We are pleased to present the 2020-2021 Froedtert & the Medical College of Wisconsin Heart and Vascular Outcomes Book. This edition details cardiovascular clinical performance in our health network and emphasizes our commitment to the use of data and analytics to provide transparent clinical quality metrics.

The quality of care we provide to our patients is defined by the expertise of our physician teams and the strength of our cardiovascular programs. This expertise, combined with access to the latest technology, allows us to offer the most current treatments for all cardiovascular conditions, including heart failure, aortic disease, arrhythmia and heart valve disease. Our treatment offerings encompass innovative mechanical circulatory devices, endovascular approaches for complex aortic aneurysms, and minimally invasive ablation procedures and aortic and mitral valve repairs.

We continue to attract top physicians and researchers from around the country to our cardiovascular team. As our expertise grows, our program offerings also continue to expand. We offer the latest in diagnostic and treatment expertise for chronic total occlusion, vascular emergencies, complex aortic aneurysms and other challenging conditions. Thanks to careful planning and attentiveness, this growth hasn’t come at the sacrifice of remarkable outcomes. We have been designated a three-star program from The Society of Thoracic Surgeons for both coronary artery bypass grafts and transcatheter aortic valve replacement. Less than 10% of participating programs earn the three-star distinction. Additionally, Froedtert Hospital was named as one of the 50 highest-performing cardiovascular hospitals in the nation in IBM Watson Health’s annual 100 Top Hospitals® benchmark series.

As the COVID-19 pandemic evolves and shapes every facet of health care, we are committed to delivering care to our patients in the safest ways possible. We remain flexible and responsive and are able to adjust quickly to the direction the science leads us. Our Extracorporeal Membrane Oxygenation (ECMO) Program at Froedtert Hospital has become a referral center for patients critically ill with COVID-19. ECMO provides support for patients’ hearts and lungs, giving their bodies an extra boost to fight the coronavirus. Our ECMO Program is a Designated Gold Level Center of Excellence by the Extracorporeal Life Support Organization.

Our relationships with referring physicians throughout the region are important to us as we collaborate to provide the highest level of care to referred patients. We value the trust placed in us to deliver the best in cardiovascular care and strive to return patients to their referring physician so they can continue their care locally.

With the latest diagnostic and treatment options, delivered by expert cardiovascular teams, we are dedicated to bringing the most advanced, comprehensive and personalized care to each patient.

Jorge Saucedo, MD, MBA, FACC, FAHA, FSCAI
Professor; Chief, Cardiovascular Medicine; Director, Heart and Vascular Services
Froedtert & the Medical College of Wisconsin health network
The Froedtert & MCW regional health network is a partnership between Froedtert Health and the Medical College of Wisconsin supporting a shared mission of patient care, innovation, medical research and education. Our health network operates eastern Wisconsin’s only academic medical center and adult Level I Trauma Center at Froedtert Hospital, Milwaukee, an internationally recognized training and research center engaged in thousands of clinical trials and studies. The Froedtert & MCW health network, which includes eight hospital locations, more than 2,000 physicians and more than 45 health centers and clinics, draws patients from throughout the Midwest and the nation. In our most recent fiscal year, outpatient visits were nearly 1.5 million, inpatient admissions to our hospitals were 55,085 and visits to our network physicians exceed 1.1 million.

About Heart and Vascular Services

Our team of nationally and internationally recognized cardiovascular specialists offers the full spectrum of specialized treatments for all forms of heart and vascular disease, from the common to the complex. Our team approach is central to the care we deliver, helping us provide optimal and thorough diagnostic and treatment approaches for each patient. We regularly participate in clinical research aimed at providing the best value to patients by delivering the right care at the right time in the right place. Our highly trained physicians and researchers are at the leading edge of cardiovascular care. With the comprehensive resources only an academic medical center can offer, our physicians and researchers are advancing the level of cardiovascular care available across Wisconsin.

In addition to our services available on the Froedtert Hospital campus, our team-based cardiovascular care is available in communities throughout southeastern Wisconsin. A complete list of locations can be found at froedtert.com/heart-vascular.

