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The Pulse is a publication from the Allegheny Health Network (AHN) Cardiovascular Institute for referring physicians. Please send your comments to laurann.may@highmarkhealth.org.

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ON THE COVER

Extracorporeal membrane oxygenation (ECMO) removes carbon dioxide from patients’ blood and sends oxygen-filled blood back to the body.
Over the last year, our teams at the AHN Cardiovascular Institute have made great strides in accomplishing our three main priorities. We are facilitating collaboration among our 20 locations to make us a truly coordinated system. We’re raising our national profile by recruiting the best and brightest, while investing in research and academic infrastructure. And the one that doesn’t take a back seat to anything — we emphasize a culture of compassion and caring.

You will read in the pages ahead about our Mitral Valve Program, where specialists from cardiac surgery, interventional and imaging cardiology, and advanced heart failure assess patients. Treatments range from specialized medications that focus on discreet components of a patient’s heart and lung physiology, to robotic surgery, to catheter-based treatments. When these options won’t work effectively for a patient, the team can offer investigational valve treatments.

Our patients are also having positive outcomes and recoveries through a minimally invasive treatment for carotid artery stenosis. We highlight how transcarotid artery revascularization clears blockages through a small incision just above the collarbone. The team places a sheath in the carotid artery, and a circuit outside the body directs the blood flow away from the brain, protecting the brain from debris for long-term plaque stabilization and stroke prevention.

We also feature our Cardio-Obstetrics Program, where cardiologists team up with maternal-fetal medicine physicians to focus on preventing, detecting, and managing heart conditions in pregnant women and those considering it.

Several trends are increasing cardiovascular risk in pregnancy. The average maternal age at first pregnancy is increasing, survival in congenital heart disease has improved, and cardiovascular risk factors are developing at younger ages. This specialized team cares for women and their children through pregnancy, delivery, and recovery.

Lastly, about 50% of patients who suffer a myocardial infarction complicated by cardiogenic shock do not survive. Our cardiogenic shock team includes interventional and heart failure cardiologists, cardiovascular surgeons, and critical care staff who rapidly and effectively manage patients in shock. These physicians assess patients on daily rounds, identify shock before other organs fail, and determine the best treatment strategies. We have seen improvements in a broad range of outcomes, including survival, due to this dedicated multidisciplinary team.

We are committed to recruiting surgeons and physicians with passion and purpose and giving them resources and space to develop their practices and explore their ideas. It’s a true pleasure to collaborate with these professionals who dedicate themselves to our patients and a philosophy of innovation and caring.

Sincerely,

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AHN’s Cardiogenic Shock Team Boosts Survival

Cardiogenic shock remains a life-threatening challenge for the medical community, but AHN’s specialized shock team is improving patients’ chances for survival.

Shock occurs when the heart is so severely damaged that it can’t pump enough blood to meet the body’s needs. Without blood and fresh oxygen reaching the organs and brain, the body goes into a state of shock. It’s often caused by a severe heart attack, but it can also result from other heart issues.

Many patients need advanced monitoring and invasive treatments, such as mechanical heart pumps or extracorporeal membrane oxygenation (ECMO), to allow the heart and lungs to rest. According to the American College of Cardiology, even with advanced care, about 50% of patients who suffer a myocardial infarction complicated by cardiogenic shock do not survive.

“The primary goal is to quickly identify that a patient is in shock before other organs, such as the liver and kidney, are adversely affected,” said Tyler VanDyck, MD, cardiothoracic intensivist and medical director of AHN ECMO Services. “For cardiogenic shock, there are options for treatment, but treatment needs to begin early. We have a team to determine how to manage these patients quickly and effectively.”

Rapid, Effective Patient Management

AHN now has a multidisciplinary, mobile shock team that includes specialists from critical care.
medicine, cardiovascular surgery, advanced heart failure cardiology, interventional cardiology, nursing, pharmacy, and perfusion.

Dr. VanDyck explained that when a doctor refers a patient for cardiogenic shock, the AHN shock team at Allegheny General Hospital (AGH) activates through a single-call line. These specialists consult with bedside providers at other hospitals to determine a collaborative treatment plan.

“Some shock patients are too ill for transport to AGH using conventional life support,” Dr. VanDyck said. “Our mobile team can place these patients on ECMO prior to transfer to AGH, where care continues.”

The shock team meets daily to assess patients’ progress and determine the next steps, which can sometimes include permanent heart pumps or heart transplant, if the heart does not recover.

LIFESAVING MEASURES IN MOTION

As a registered nurse and manager of an acute dialysis department, Tom Conley knows when something’s just not right with his body. In May 2022, he had abdominal pain that continued worsening during the night as he began vomiting.

