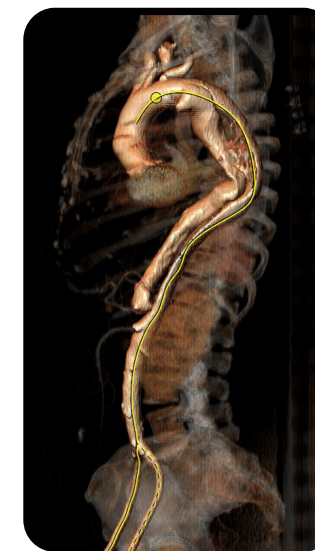
MedStar Washington Hospital Center has again been recognized as one of the top 50 heart and vascular centers in the country by U.S. News & World Report. MedStar Washington's Cardiology, Heart & Vascular Surgery program is tied at No. 33 nationwide in the recently released 2023-2024 rankings. It is the only nationally recognized heart and vascular program of its kind in the Washington D.C. metropolitan area. For the first time, the rankings now include vascular surgery—a recognition of the essential role vascular surgery providers and staff play in the comprehensive care of the cardiovascular patient. MedStar Washington also received the highest rating possible in abdominal aortic aneurysm repair, aortic valve surgery, heart attack care, heart bypass surgery, heart failure care, and transcatheter aortic valve replacement.

"Our established stature among the best regarded cardiovascular centers in the country is a tribute to the tireless teamwork and dedication of our physicians, clinical staff, and associates who strive to keep patients at the heart of everything we do," said Stuart F. Seides, MD, physician executive director of MedStar Heart & Vascular Institute. "Our entire team feels a genuine sense of pride and accomplishment in this well-deserved and ongoing recognition."

Introducing our new DMV Aortic Club.

Each quarter, we host a collaborative, clinical discussion on aortic disease with colleagues from health systems throughout the Mid-Atlantic region. Interesting cases are shared over dinner at a local restaurant. Attendees are encouraged to present cases that feature advanced techniques, new technologies, complications, or challenging disease/anatomy. Our next meeting is on December 11 at 6:30 p.m. at Ruth's Chris Steak House in Tysons Corner, Virginia.

If you plan to attend, please RSVP to: clubaortic@gmail.com or javairiah.fatima@medstar.net.



MedStar Washington has among the lowest myocardial infarction death rates in the country.

MedStar Washington Hospital Center has been ranked among the top 10 hospitals with the lowest heart attack death rates in the U.S., according to data (complication measures, CMS Patient Safety Indicators, and 30-day death rates) collected by the Centers for Medicare & Medicaid Services.

Multidisciplinary teams throughout the hospital contribute to this focused, fast, and lifesaving care of patients who come to us in crisis, from all across the region.

Welcome **new medical staff.**



Othman Abdul-Malak, MD, is a vascular surgeon at MedStar Franklin Square Medical Center. He performs the full spectrum of vascular surgery procedures and sees patients for peripheral arterial disease, aortic aneurysms, carotid disease, and venous disease. Dr. Abdul-Malak integrates medical and surgical treatments to create a personalized management plan based on a patient's unique pathology and anatomy. Beyond surgical methods of treatment, Dr. Abdul-Malak strongly encourages lifestyle and behavior modifications, e.g., supervised exercise therapy and smoking cessation, to optimize individual patient outcomes. He embraces new technologies and innovations that allow for treating a wider breadth of patients who otherwise would not be a candidate for more traditional methods or procedures. His approaches combine minimally invasive techniques with traditional surgery in hybrid procedures.

Education and training:

- **Integrated Residency:** Vascular Surgery, University of Pittsburgh Medical School, Pittsburgh, Pennsylvania
- **Medical school:** American University of Beirut, Beirut, Lebanon



Jonathan Gardner, MD, is a general cardiologist at MedStar Franklin Square Medical Center who treats patients for a wide range of disorders, from preventative care to advanced heart failure. He is board-certified in general cardiology and nuclear cardiology. Dr. Gardner's approach is highly informed by his extensive experience in advanced heart failure. As part of his training, he completed a fellowship in advanced heart failure and transplant cardiology and brings knowledge of these specialties and a holistic perspective to his clinic. Dr. Gardner is passionate about advocating for and educating his patients, especially young people, on how to prevent future cardiac complications and actively treating issues when they occur in patients of all ages.