The Froedtert & MCW Heart and Vascular Center, located within the Center for Advanced Care on the Froedtert Hospital campus, provides patients an enhanced care experience where all their cardiovascular needs can be met under one roof.
Program Spotlights

Heart Valve Disease Program
The Froedtert & MCW Heart Valve Disease Program provides a dedicated and coordinated approach to diagnosing and treating all types of valve disease. The collaborative, multidisciplinary team uses best-practice techniques, meeting regularly to discuss the care of each patient and develop personalized treatment plans. From medical management to catheter-based procedures and advanced surgical options for valve repair and replacement, the team has the expertise to treat each patient no matter the concern. These options include a robust transcatheter aortic valve replacement (TAVR) clinic, which performs most procedures without general anesthesia, resulting in an average length of stay in the hospital of one day. We are the only hospital in Wisconsin to perform TAVR using the Sentinel™ Cerebral Protection System in every eligible patient to prevent strokes during the procedure. In addition, the team is skilled in performing complex valve repairs and replacements in mitral and other heart valves, such as transcatheter paravalvular leak closures, valve-in-valve replacements and MitraClip™ procedures.

Extracorporeal Membrane Oxygenation (ECMO) Program
The Froedtert & MCW ECMO Program provides lifesaving support for patients in cardiac or pulmonary distress. By supporting the heart and lungs, the ECMO machine can help to stabilize patients to allow their body more time to work toward recovery. We are one of the largest ECMO programs in the Midwest, with around-the-clock ECMO-dedicated staff and the capability to care for more than 16 patients simultaneously. Additionally, we are a Designated Gold Level Center of Excellence by the Extracorporeal Life Support Organization (ELSO). The designation recognizes centers demonstrating an exceptional commitment to evidence-based processes and quality measures, staff training and continuing education, patient satisfaction and ongoing clinical care.

While our ECMO Program has helped many patients through the years, the COVID-19 pandemic increased focus on this technology as COVID-19 has been shown to overwhelm the lungs in some cases and, in turn, negatively affect the heart. We are proud to partner with physicians across the region to make this technology available for more patients.

Intensive Cardiac Rehabilitation
The Froedtert & MCW Intensive Cardiac Rehabilitation (ICR) Program is certified and takes a holistic approach to patient recovery after a cardiac event by focusing on lifestyle modifications in addition to heart healthy exercise. Our team collaborates with Pritikin to offer this service. In addition to the heart-healthy exercise that traditional cardiac rehabilitation is known for, ICR adds lifestyle education, nutritional workshops and cooking demonstrations to provide patients with the resources and opportunities to carry out a heart-healthy lifestyle.
Comprehensive Heart Failure and Transplant

The Comprehensive Heart Failure and Transplant Program provides patients with access to a highly experienced team of advanced heart failure cardiologists and heart transplant surgeons. Individualized medical therapy is the first treatment approach for heart failure patients and part of the full spectrum of treatment options, including managing heart failure patients with the latest technology, such as CardioMEMS™, a remote monitoring system that allows providers to monitor a patient’s heart pressure and adjust medications before the patient’s health declines. In addition, the program offers patients the latest in available short-, intermediate- and long-term mechanical circulatory support, including total artificial hearts (TAHs) and ventricular assist devices (VADs). Froedtert Hospital is one of only three providers in Wisconsin certified by the Joint Commission and recognized by the Centers for Medicare and Medicaid Services as a VAD Destination Therapy Program. If patients require transplantation, they will be treated by some of the most experienced transplant surgeons in the country. As part of an academic health network, the team also participates in and conducts substantial research, which enables them to further understand the causes of heart failure and identify innovative treatments, including increasingly sophisticated VADs and TAHs.

In recognition of the commitment and success in implementing the highest standard of cardiac care, the American Heart Association/American Stroke Association recognized Froedtert Hospital and Froedtert Menomonee Falls Hospital with the Get With the Guidelines® Heart Failure Gold Plus achievement award in 2020.

American Heart Association (AHA) Get With The Guidelines
Heart Failure Achievement Measurement

<table>
<thead>
<tr>
<th>Measurement</th>
<th>Froedtert Hospital</th>
<th>Froedtert Menomonee Falls Hospital</th>
<th>AHA Achievement Benchmark</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACE Inhibitor or ARB Prescribed at Discharge</td>
<td>100%</td>
<td>100%</td>
<td>95%</td>
</tr>
<tr>
<td>Beta Blocker Prescribed at Discharge</td>
<td>95%</td>
<td>95%</td>
<td>90%</td>
</tr>
<tr>
<td>LVEF Measurement at Discharge</td>
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<td>75%</td>
</tr>
<tr>
<td>Follow-Up Appointment at Discharge</td>
<td>80%</td>
<td>80%</td>
<td>75%</td>
</tr>
</tbody>
</table>

