

From the Chair

On behalf of the 200 medical professionals and over 1,000 dedicated staff who form the WVU Heart and Vascular Institute, it is my distinct privilege to share just some of the many tremendous accomplishments this devoted team has provided our state, region, and nation to make WVU Heart and Vascular Institute a national leader in heart, lung, and vascular care.

Formed in mid-2016 through the ardent support of WVU Medicine, the WVU Heart and Vascular Institute has expanded from a 3-hospital program in early 2017, to a dedicated cardiovascular service line responsible for the care in 8 major hospitals and 10 critical access hospitals in 4 states, and still growing. With the clear mission to provide enhanced access to the most advanced heart, lung, and vascular care available to all we serve, the WVU Heart and Vascular Institute with its quaternary facility in Morgantown, WV, regularly cares for patients from throughout West Virginia, Pennsylvania, Ohio, Maryland, Virginia, and Kentucky. However, our teams have also recently welcomed patients seeking our innovative cutting-edge treatments from multiple distant states, including Florida, Nebraska, New York, and California, as well as from international locations in the Middle East, Philippines, and Canada.

I am incredibly proud of our internationally renowned and award-winning faculty who have performed no less than 15 state-firsts for West Virginia in the fields of transcatheter valve therapy, robotic surgery, endovascular therapy, atrial fibrillation therapy, mechanical support, and transplantation. In addition to nearly 600 peer-reviewed publications, over 50 innovative clinical trials, and funding from the National Institutes of Health, the last 3 years have seen our faculty welcome physicians from across the United States, South America, and Europe who have requested to observe and learn their innovative techniques.

This report will outline several achievements by WVU Medicine and the WVU Heart and Vascular Institute recognized by the American Heart Association, *U.S. News & World Report*, and several organizations as West Virginia's #1 institution focused on innovation, access, and quality. Despite all of our innovative treatments at WVU HVI, our statewide leadership during the 2020 pandemic and the national recognition, the one thing that I am especially proud of is the signature West Virginian personal touch that each of our providers deliver to all of our patients to make them feel like family during their time of need.

Sincerely,

Vinay Badhwar, MD

Executive Chair, WVU Heart and Vascular Institute







155,978 **Cardiac Diagnostic Tests Performed**

1,786 **Thoracic Operations**

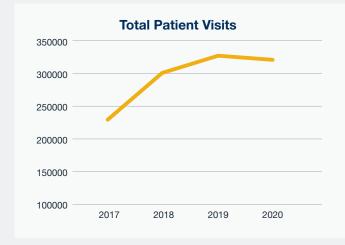
4,234 **Cath Lab Procedures** and Interventions

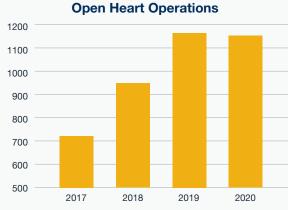
1,157 **Open Heart Operations**

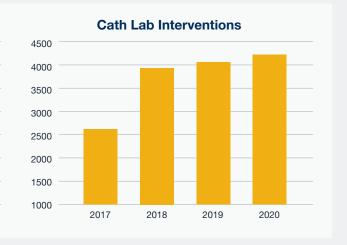
2,003 **Vascular Operations**

1,038 **Electrophysiology Procedures**

The pandemic saw some limited access to our services in 2020, so here is a trend to the tremendous growth of WVU HVI:









ADVANCED MECHANICAL SUPPORT PROGRAM providing access to left ventricular assist device (LVAD) implantation, such as the HeartMate 3, along with our leading extracorporeal membrane oxygenation (ECMO) program, receiving the nation's highest quality award from the Extracorporeal Life Support Organization (ELSO).

> **COMPREHENSIVE ADVANCED HEART FAILURE PROGRAM** performing heart transplantation and wide-ranging heart failure management, including access to the latest innovative therapies and clinical trials.

CENTER FOR ADVANCED ROBOTIC SURGERY (CARS) performing advanced robotic lung and esophageal surgery, complex robotic mitral valve repair, and the world's first program to offer robotic aortic valve replacement. The WVU CARS program is recognized by the American Association for Thoracic Surgery and the Society for Thoracic Surgeons as one of the nation's best and a destination site for visiting surgeons from around the world.

COMPREHENSIVE ATRIAL FIBRILLATION CENTER that provides access to a singularly unique multidisciplinary team approach to atrial fibrillation, or AFib, including advanced catheterbased ablation, left atrial appendage occlusion such as with the WATCHMAN FLEX, and access to nation-leading surgical ablation including robotic Cox Maze procedures.

COMPREHENSIVE AORTIC PROGRAM performing the state's first hybrid aortic debranching operation and fenestrated endovascular repair to serve patients with complex aortic disease.

COMPREHENSIVE MITRAL VALVE PROGRAM performing the state's first transcatheter mitral valve repair (MitraClip), transcatheter mitral valve replacement (Tendyne), and complex robotic surgical repair, the WVU mitral valve program was recently recognized by an American Heart Association Award as one of the nation's top 10 mitral valve repair reference centers and the only one in West Virginia, Pennsylvania, and Virginia.