Tom, 39, went to the emergency department at AHN Wexford Hospital, where doctors diagnosed him with pancreatitis.

Two days later, Tom’s breathing worsened as he developed “broken heart syndrome,” a form of sudden heart failure. His condition progressed into cardiogenic shock, which prompted the doctors at Wexford to consult with the shock team at AGH.

Dr. VanDyck said Tom was so sick, it wasn’t safe to transport him on traditional life support. So, the mobile ECMO team went to Wexford to place him on ECMO support and transferred him to AGH. Tom had multi-organ failure but made a full recovery and continues cardiac rehab at an outpatient facility.

“Today, I’m back at work and averaging about five miles walking a day,” Tom said. “I’m building my endurance.”

TEAMWORK AND EXPERIENCE IMPROVE ECMO OUTCOMES

AHN physicians have become so proficient at treating patients with ECMO that AGH is one of the busiest in the U.S. AGH is also a Center of Excellence from the Extracorporeal Life Support Organization (ELSO).

AGH provides the full spectrum of ECMO care, including for patients who require venovenous (VV) for lung support and venoarterial (VA) ECMO for those needing heart support.

Overall, patients’ survival at AGH after VV ECMO is 60% and 50% for VA ECMO. These outcomes are 10% higher than the national average established by the ELSO registry, said Michael Collins, MD, cardiothoracic intensivist and surgical director of AHN ECMO Services.

“ECMO is a bridge, not a treatment unto itself or a destination,” Dr. Collins said. “It requires a multidisciplinary team of specialists to identify patients who will benefit from ECMO and ensure they can receive that therapy quickly.

“We’re very fortunate to have assembled a highly skilled and experienced shock and ECMO team here at AHN that can bring our expertise forward to help patients 24/7.”

Reach Dr. Collins at 412-935-3096 or michael.collins@ahn.org.

Reach Dr. VanDyck at 412-910-4723 or tyler.vandyck@ahn.org.

Reach ECMO Coordinator Debra Camp, RN, at 412-616-9905 or debra.camp@ahn.org.

1 elso.org/registry/statistics/internationalsummary.aspx
SURVIVAL AT AHN WITH VA ECMO

10% higher
than the international average

TYLER VANDYCK, MD
Cardiothoracic intensivist and medical
director of AHN ECMO Services
INDU POORNIMA, MD
AHN director of Preventive Cardiology and the Women’s Heart Center
Cardio-obstetrics

COORDINATED MATERNAL HEART CARE FOR HEALTHY PREGNANCIES

Heart disease is the leading cause of pregnancy-related death in the U.S., and AHN physicians plan to reduce those numbers with coordinated specialty care at the new Cardio-Obstetrics Clinic.

Cardiologists collaborate with obstetricians to care for women with congenital heart disease, rheumatic heart disease, prior valve replacement, or acquired myocardial disease. The team also provides care to women considering pregnancy who have a considerable risk for cardiovascular complications because of conditions like high blood pressure, high cholesterol, diabetes, and obesity.

“We want to start caring for women with heart disease, or those at risk before they become pregnant or at the onset of their pregnancies, and not wait until cardiac issues arise at delivery,” said Indu G. Poornima, MD, AHN director of Preventive Cardiology and the Women’s Heart Center. “This coordinated and streamlined effort will positively impact the outcome for women and their babies.”

Women who previously experienced preeclampsia or high blood pressure during pregnancy, as well as postpartum cardiomyopathy, would benefit from the multidisciplinary care offered at the Cardio-Obstetrics Clinic.

The clinic is based at West Penn Hospital, and the team includes Dr. Poornima, Mahathi Indaram, MD, and Lindsay Mehring, DO.

“Pregnancy is a form of ‘stress test’ for the heart and blood vessels, and healthy women typically cruise through without any issues,” Dr. Poornima said. “Complications that arise during pregnancy unmask underlying cardiac concerns, which is why a preemptive evaluation of women at risk is a safer approach.”

EDUCATION ON ALL FRONTS

Research shows that 60% of pregnancy-related deaths are preventable. Common risk factors are older maternal age, diabetes, high blood pressure, obesity, and high cholesterol.

Another leading factor is race and maternal mortality is highest in Black women. The risk of death from heart disease is 3.5 times higher among Black women than white women.

She went on to say that women shouldn’t automatically rule out pregnancy because they have heart problems. The AHN team can assess a woman’s heart risk as she contemplates pregnancy.

“Through increased awareness and proactive measures and treatments, we can save women’s lives,” Dr. Poornima said. “We need to educate women about the cardiac risk factors, signs, and symptoms, and eliminate communication gaps between obstetricians and cardiologists.”