Education and training:

- **Fellowships:**
 - Advanced Heart Failure and Transplant Cardiology, Houston Methodist DeBakey Heart & Vascular Center, Houston, Texas
 - Cardiovascular Disease, University of Tennessee Health Science Center, Memphis, Tennessee
- **Residency:** Medical College of Georgia, Augusta, Georgia
- **Medical School:** Ross University School of Medicine Dominica, West Indies



Aubrey J. Grant, MD, is a sports cardiologist practicing at MedStar Union Memorial Hospital and MedStar Health at Lafayette Centre. Dr. Grant specializes in treating athletes, particularly in differentiating between exercise-induced adaptations of the heart versus true cardiovascular disease or pathology. He uses a variety of comprehensive tests and assessments to determine sports eligibility, give exercise prescriptions, and make recommendations on how to prevent or manage cardiovascular disease. In particular, Dr. Grant performs cardiopulmonary exercise tests (also known as VO2 tests), a specialized stress test that measures a patient's fitness level. With this evaluation, he can offer athletes specific and individualized advice on how to reach peak performance. For Dr. Grant, an "athlete" can be anyone—high school athletes, Olympians, master athletes, professional or semi-professional, or weekend warriors. If an individual is interested in improving their performance or maintaining high activity levels, Dr. Grant welcomes them into his clinic.

Education and training:

- **Fellowships:**
 - Sports Cardiology, Massachusetts General Hospital/Harvard Medical School, Boston, Massachusetts
 - Cardiovascular Disease, Georgetown University/MedStar Washington Hospital Center, Washington, DC
- **Residency:** Emory University School of Medicine, Atlanta, Georgia
- **Medical School:** Meharry Medical College, Nashville, Tennessee



Janet Tsang, MD, is a non-invasive cardiologist at MedStar Good Samaritan Hospital. She has board certifications in cardiovascular disease, nuclear cardiology, adult echocardiography, internal medicine, and clinical cardiac electrophysiology. Dr. Tsang specializes in a variety of cardiac issues including coronary artery disease and arrhythmias. Her approach is to treat the whole patient, incorporating each individual's social, cultural, and lifestyle factors when developing a treatment plan. When Dr. Tsang first meets with patients, she begins by educating them and takes the time to thoroughly explain their diagnoses and their test results. Once patients understand their condition, Dr. Tsang helps them create an individualized plan to improve their heart health.

Education and training:

- **Fellowship:** Cardiovascular Disease, Cooper University Hospital, Camden, New Jersey
- **Residency:** Harbor-University of California, Los Angeles Medical Center, Los Angeles, California
- **Medical school:** University of California, Irvine School of Medicine, Irvine, California



Cardiovascular Physician is a publication of MedStar Health. It is a forum to share clinical, research, and teaching information in cardiology, cardiac surgery, and vascular care.



Please submit any comments to Managing Editor Karoline Hutson, at karoline.m.hutson@medstar.net.

MedStar Heart & Vascular Institute

Stuart F. Seides, MD

Physician Executive Director

Steven D. Abramowitz, MD

Chair, MedStar Health Vascular Program

Brian T. Bethea, MD

Chief, Cardiac Surgery
MedStar Union Memorial Hospital

Zayd A. Eldadah, MD

Director, MedStar Health Cardiac Electrophysiology

Sandeep M. Jani, MD

Medical Director, Advanced Heart Failure
Baltimore Region

Robert A. Lager, MD

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Baltimore Region

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Sriram Padmanabhan, MD

Chief, Cardiology
MedStar Franklin Square Medical Center

Lowell F. Satler, MD

Director, Interventional Cardiology
Washington Region

Farooq H. Sheikh, MD

Medical Director, Advanced Heart Failure
Washington Region

Allen J. Taylor, MD

Regional Chair, Cardiology, Washington Region

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Ron Waksman, MD

Director, Cardiovascular Research
and Advanced Education

John C. Wang, MD

Director, Interventional Cardiology
MedStar Union Memorial Hospital
MedStar Franklin Square Medical Center

Department of Continuing Professional Education

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Save the Date!

CRT 2024

March 9 - 12, 2024

Washington Hilton Hotel
Washington, DC

This annual 4-day conference will focus on five tracks—coronary, valve and structural, endovascular and stroke intervention, health disparities, and nurses and technologists. CRT 2024's concurrent meetings are designed to impact practice with focused sessions that discuss new trial data, explore evidence-based research, and demonstrate cutting-edge techniques that can be directly applied to the learners' clinical and academic practice.

CRTmeeting.org

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Cardiac Ultrasound and Advanced Imaging Conference

Weekly, Thursdays, 7:30 a.m.
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Electrophysiology Core Curriculum Conference

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