PANDEMIC RESPONSE

WVU HVI providers were front and center in the state's pandemic response as one of only a few centers in the US and the only one in West Virginia to offer access to the NIH's leading inpatient monoclonal antibody therapy trial as part of US Operation Warp Speed. In addition, the multidisciplinary critical care team of the WVU HVI responsible for the state's premier advanced ECMO program was recognized for having COVID-19 ECMO survival rates among the highest in the nation.



ROBOTIC AORTIC VALVE REPLACEMENT PROGRAM

WVU HVI cardiologists and surgeons have long been recognized for their national leadership in the treatment of valvular heart disease. In 2020, they developed and launched the world's first robotic aortic valve replacement program, completing 50 cases with outstanding results.



WVU HVI thoracic surgeons were recognized by the Society of Thoracic Surgeons for having an esophageal surgery program of the highest quality (3-stars).







Division of Cardiology

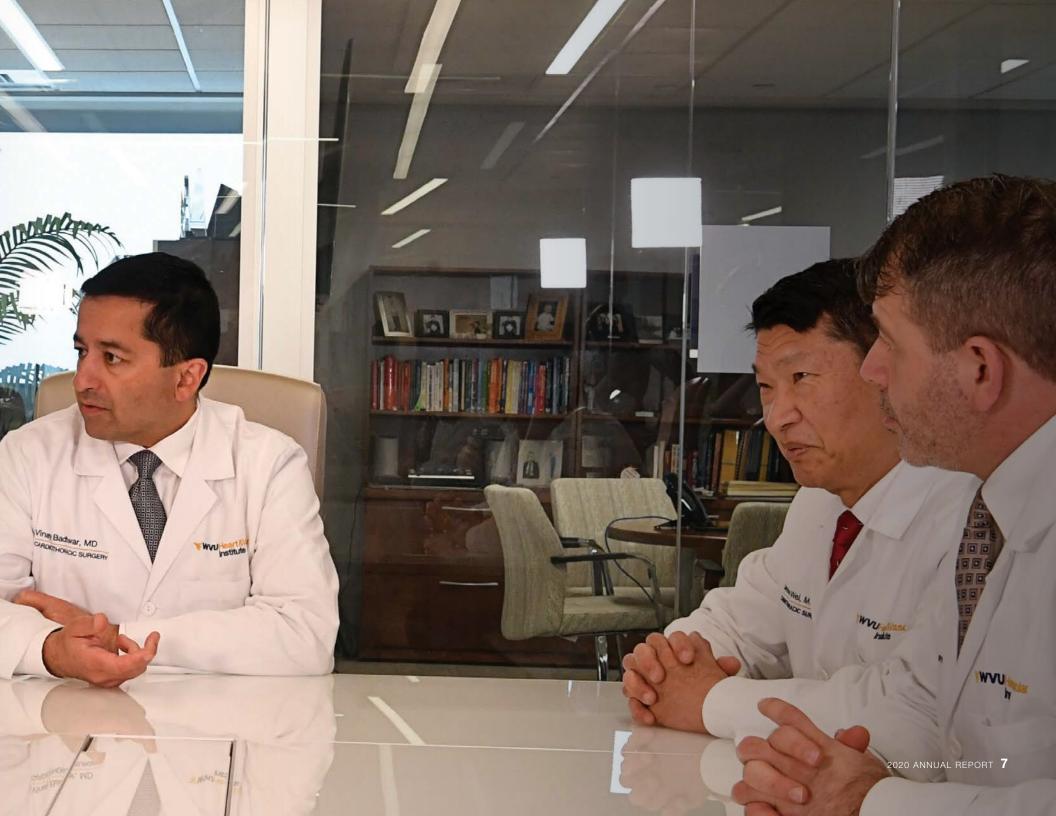
Division of Cardiac Surgery

Division of Thoracic Surgery

Division of Vascular Surgery

Division of Cardiovascular Critical Care and ECMO Program

Division of Research



DIVISION OF

Cardiology

Today, the WVU Heart and Vascular Institute is home to over 50 board-certified cardiologists. Following a multi-year expansion effort starting in 2016 and the recruitment of nation-leading faculty, the WVU HVI Cardiology Program is at the very forefront of innovative therapy and technology.

Host to more than 20 interventional cardiologists, the structural and interventional teams have expanded access to novel innovative approaches across the hospitals of the service line. The team has steadily expanded patient volume while improving outcomes and lowering the risks of procedural complications, even among the most high-risk patients. WVU HVI has quickly become the quaternary referral center of choice for patients across West Virginia and surrounding states who have been deemed high risk. HVI interventional cardiologists at the HVI perform close to 4,500 procedures, nearly 80% of which employ radial access. In addition to reducing stroke risk in certain populations, the team, through a statewide coordinated network, has reduced in-hospital mortality rates among patients with ST-elevation myocardial infarction (STEMI) down to 4.3% – below the national average. "We offer several interventional and structural procedures that are not available anywhere else in West Virginia, and

we participate in leading research to help identify safer, less invasive ways of treating cardiovascular conditions," says Bryan Raybuck, MD, director of the Cardiac Catheterization Laboratory. The team's areas of expertise include:

Complex atherectomy

Alcohol septal ablation

Chronic total occlusion treatment

Use of transcatheter mechanical support devices to support heart function during highrisk percutaneous coronary interventions