Reach Dr. Poornima at 412-417-1608 or indu.poornima@ahn.org.

1 cdc.gov/vitalsigns/maternal-deaths/index.html
2 ajph.aphapublications.org/doi/full/10.2105/AJPH.2021.306375
3 ahajournals.org/doi/10.1161/CIRCULATIONAHA.120.050665
OPENING POSSIBILITIES

LOWER STROKE RISK WHILE UNBLOCKING CAROTID ARTERIES

AHN doctors are opening blocked carotid arteries with a minimally invasive procedure that’s effective as traditional surgery and with a lower stroke rate.

Transcarotid artery revascularization (TCAR) treats carotid artery stenosis. For the last few years, AHN vascular surgeons performed the procedure on high surgical risk patients using criteria established by the ROADSTER\(^1\) multicenter clinical trial.

“The results have been superb,” said Satish Muluk, MD, vascular surgeon.

The stroke rate for patients in this international clinical trial was 1.4% in high surgical risk patients,\(^2\) compared to 2.3% stroke rate of carotid endarterectomy and a 4.1% stroke rate of carotid artery stenting from a transfemoral approach in standard risk patients.\(^3\)

Highly favorable outcomes have accelerated TCAR to the next phase, which entails performing the procedure on standard risk patients. Dr. Muluk said AHN is a national leader in TCAR volume — 350 procedures — and will continue performing the procedure on well-suited patients.

RELIABLE STANDARDS OF CARE

For decades, surgeons have treated carotid artery stenosis with carotid endarterectomy. This involves a long incision across the front of the neck to open the carotid artery and remove plaque.
SATISH MULUK, MD
Vascular surgeon
“This procedure has been time-tested, works very well, and the stroke rate is low,” Dr. Muluk said. “But that patient is under anesthesia, and there’s a moderate risk of injury to the nerves around the carotid artery, which causes temporary symptoms like difficulty chewing and swallowing and hoarseness.”

“The results have been superb.”
— Dr. Satish Muluk

Dr. Muluk said he typically completes TCAR in half the time of traditional surgery. AHN surgeons perform the procedure at Allegheny General, Forbes, Saint Vincent, West Penn, and Wexford hospitals.

“TCAR gives us the best aspects of carotid surgery and the best aspects of carotid stenting, while also eliminating the negatives of both procedures,” Dr. Muluk said. “Even if plaque comes loose, the reversal system’s filter traps it.”

To refer a patient or for more information, reach Dr. Muluk at 412-359-8820 or satish.muluk@ahn.org.

The other historical operation that surgeons use for higher-risk patients is minimally invasive carotid stenting. The patient only needs to be sedated for this procedure — rather than undergoing anesthesia — because it’s done via a catheter in the femoral artery in the groin.

“However, the stroke risk is 4% to 6% because of the chance that plaque can be released during the procedure,” Dr. Muluk said. “That’s an unacceptably high stroke rate. If you can get risk under 2%, it’s helpful. But the benefit of treatment is not meaningful if it’s over 2%.”

IMPROVING THE STANDARDS

With TCAR, surgeons access the carotid artery through a much smaller incision, just above the collarbone. They insert a short hollow tube (sheath) into the artery that’s connected to a flow reversal system that directs blood away from the brain and safely back into a vein in the leg. This protects the patient from dangerous debris reaching the brain during the procedure.

Surgeons then filter the blood before returning it to a vein in the groin. They implant a stent into the carotid artery via the sheath to stabilize the plaque and prevent future strokes.

STROKE RATE

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>TCAR</td>
<td>1.4%</td>
</tr>
<tr>
<td>Carotid endarterectomy</td>
<td>2.3%</td>
</tr>
<tr>
<td>Carotid artery stenting</td>
<td>4.1%</td>
</tr>
</tbody>
</table>

The monitor shows the device in place during transcarotid artery revascularization (TCAR).
INNOVATION WITH EXPERTISE
The team prepares the robotic device prior to surgery.
Ahn Investigates More Ways to Treat Mitral Valve Disease

When it comes to mitral valve disease at Ahn, one treatment or one specialist doesn’t fix all.

Decades of research and experience shows that every patient’s mitral valve condition is unique and needs to be scrutinized by a team of experts to determine the best path forward.

“Our patients are assessed by a team of specialists representing cardiac surgery, interventional and imaging cardiology, and advanced heart failure,” said Walter McGregor, MD, director of Ahn cardiac surgery.

“Together we determine appropriate treatment — ranging from specialized medications that focus on subtle components of a patient’s heart and lung physiology, to robotic surgery and its attributes, to catheter-based treatments for patients with sometimes very challenging valve problems.”