Heart Transplant Adult Patient Survival Rate – One-Year

Source: Scientific Registry of Transplant Recipients, srtr.org, July 2021

Froedtert Hospital
National Average

Higher is Better
Managing the Left Atrial Appendage When Long-Term Anticoagulation Isn’t an Option

The left atrial appendage (LAA) of the heart may be a small structure, but it plays an outsized role in caring for patients with atrial fibrillation (AFib). Joshua Meskin, MD, cardiologist and Medical College of Wisconsin faculty member, and Mario Gasparri, MD, cardiothoracic surgeon and MCW faculty member, review the latest strategies for LAA management.

T he LAA is like a small, “blind” pouch on the side of the atrium, a developmental remnant that research suggests does not have an important function. Blood flow within it tends to stagnate. AFib only accentuates that and stagnant blood is more likely to clot. For that reason, it is the largest source of clots leading to strokes in people with AFib.

“The traditional first-line treatment for patients with AFib and an LAA that puts them at risk for stroke is blood thinners, but not everyone is a candidate for anticoagulation long term,” Dr. Meskin said. “Some patients can’t maintain control of their INR (warfarin levels), or they have a bleeding problem like a lower GI bleed or other disorder. It may also be a lifestyle issue — a downhill skier, for example, who faces increased risk of injury and doesn’t want to be on a blood thinner.”

“For these patients, there has been an effort to address this mechanically if we can’t address it with blood thinners,” Dr. Gasparri said. “Through our multidisciplinary team, we are able to provide referred patients with multiple options to successfully manage the LAA.”

Umbrella-Like WATCHMAN Seals the LAA From Inside

“For many patients, the preferred choice for LAA occlusion is the WATCHMAN™, an expandable device placed inside the appendage to block it off,” Dr. Meskin said.

Froedtert Hospital, the academic medical center of the Froedtert & MCW health network, has been performing WATCHMAN procedures since 2015 and is a leading implanter in the state.

“To implant the WATCHMAN, we enter through a vein in the groin, go up into the heart, cross from one side to the other, place a catheter into the LAA and deploy the WATCHMAN,” Dr. Meskin said. “It’s like an umbrella we open at the orifice of the appendage, closing it off. Placement of the WATCHMAN is critical. I provide imaging support using transesophageal echocardiography, giving direction to the other cardiologist at the table for positioning the catheter.”

Different sizes of the WATCHMAN device are available to fit a variety of LAA anatomies. Sizing is critical as the WATCHMAN must be large enough so that compression will hold it in place. It can’t be too small that it comes loose and risks tearing tissue. The WATCHMAN device itself is a combination of metal and fabric. It starts out like a filter and eventually the body grows endothelial tissue over it and seals it. Patients usually go home the same or next day and take anticoagulants for 45 days, followed by aspirin long term.

“The WATCHMAN has a very good track record and there is data to support better outcomes at higher volume centers like ours where we perform more than 30 implants a year,” Dr. Meskin said.

Robotically Placed Clip Isolates the LAA Externally On the Beating Heart

While the WATCHMAN has proven to be effective for many patients, about 10% of patients aren’t candidates because of the anatomy of their LAA or other issues. “Some patients with atrial fibrillation can’t get the WATCHMAN and can’t take blood thinners,” Dr. Gasparri said. “For them, we offer a robotic clip, called AtriClip™.”

Instead of blocking the LAA from the inside like the WATCHMAN, the clip does it from the outside of the heart. The Froedtert & MCW cardiology team has two options — one looks like a bobby pin and another looks like an O. Both procedures are performed robotically with three small incisions for the scope and instruments.

“Once near the heart, we open the pericardium so we can see the LAA, dissect it from adjoining structures and then deploy the clip from a delivery device,” Dr. Gasparri said. “Intraoperative echocardiography guides us to make sure the clip is at the base of the appendage before we secure it.

“It’s a perfect application for the robot, which gives us exceptional visualization. I sit at the console controlling the robotic arms, while a cardiothoracic surgeon stands at the table and ‘fires’ the clip. It’s a true collaborative effort where we have both thoracic and cardiac expertise in the room. We check with echocardiography to make sure the clip is in the right place and also do follow-up studies. Patients usually go home the next day and are back to regular activities within 10 to 14 days.”