Nation-leading cardiologists and surgeons of the WVU HVI Structural Heart Program specialize in problems with the heart's valves, walls, or chambers. They use the latest percutaneous catheter-based techniques to treat all forms of structural heart disease, including aortic and mitral valve disease, congenital defects, tricuspid valve regurgitation, and paravalvular leaks. "Here at WVU HVI, patients with structural heart conditions have access to the highest level of expertise and experience in the state and region," Ramesh Daggubati, MD, director of the Structural Heart Program, says. "Given our nationally recognized expertise, we are often the first in our multi-state region to gain access to emerging new techniques or devices that we have the privilege to bring to our patients." Team members offer the following structural interventions:

Left atrial appendage closure (WATCHMAN, WATCHMAN FLEX, and Amulet devices)

Percutaneous balloon aortic and mitral valvuloplasty

Transcatheter edge-to-edge mitral valve repair (MitraClip, NTR, XTR, G4)

Transcatheter mitral valve replacement (Tendyne)

Transcatheter aortic valve replacement (TAVR), including alternative access techniques

Protected TAVR to avoid stroke using cerebral embolic protection

(continued)







Multidisciplinary heart team access to robotic aortic valve replacement (new)

Transcatheter valve-in-valve therapies for degenerated mitral and tricuspid valves

Catheter-based closure of atrial and ventricular septal defects, pseudoaneurysms, and paravalvular leaks

CardioMEMS device placement in patients with heart failure

The award-winning WVU HVI imaging cardiology team has innovated in the areas of echocardiographic diagnosis, artificial intelligence, and phenotyping. Recognized by the National Heart, Lung, and Blood Institute (NHLBI) and the American Society of Echocardiography (ASE), the team was awarded the ASE Arthur E. Weyman Young Investigator's Award for work, entitled Cardiac Ultrasonic Fingerprinting: A Radiomics Approach for High-Throughput Feature Phenotyping of Dysfunctional Myocardium. The team has also won the ASE Richard Popp Excellence in Teaching Award and the NHLBI Big Data Analysis Challenge: Creating New Paradigms for Heart Failure

Research. The HVI imaging team has developed a machine learning algorithm to improve early diagnosis of patients with left ventricular diastolic dysfunction. These advanced methods have been used to identify heart problems in their early stages, guide intervention efforts, and allow patients to reduce the likelihood and progression of heart failure developing or, in some cases, stop its progression. Such efforts have allowed HVI significant patient and procedural volume growth and expanded thought leadership across the region. WVU HVI cardiologists offer unmatched expertise in cardiac imaging procedures as well as access to several technologies that are not widely available, permitting enhanced early detection of abnormalities before symptoms occur. The advanced cardiac imaging services at the HVI include:

Cardiac computed tomography (CT), including 3mensio, CT-guided fractional flow reserve for coronary blood flow. The multidisciplinary team performs over 1,200 studies annually.

Cardiac magnetic resonance imaging (MRI) is performed nearly 500 times annually for advanced quantitative perfusion mapping,

tissue mapping, and quantification of fourdimensional flow.

Advanced echocardiography, including transesophageal echocardiography, strain echocardiography, and supine-bicycle stress echocardiography. HVI performed over 22,000 studies at the Morgantown location alone - a 30% increase over the previous 3 years.

Advanced nuclear cardiology, including stateof-the-art techniques for perfusion mapping, viability assessments, cardiac amyloidosis imaging, and cardiovascular inflammation imaging was performed more than 1,800 times in 2020.

WVU HVI was the region's first to employ magnetocardiography (MCG) or CardioFlux, to quickly diagnose myocardial ischemia or infarction in patients with symptoms of acute coronary syndrome by imaging the heart's naturally generated magnetic fields without the use of radiation, medications, or exercise in just 90 seconds.





WVU HVI electrophysiologists diagnose and treat patients with every type of arrhythmia, including atrial fibrillation, or Afib, ventricular tachycardia, premature ventricular contractions, and Wolff-Parkinson-White syndrome. The unique partnership with nation-leading arrhythmia surgeons make the

WVU HVI Comprehensive Atrial Fibrillation **Center** second to none in the multi-state region.

"Because we offer the full range of medical, surgical, and interventional services, we can optimally tailor therapies to each patient's form of arrhythmia and address their unique symptoms and risk factors using the best evidence available," Stanley Schmidt, MD says. The electrophysiology services provided include:

Cardiac resynchronization therapy (biventricular pacing) for patients with heart failure and arrhythmia

Catheter ablation, including cryoablation, radiofrequency and irrigated radiofrequency

CT-guided, 3-D mapping of arrhythmias

Laser extraction of pacemaker and defibrillator leads

Left atrial appendage closure (WATCHMAN, WATCHMAN FLEX, and Amulet devices)

Pacemaker and defibrillator implantation and monitoring

Robotic-assisted Cox-Maze procedures, in collaboration with HVI surgeons

The WVU HVI Advanced Heart Failure

Program is West Virginia's most comprehensive, providing inpatient and outpatient multidisciplinary comprehensive care that includes a team of 5 fellowship-trained cardiologists, 3 surgeons, physical therapists, dieticians, pharmacists, and nurse coordinators. This integrated expert team recognized by U.S. News & World Report 2020-2021 as High Performing in heart failure, provides the following:

Access to advanced heart failure therapeutics in clinical trials

Heart transplantation management

LVAD management as West Virginia's only Joint Commission-accredited LVAD program Home infusions of inotropic therapy for patients with advanced heart failure

Remote CardioMEMS monitoring to quickly identify changes in pulmonary artery pressure among heart failure patients

Advanced Pulmonary Hypertension Program with access to therapeutics in clinical trials

Hypertrophic Cardiomyopathy Program with advanced medical, interventional, and surgical therapy

Cardio-Oncology Program overseeing the management and diagnosis of heart failure unique to cancer patients

Finally, two board-certified cardiologists specializing in the unique aspects of diagnosis and management of heart care for women, including cardio-obstetrics and cardio-gynecology pathways of care, as well as the management of peri-partum cardiomyopathy and the cardiology of pregnancy lead the WVU HVI Women's Heart Program.