Dr. McGregor said Ahn’s mitral valve team has gained so much experience that they can sometimes perform complex valve surgery in an outpatient setting.

Clinical Trials for Continued Progress

With mitral valve stenosis, the mitral valve passage narrows due to either inflammation or calcium and protein deposits. The heart must work harder to eject blood through the smaller opening.
With mitral valve regurgitation, the valve doesn’t fully close, and blood flows in the opposite direction. This puts the heart in distress while it pumps blood forward and gives the body oxygen.

Symptoms for both conditions include fatigue and shortness of breath. Sometimes patients don’t have any symptoms until the disease has progressed significantly.

For some high-risk patients, standard treatments don’t work, which is why physicians investigate new valve options. For example, AHN is part of a multicenter clinical trial in the U.S., Canada, Europe, and Japan. The SUMMIT clinical trial will evaluate the safety and effectiveness of using the Tendyne™ Transcatheter Mitral Valve System to treat symptomatic mitral regurgitation and mitral stenosis.

The Tendyne is a tissue valve for patients who aren’t candidates for open-heart surgery or transcatheter mitral valve repair. The patient’s native valve remains, and the new valve expands and pushes the old valve to the side.

**WHY STUDIES MATTER**

Nick Pascovich, 82, of Windber, Pennsylvania, had been struggling with shortness of breath, lethargy, loss of appetite, and no strength. A former steel mill boiler room operator and retired home renovator, Nick’s not used to sitting down. Doctors diagnosed him with mitral valve stenosis in 2020.

Not a surgical candidate, Nick had balloon mitral valvuloplasty, which temporarily improved his symptoms. But a year later, Nick’s stenosis got worse, and he developed mitral regurgitation as well.

“I couldn’t do my daily activities like I was used to doing,” Nick said. “Basically, I sat around on my recliner and used oxygen when I felt short of breath.”

Dr. McGregor met with Nick, and in December 2021, the team inserted the Tendyne valve. He experienced significant improvement of his symptoms almost immediately. Just 17 days later, Nick and his wife, Patricia, vacationed in Maryland. For a change, they felt confident about his health.

“It was remarkable. I felt better as soon as I got home from the hospital,” Nick said. “I have trimmed our bushes, climbed the ladder and painted, and just completely returned to an active life.”

To refer a patient or for more information, reach Dr. McGregor at 855-4MITRAL (855-464-8725) or walter.mcgregor@ahn.org.

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## Mitral valve disease treatments

<table>
<thead>
<tr>
<th>PROCEDURE</th>
<th>TO TREAT</th>
<th>HOW IT WORKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surgical repair or replacement</td>
<td>Diseased valve</td>
<td>Corrects the existing valve or replaces it with a mechanical or artificial tissue valve.</td>
</tr>
<tr>
<td>Robotic repair or replacement</td>
<td>Diseased valve</td>
<td>Corrects or replaces existing valve using 3D cameras inserted through small incisions.</td>
</tr>
<tr>
<td>MitraClip™ transcatheter edge-to-edge repair</td>
<td>Regurgitation</td>
<td>Inserts a catheter with a clip through the femoral artery to the heart valve to stop leakage.</td>
</tr>
<tr>
<td>Transcatheter mitral valve replacement</td>
<td>Regurgitation or stenosis</td>
<td>Places an artificial tissue valve inside the existing, diseased mitral valve.</td>
</tr>
<tr>
<td>Percutaneous balloon mitral valvuloplasty</td>
<td>Rheumatic stenosis if surgery is not an option</td>
<td>Inserts catheter through the femoral artery to the heart, where a balloon stretches open the valve leaflets.</td>
</tr>
<tr>
<td>SUMMIT Tendyne trial</td>
<td>Moderate-to-severe regurgitation or mitral annular calcification</td>
<td>Examines transcatheter mitral valve replacement with Tendyne™ mitral valve.</td>
</tr>
<tr>
<td>ENCIRCLE trial</td>
<td>Regurgitation if surgery is not an option</td>
<td>Examines the Edwards SAPIEN M3 transcatheter mitral valve replacement system.</td>
</tr>
<tr>
<td>EMPOWER trial</td>
<td>Heart failure with at least mild regurgitation</td>
<td>Examines the Carillon® Mitral Contour System®.</td>
</tr>
</tbody>
</table>
In the news

HEALTHGRADES SPECIALTY CARE RECOGNITION

Four AHN hospitals received Healthgrades® 2022 Specialty Excellence Awards in these medical and surgical specialties:

- Allegheny General — Cardiac Care, Cardiac Surgery, Coronary Intervention
- Allegheny Valley — Critical Care, Gastrointestinal Care, Pulmonary Care, Stroke Care
- Forbes — Cardiac Care, Gastrointestinal Surgery/Care, Critical Care, Pulmonary Care, Stroke Care
- Jefferson — Bariatric Surgery, Vascular Surgery

Each year, Healthgrades — a leading online resource for comprehensive information about physicians and hospitals — evaluates hospital performance at 4,500 hospitals nationwide for 32 of the most common inpatient procedures and conditions.