To refer a patient to our team, call 414-805-3666 or visit froedtert.com/refer. To learn more about our team of physicians and available treatment options, visit froedtert.com/heart.
Cardio-Oncology Program Addresses Dual Concerns

Cancer patients often face a double challenge: undergoing cancer treatment while also contending with existing or new cardiovascular disease. To address concurrent cancer and cardiovascular needs, the Froedtert & the Medical College of Wisconsin health network established a Cardio-Oncology Program. Sherry-Ann Brown, MD, PhD, cardiologist, director of Cardio-Oncology and MCW faculty member, answered questions providers might have about this new initiative.

Q: What was the impetus for developing the Cardio-Oncology Program?
Dr. Brown: More and more people are surviving cancer, and this population is aging, which places people at increased risk for heart disease. In addition, some cancer treatments can cause damage to the heart. We wanted to meet the needs of these patients in a comprehensive way.

Q: How prevalent are heart problems among cancer patients?
Dr. Brown: It is a significant concern for physicians to be aware of with their cancer patients during treatment and afterward. Studies have shown that about 10% of cancer survivors will die of cardiovascular disease. Between 5%-15% of cancer patients will develop heart failure after surviving cancer. Overall, cardiovascular disease is the leading cause of death in cancer survivors.

Q: What services does the Cardio-Oncology Program provide?
Dr. Brown: We offer a full range of services, including:
- Evaluation for and risk-reduction planning for cardiovascular disease before cancer treatment
- Coordination of a cancer regimen that reduces cardiovascular risk during treatment
- Cardiovascular health monitoring during treatment
- Advanced treatments for heart issues possibly occurring during, or years after, cancer treatment

Q: How does cancer treatment affect the heart?
Dr. Brown: The short answer is that cancer treatment can affect every part of the cardiac and vascular system. This is called cardiotoxicity. Some chemotherapies can cause cardiomyopathy or congestive heart failure. Radiation therapy concentrated in the chest region can trigger thickening of the blood vessels, calcification of heart valves, inflammation and artery occlusions. Other patients may develop high blood pressure or atrial fibrillation.

Q: What happens once cancer therapy is underway?
Dr. Brown: We are alert for any changes or abnormalities in the heart and use diagnostic imaging to track them. We also monitor patients for side effects that can occur from chemotherapy or radiation therapy. Throughout treatment, we partner with oncologists to recommend safer forms of chemotherapy and suggest when therapies might need to be paused.

Q: Are there special cardiac medications for cancer patients with heart problems?
Dr. Brown: No, the same drugs used with heart patients who do not have cancer are effective before, during or after cancer treatment.

Q: What specialists are part of the Cardio-Oncology Program?
Dr. Brown: Our program is made up of a multidisciplinary team that brings together specialists from cardiology, cardiac imaging, cardiothoracic surgery, hematology, medical oncology and radiation oncology. All told, we have about 10-15 cardiologists, as well as nurse practitioners, who see cancer patients. By assembling a multidisciplinary team, our goal is to manage heart problems without changing or interrupting the cancer treatment regimen whenever possible.

Q: What types of research are you doing?
Dr. Brown: The primary focus of our research is on detecting cancer patients who are at higher risk of developing heart problems and preventing cardiovascular disease. We are looking at past patient histories to find common factors allowing us to identify these patients sooner and intervene earlier.

Q: How can providers access the Cardio-Oncology Program?
Dr. Brown: We will gladly work with referring providers to review a patient’s case or consult on treatment. We consider referring providers our partners in the care of these patients and work collaboratively to develop long-term care plans for patients at risk for cardiovascular disease during or following cancer treatment. To refer a patient or for a treatment consultation, call 414-805-3666.
Froedtert & the Medical College of Wisconsin vascular disease specialists use a collaborative and comprehensive approach to care for patients with all forms of vascular disease from the common to the complex, including peripheral artery disease, aneurysms of the vascular system, vascular malformations and complications due to vascular disease.

Our multidisciplinary team, including vascular surgeons, vascular medicine specialists and vascular and interventional radiologists, has the experience and resources to treat even the most complicated vascular disease cases. In addition, as an academic medical center, our team is a leader in advancing the understanding of vascular disease and identifying innovative treatments through research and clinical trials. Our team works closely with referring physicians, updating them each step of the way, as we collaborate to develop a long-term care plan for each patient. We also make ourselves available to provide continual assistance and resources as patients transition back to the referring physician for continued care.