Cardiac Surgery

The WVU HVI has fast become the primary trusted resource for patients and cardiologists from all of West Virginia's 55 counties as well as multiple sites in Pennsylvania, Ohio, and Virginia for access to advanced nation-leading cardiac surgery. The quaternary facility in Morgantown, WV, expanded into Parkersburg, WV, in 2017 and to Wheeling, WV, in 2021 to provide comprehensive access to all services available. The team of WVU HVI surgeons perform over 1,000 heart operations annually that include:

Complex valvular reconstruction, including mitral valve, tricuspid valve, and aortic valve repair, including geometric ring annuloplasty (HAART) and the Ozaki procedure

Surgical treatment of atrial fibrillation, or the Cox Maze IV procedure

Robotic valve repair and replacement and robotic surgical ablation of atrial fibrillation

Complex aortic aneurysm repair, including root remodeling and hybrid arch reconstruction

Coronary Artery Bypass Grafting (CABG),

including robotic-assisted minimally invasive **CABG**

Heart transplantation

Mechanical circulatory support, LVAD

Surgical myectomy for hypertrophic cardiomyopathy

Congenital heart surgery from neonatal to adult congenital

The WVU HVI heart surgeons have been national innovators and leaders contributing over 200 national and international presentations and 150 peer-reviewed publications since 2017, with 50 in 2020, as well as receiving grant funding from the NIH, 6 patents regarding new technology, and senior national leadership responsibilities in the American Association for Thoracic Surgery and the Society of Thoracic Surgeons. This team practices in a unified manner to bring the most advanced techniques and highest quality outcomes to their patients. In addition to initiating heart transplantation and LVAD implantation in West Virginia, this team built upon their nation-leading extensive robotic mitral valve experience to introduce the world's first robotic aortic valve replacement program in 2020.

Recognized as one of the nation's best heart surgery programs for valve disease and surgical ablation of atrial fibrillation, the WVU HVI Mitral Valve Repair Program was recently acknowledged by a panel of experts from the American Heart Association and Mitral Foundation to be among the nation's top mitral programs. The WVU HVI received the prestigious 2020 American Heart Association Mitral Valve Repair Reference Center Award that is given to only the nation's leading centers for volume, quality, and durability of mitral valve repair. WVU is considered to be one of the top 10 mitral valve repair programs in the United States.

Educating the next generation of cardiothoracic surgeons is a top priority of the WVU HVI. In 2017, the WVU Department of Cardiovascular and Thoracic Surgery re-launched its fellowship program garnering their top resident picks from across the nation every year. The CT surgery fellows have been exposed to exemplary technical and academic opportunities that have resulted in all receiving excellent positions around the United States.



Thoracic Surgery

Following a robust physician recruitment period and remarkable growth in referrals, the Thoracic and Esophageal Surgery Program at the WVU Heart and Vascular Institute has received critical acclaim and is ranked among the nation's best. In 2020, the program earned a prestigious 3-star rating from the Society of Thoracic Surgeons for the quality and safety of its esophageal surgery program. The WVU Center for Benign Esophageal Disease is a collaboration between thoracic surgeons and gastroenterologists. Together, they provide state-ofthe-art management of patients with digestive and motility disorders. Services include high-resolution esophageal manometry and esophageal pH testing. The team also specializes in LINX magnetic ring implantation, transoral incisionless fundoplication, endoscopic mucosal resection, peroral endoscopic myotomy, and various fully robotic procedures.

In addition to esophageal surgery expertise, the WVU HVI was named to the 2020-2021 U.S. News & World Report's Best Hospitals list as High Performing in lung surgery. These accolades underscore how the Thoracic and Esophageal Surgery Program has become an international destination for patients

seeking expert, minimally invasive care for benign and malignant conditions. "Here at WVU Medicine, we have both the expertise and the technology necessary to help patients swallow better, breathe more easily, and survive cancer by providing access to the most advanced therapies available," Ghulam Abbas, MD, chief of Thoracic Surgery, says. The Division of Thoracic Surgery offers the full range of open and minimally invasive surgical procedures, including video-assisted thoracoscopic surgery, as well as laparoscopic and robotic-assisted techniques. WVU HVI thoracic surgical experts offer one of the few national destinations for advanced airway disorders, including complex tracheal reconstruction, and extended lung resection following chemotherapy and radiation therapy, with options for sleeve resections to minimize the need for pneumonectomy. The Thoracic and Esophageal Surgery Program has established a regional reputation with specific expertise in robotic-assisted surgery. Nearly 200 robotic procedures were performed in 2020, making it one of the country's highest-volume programs. Robotic-assisted procedures commonly performed by the program include:

Robotic Heller myotomy for achalasia

Robotic or laparoscopic hiatal hernia repair

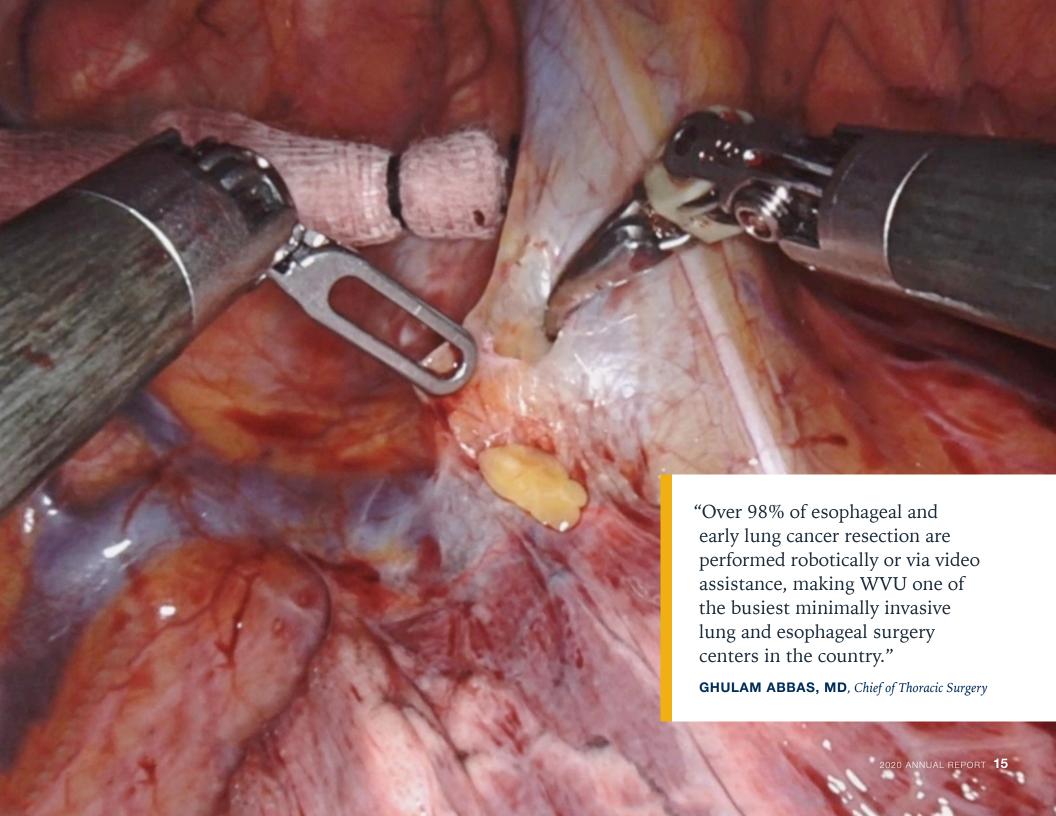
Robotic esophagectomy

Robotic lobectomy or segmentectomy for focal lung nodules or lung cancer

Robotic sympathectomy for hyperhidrosis

Robotic thymectomy for myasthenia gravis and early thymomas

Patient outcomes from the WVU HVI thoracic surgeons remain excellent, enhanced by access to advanced technology. The Thoracic and Esophageal Surgery Program continues to meet and exceed national benchmarks related to post-operative length of stay, mortality, and survival.



Vascular Surgery

The WVU HVI Division of Vascular and Endovascular Surgery focuses on a collaborative evidencedriven approach to the diagnosis and management of vascular disease. The Division applies the most advanced technologies in the treatment of cerebrovascular, aortic, and peripheral vascular disease to effect optimal patient outcomes and quick recovery with return to normal life. The Vascular Division focuses on 4 tenets to achieve these results: 1) The use of minimally invasive and percutaneous techniques whenever appropriate and supported by evidence, 2) Tracking outcomes of patients through the national Vascular Quality Initiative (VQI) to allow for continual improvement in care and transparent comparison to other programs, 3) Training the next generation of vascular surgeons through an ACGME approved 5+2 vascular surgical fellowship training program, and 4) Supporting research efforts designed to evaluate the population we serve to improve our understanding of specific barriers to vascular care and to design primary prevention initiatives to reduce the incidence of vascular disease in our community.

The WVU HVI flagship facility in Morgantown, WV, is equipped with 3 state-of-the-art hybrid operating suites. These suites allow x-ray and CT imaging to be incorporated into the delivery of procedural/surgical care in real time. This has led to the expansion of

cerebrovascular care for stroke therapy and prevention, aneurysm care for all portions of the aorta extending from the chest through the abdomen, and advanced treatment of peripheral vascular disease for limb salvage and amputation prevention. The advanced procedures provided include:

Transcarotid artery revascularization (TCAR)

Carotid artery stenting (CAS) and carotid end-arterectomy

Thoracic endovascular aortic repair (TEVAR)