AHN HOSPITALS RECEIVE AHA’S TOP HONOR

Seven AHN hospitals received national recognition for delivering the highest quality of heart failure and atrial fibrillation treatment.

Allegheny General, Allegheny Valley, Saint Vincent, Forbes, Jefferson, and West Penn hospitals have each earned the annual American Heart Association’s (AHA) Get With the Guidelines® — Heart Failure Achievement Award, Gold Plus designation, marking the highest level of achievement for each site.

AHN ANTICOAGULATION CLINIC RECOGNIZED FOR EXCELLENCE

The Anticoagulation Forum, a Newton, Massachusetts-based educational group, named AHN’s outpatient anticoagulation clinic as a Center of Excellence.

The anticoagulation clinic provides patients with medication monitoring. Medications such as warfarin prevent blood clots in patients with heart disease, but doctors must closely monitor dosages to maximize effectiveness while ensuring safety.

AHN WELCOMES NEW SPECIALISTS

Aneel Bole, MD, is a cardiologist at Saint Vincent Hospital specializing in coronary artery disease, structural heart disease, and peripheral vascular disease. He is skilled at performing invasive surgical and interventional nonsurgical cardiology procedures.

He attended medical school at Osmania Medical College in Hyderabad, India, and completed his residency at West Penn Hospital and fellowships in cardiology and interventional cardiology at Allegheny General Hospital.

Hazem N. El-Khatib, MD, joined Forbes Hospital as director of Cardiac Surgery. He previously served Butler Health System as medical co-director of cardiothoracic surgery and co-director of the Valve Clinic/TAVR (transcatheter aortic valve replacement) Program.

He received his bachelor’s degree and medical degree from the American University of Beirut, and completed a research fellowship at the University of Iowa Hospitals and Clinics, followed by a general surgery residency at the Medical College of Ohio and a fellowship in cardiothoracic surgery at the University of Iowa Hospitals and Clinics.
Mahathi Indaram, MD, is a noninvasive cardiologist at Allegheny General Hospital who treats coronary artery disease, heart failure, congenital heart defects, and arrhythmias. She specializes in women’s heart health and preventive cardiology.

After attending medical school in India, Dr. Indaram completed a residency in internal medicine at University of Missouri – Kansas City School of Medicine in Missouri, and a fellowship in cardiology at Allegheny General Hospital.

Tyler Moore, MD, is a cardiologist at Jefferson Hospital. He earned his medical degree from the University of Wisconsin – La Crosse. He completed a fellowship in cardiovascular disease at Allegheny General Hospital and a residency in internal medicine at Summa Health System in Akron, Ohio.

AHN PHYSICIANS ON THE MOVE

Two prominent AHN surgeons have moved their primary practice locations to Wexford Hospital in Pine Township.

Hiran Fernando, MD, cardiothoracic surgeon, performs video-assisted thoracoscopic surgery (VATS) and robotic procedures for the lung, esophagus, and mediastinum. He is also skilled in endoscopic procedures such as peroral endoscopic myotomy and transoral incisionless fundoplication for gastroesophageal reflux. He treats patients for lung cancer, esophageal cancer, gastroesophageal reflux, achalasia, mediastinal tumors, and myasthenia gravis.

Dr. Fernando received a medical degree from Royal Free Hospital School of Medicine at the University of London in England, and completed residencies in California at Harbor-UCLA, UC Irvine, and UC Davis. He gained further training through a fellowship in minimally invasive thoracic surgery at the University of Pittsburgh Medical Center. He is a fellow of the Royal College of Surgeons of England and Edinburgh.

Satish Muluk, MD, AHN vascular surgeon and director of AHN Division of Vascular Surgery, has helped grow Allegheny General Hospital’s vascular program for 20 years. He is principal investigator on more than 20 clinical research projects and has led efforts to develop treatments for patients with cardiovascular disease.

Dr. Muluk earned a medical degree from Boston University School of Medicine and completed his residency and fellowship training at Massachusetts General Hospital.

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The first 100 responses receive a $10 Amazon gift card.

Scan to give your input.