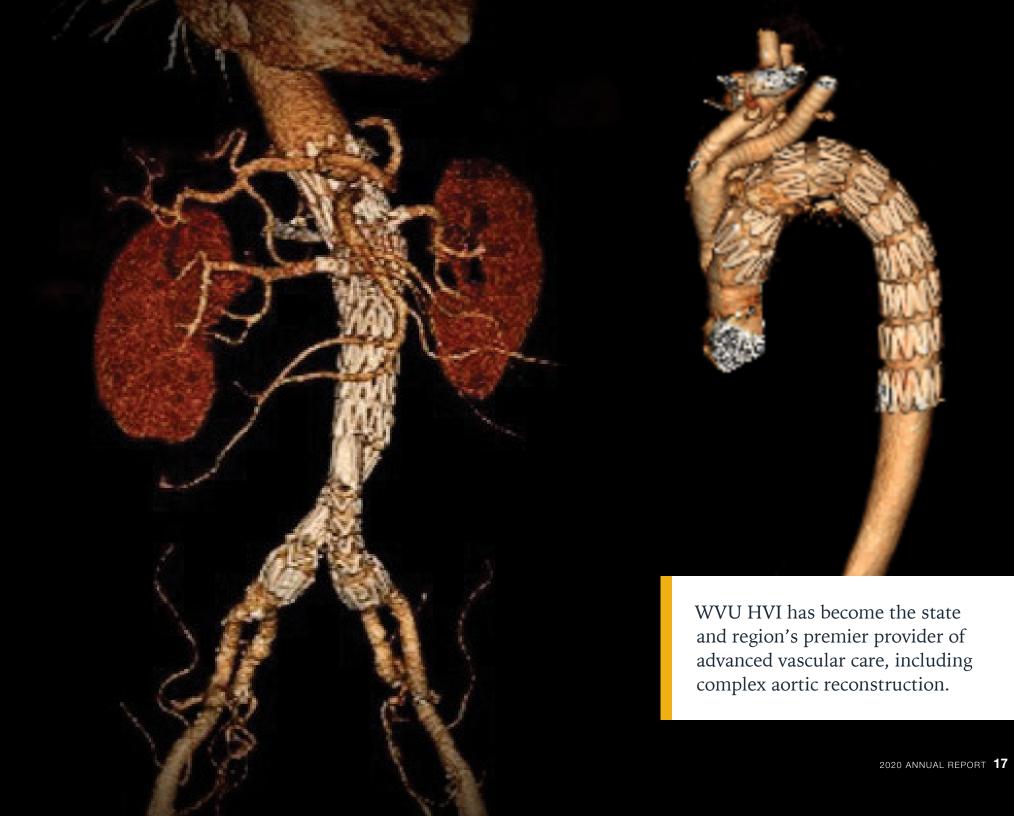
Endovascular aortic aneurysm repair (EVAR)

Fenestrated endovascular aortic repair (FEVAR) was first performed at the WVU HVI and has become the state's leader in this innovative procedure

Complex limb salvage procedures to revascularize with advanced peripheral techniques

Overall, the WVU HVI has helped improve patient outcomes with a decreased need for inpatient

hospital stay and a quicker return to normal life. Congruent with our mission to improve the vascular health of our community, the Division prides itself on improving patient follow up and medical risk factor modification to stem the progression of vascular disease. Three approaches have been actively pursued by the Division: 1) Eight outreach sites have been established for vascular care and testing throughout the region (Parkersburg, Uniontown, Keyser, Oakland, Fairmont, Elkins, Waynesburg and Wheeling) to improve patient access to care and compliance with follow-up visits, 2) Telemedicine and teleclinics have been established at our most remote locations, 3) The VQI database has been leveraged to maintain long-term longitudinal follow up to help assess compliance with medical therapy, necessary imaging, and smoking cessation programs. These advances have helped the WVU HVI become the state and region's premier provider of advanced vascular care.



Cardiovascular Critical Care and ECMO Program

The WVU HVI in Morgantown, WV, is equipped with nearly 30 dedicated CVICU beds with state-of-the-art resources to serve as the state's quaternary cardiac critical care destination. Dedicated board-certified critical care physicians, advanced providers, and specialized cardiovascular critical care nurses and specialists provide 24/7 care for West Virginia's most critically ill to help them recover from cardiogenic shock, cardiopulmonary respiratory failure, or acute cardiac events, including heart surgery. Highly experienced with the most advanced supportive measures, including mechanical circulatory support devices, transplantation, and extracorporeal membrane oxygenation (ECMO), this dedicated team helped the ECMO Program grow from being the state's first in 2017, to becoming the state's only Center of Excellence Silver Designation from the Extracorporeal Life Support Organization (ELSO) within the first 3 months of its existence. The designation confirms the Program's rigorous, evidence-based quality and safety standards. In 2021, the ECMO program ascends to ELSO Gold Status, joining a select few in the country. The ECMO volume has risen by an annual rate of 55% while achieving excellent outcomes based on a multidisciplinary, multispecialty stakeholder alliance

that has catapulted the survival outcomes to higher than 2.5 standard deviations above international benchmarks. WVU has quickly become an important and life-saving destination for patients within a five-state catchment area. This includes Ohio, Pennsylvania, Maryland, and Virginia. To this end, an experienced WVU HVI rescue team is prepared to repatriate patients within an hour of transfer request, replete with a flight crew and specially equipped aircraft that can accommodate a portable ECMO circuit and other advanced equipment to allow treatment to continue while en route to WVU Medicine. The WVU HVI offers both venovenous (VV) ECMO, providing lung support, and venoarterial (VA) ECMO to support both the heart and lungs in the context of:

Cardiogenic shock

Heart failure (bridge to transplant)

Myocarditis

Nonischemic cardiomyopathy

Post-cardiotomy support

New threats, such as e-cigarette and vapingrelated lung injury (EVALI)

Respiratory failure secondary to COVID-19

The robust outcomes of the Division of Cardiovascular Critical Care have enabled innovation. WVU HVI was selected as one of the first nine medical centers to use the Nautilus oxygenator, an ECMO device designed to improve long-term gas transfer and reduce velocity changes that can lead to low flow and stasis. The ECMO Program was also among the first to examine the Fresenius Novalung. "Our clinical and research efforts contribute to better patient care," says J.W. Awori Hayanga, MD, ECMO Program director. "In addition to meeting or exceeding other industry benchmarks, our ECMO Program has achieved an overall survivalto-decannulation rate of 85% with a survival-todischarge rate of 80%." The ECMO Program's mantra of "Cannulate, Extubate, Ambulate" is a goal-driven, action-oriented approach to care that is reflected in the close collaboration with all of the multidisciplinary providers of the WVU HVI Cardiovascular Critical Care Team.



Research

The WVU HVI Division of Research serves as the academic epicenter for HVI faculty, residents, fellows, and their collaborators. Home to biostatisticians. research coordinators, regulatory personnel, and administrators, the cores of the Division of Research blend a combination of biostatistical and nationleading clinical research expertise to facilitate a highly productive environment. Since 2017, WVU HVI has produced close to 600 peer-reviewed manuscripts and generated several million dollars in grant funding, including from the NIH.

The WVU HVI team of research coordinators and regulatory personnel support the investigators as they navigate the intricacies of over 50 cuttingedge FDA sponsored clinical trials. This robust infrastructure has enabled a central tenet of the WVU HVI mission, to be able to offer the people of West Virginia and all we serve access to the very latest in therapeutics available. Specifically, some of these trials provide access to devices or treatments not otherwise available to any other program in the state or region, particularly to help patients with little to no other option for care.

Physicians from each of the Divisions of Cardiac Surgery, Thoracic Surgery, Vascular Surgery, Cardiology (Advanced Heart Failure, Interventional,

Non-Invasive), and Cardiac Anesthesia, as well as administrative staff, directors, and managers of clinical units, and the Heart and Vascular Institute Quality Team have office space and conference rooms on the same floor. This proximity permits a ripe forum for interdisciplinary clinical and academic collaboration. The Division is responsible for the registration of patients, data acquisition, and the maintenance of protocols as well as for the oversight of institutional, industry-sponsored, and cooperativegroup clinical trials. The Division, in conjunction with the WVU Health System, also provides expertise in protocol development, protocol review, data safety monitoring, and other data reporting functions.

The recent coronavirus disease 2019 (COVID-19) pandemic has placed the Heart and Vascular Institute at the forefront of disaster planning and mitigation. The HVI is now one of a few enrolling sites for the NIH-sponsored ACTIV-3 trial, a phase 3, randomized, clinical trial testing the use of monoclonal antibodies against the severe SARS-CoV-2 acute respiratory syndrome. This is a central part of US Operation Warp Speed, a federal government led public-private partnership to facilitate and accelerate the development, manufacturing, and distribution of COVID-19

vaccines, therapeutics, and diagnostics. The WVU HVI has quickly risen to become a top contributor, and it routinely leads national lists of top-enrolling centers in several other cardiac trials, including the Cardiothoracic Surgery Network (CTSNet).

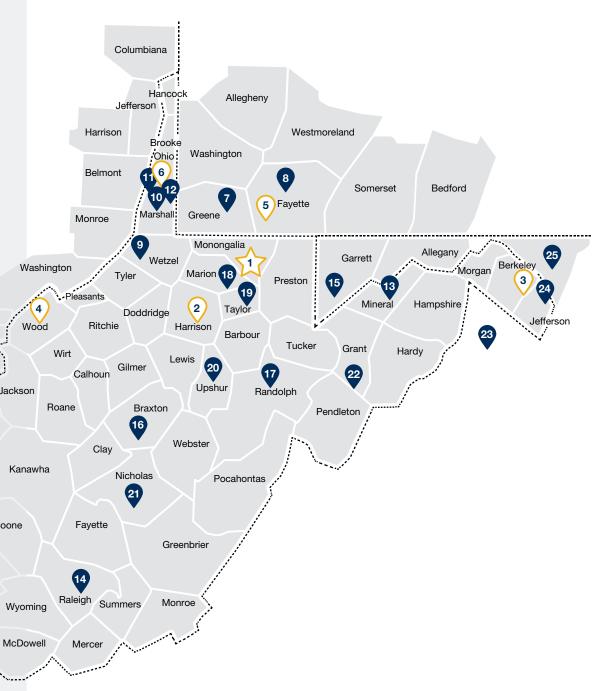
The WVU HVI faculty are national academic leaders. Several providers serve as associate editors and editorial board members of the most prestigious, high-impact journals in the fields of cardiology, cardiothoracic surgery, and vascular surgery. These journals include the Journal of the American College of Cardiology, Journal of Thoracic and Cardiovascular Surgery, and the Journal of Vascular Surgery. Our providers are leading researchers, scientists, and innovators on the national, regional, and international stage and have, as a matter of routine, published hundreds of commentaries and editorials along with original scientific manuscripts. The academic contributions of the faculty of WVU HVI all have a steadfast focus on prevention, early detection, and treatment of cardiovascular and thoracic disease with an emphasis on quantity and quality of life, all in order to translate these efforts into to making a difference in the lives of every West Virginian and all we serve.



ACTIV-3 NIH monoclonal therapy for COVID-19 A-Due Ianssen pulmonary hypertension management prevention of renal failure AKI Astellas use of LINQ sensors to monitor and treat heart failure **ALLEVIATE HF** Medtronic Abiomed ventricular assist device management cVAD **DIAMOND** access and treatment of pulmonary hypertension Relypsa **DyeMINISH** Osprey minimization of contrast dye use monoclonal therapy for COVID-19 EBO5 Edesa/NIH lipid and triglyceride lowering trial **FCS PR** Akcea geometric ring annuloplasty for aortic valve repair **HAART** Biostable surgical treatment of atrial fibrillation **ICE-AF** Atricure lipid lowering clinical trial **LOWER** Aegerion short wave infrared early detection of heart failure **Monitoring** ChemImage trial of the WATCHMAN FLEX left atrial appendage occlusion **OPTION** Boston Sci postoperative atrial fibrillation management **PACeS** NIH/CTSN PHP SHIELD II percutaneous left ventricular assistance during MI Abbott pulmonary artery pressure monitoring for heart failure Endotronix **Proactive HF** transcatheter vs. surgical mitral valve repair **REPAIR-MR** Abbott SAFE-STEMI Medtronic radial access image guided stenting in seniors STEMI-DTU Abiomed unloading during myocardial infarction cardiac anesthesia safety Merck Sugammadex **SUMMIT** Abbott transcatheter mitral valve replacement vs. repair







WVU HEART AND VASCULAR INSTITUTE LOCATIONS

- 1. J.W. RUBY MEMORIAL **HOSPITAL (MAIN CAMPUS)** Morgantown, WV
- 2. UNITED HOSPITAL CENTER Bridgeport, WV
- 3. BERKELEY MEDICAL CENTER Martinsburg, WV
- 4. CAMDEN CLARK **MEDICAL CENTER** Parkersburg, WV
- 5. UNIONTOWN HOSPITAL

Uniontown, PA

- 6. WHEELING HOSPITAL Wheeling, WV
- 7. WAYNESBURG Waynesburg, PA
- 8. SCOTTDALE Scottdale, PA
- 9. **NEW MARTINSVILLE** New Martinsville, WV
- 10. REYNOLDS MEMORIAL **HOSPITAL** Glen Dale, WV
- 11. WHEELING CLINIC Wheeling, WV
- 12. WHEELING TRIDELPHIA Triadelphia, WV
- 13. POTOMAC VALLEY HOSPITAL Keyser, WV

- 14. BECKLEY Beckley, WV
- 15. GARRETT REGIONAL **MEDICAL CENTER** Oakland, MD
- 16. BRAXTON COUNTY **MEMORIAL HOSPITAL** Gassaway, WV
- 17. DAVIS MEDICAL CENTER Elkins, WV
- 18. FAIRMONT Fairmont, WV
- 19. PINEWOOD MEDICAL CENTER Grafton, WV
- 20. ST. JOSEPH'S HOSPITAL Buckhannon, WV
- 21. SUMMERSVILLE REGIONAL **MEDICAL CENTER** Summersville, WV
- 22. GRANT MEMORIAL HOSPITAL Petersburg, WV
- 23. WINCHESTER Winchester, VA
- 24. SHEPHERDSTOWN Shepherdstown, WV
- 25. HAGERSTOWN Hagerstown, MD

EDUCATION

The expertise, academic leadership, research, and mentorship of the WVU HVI faculty afford the opportunity and responsibility of several Accreditation Council for Graduate Medical Education (ACGME) fellowships and non-ACGME subspecialty fellowships offered at WVU HVI. These include:

Cardiac Anesthesiology Fellowship

Cardiovascular Diseases (Cardiology) Fellowship

• Advanced cardiac imaging post-graduate fellowship (non-ACGME)

Interventional Cardiology Fellowship Structural Cardiology Fellowship (non-ACGME)

Cardiothoracic Surgery Fellowship

• Advanced minimally invasive and robotics cardiac surgery post-graduate fellowship (non-ACGME)

Vascular Surgery Fellowship

Cardiovascular Critical Care Fellowship (non-ACGME)



LEADERSHIP

Vinay Badhwar, MD, Executive Chair

Frank Briggs, Vice President

Leslie Lawson, Assistant Vice President

Ramesh Daggubati, MD, Cardiology

Luke Marone, MD, Vascular Surgery

Ghulam Abbas, MD, Thoracic Surgery

Paul McCarthy, MD, Cardiovascular Critical Care

J.W. Awori Hayanga, MD, Research

Vinay Badhwar, MD, Executive Chair, WVU Heart and Vascular Institute

[&]quot;Despite all of our innovative treatments at WVU HVI, our statewide leadership during the 2020 pandemic, and the national recognition, the one thing that I am especially proud of is the signature West Virginian personal touch that each of our providers deliver to all of our patients to make them feel like family during their time of need."



1 Medical Center Drive Morgantown, WV 26506

855-WVU-CARE

WVUMedicine.org/Heart