<table>
<thead>
<tr>
<th>Vascular and Endovascular Surgery Mortality</th>
<th>2018</th>
<th>2019</th>
<th>2020</th>
<th>2021*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carotid endarterectomy</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Elective carotid artery stent</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Elective endovascular aneurysm repair (EVAR)</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Elective TEVAR/Complex EVAR</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Infra bypass</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
</tbody>
</table>

TEVAR = Thoracic endovascular aortic repair
*As of September 2021

New Multidisciplinary Clinic Formed To Treat Complex Aortic Disease

In an effort to meet the growing need for effective, coordinated care of complex aortic disease, a team of providers formed a new multidisciplinary clinic at Froedtert Hospital. The Complex Aortic Clinic marshals the resources of vascular surgery, cardiac surgery and interventional radiology to address the multiple facets of aortic disease. While the team treats any form of complex aortic disease, aneurysms and dissections are the two most common conditions evaluated in this clinic.

Following a thorough evaluation of the patient’s condition, our physician team carries out care in the least invasive way possible. Depending on the condition of the patient’s aorta and the stage of disease, treatment may start with surveillance and medical management for high blood pressure. When needed, our team can perform endovascular stenting – including the most complex repairs involving branches and fenestrations – or open surgery to reconstruct the aorta, whether as a scheduled case or emergent situation.

Weekly Conferences Provide Tailored Care

Each week, a team of physicians meets to review cases and customize treatment plans for patients with complex disease. By coming together, our team explores all angles of treatment to develop optimal care management. We routinely review cases and offer second opinions for other physicians outside our area.

The team welcomes referring physicians from around the state to present cases and gain a multidisciplinary perspective. To learn more or to refer a patient to our clinic, call 414-805-3666 or visit froedtert.com/refer. For a physician-to-physician phone consultation or patient transfer, call 414-805-4700.
**Clinical Outcomes: Vascular and Endovascular Surgery continued**

### Elective Endovascular Aneurysm Repair Complications

<table>
<thead>
<tr>
<th>Condition</th>
<th>2018</th>
<th>2019</th>
<th>2020</th>
<th>2021*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Access site hematoma</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Access site infection</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Access site occlusion</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Congestive heart failure</td>
<td>N/A</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Dialysis</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Intestinal ischemia</td>
<td>N/A</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Myocardial infarction</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Respiratory</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Stroke</td>
<td>0%</td>
<td>0%</td>
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<td>0%</td>
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</tbody>
</table>

*As of September 2021

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**Vascular Emergency Response Program Provides Resource for Providers Across the Region**

The Froedtert & MCW Vascular Emergency Response Program provides a 24/7 resource for patients who experience a vascular emergency, including aortic aneurysms, aortic dissections, acute limb ischemia and acute mesenteric ischemia. A delay in the recognition of the acute diagnosis and rapid treatment of these conditions can lead to limb loss or death. Our program focuses on partnering with physicians across the region for rapid recognition, transportation and treatment of these acute life-and-limb-threatening emergencies.

To activate the vascular emergency response protocol team, call the Froedtert & MCW Access Center at **414-805-4700**. Upon receiving the page, a group of specialists collaborate to discuss the patient’s needs, with each specialist weighing in to determine the best treatment. The care team will quickly deliver a recommendation and, in appropriate cases, arrange to transport the patient to Froedtert Hospital for care.

Following treatment, our team works with the referring provider to coordinate the return of the patient for continued, long-term care.
In response to growing demand, a new, larger Kathy’s House — a hospital guest house — opened June 7, 2021, near the Froedtert Hospital campus. Open 365 days a year, Kathy’s House offers affordable lodging in a caring, supportive environment for people traveling to Milwaukee for medical care. It is compliant with the Americans with Disabilities Act and features 36 patient rooms, a separate wing for patients with compromised immune systems, and room for basic clinical services, such as blood draws and video telehealth visits. Kathy’s House is the only facility of its kind in southeastern Wisconsin serving patients of all ages, their families and their caregivers. It accepts referrals from all accredited area hospitals.

In 2017, Froedtert Hospital, a longtime partner of Kathy’s House, pledged $6 million to build the new facility.

To contact Kathy’s House on behalf of a patient, call 414-453-8290 or e-mail Kathy Wagner, director of operations and guest services, at kathyw@kathys-house.org.
Clinical Outcomes: Cardiothoracic Surgery

Cardiac Surgery Volume*

The Froedtert & the Medical College of Wisconsin cardiovascular team has been an early adopter of endovascular techniques. These minimally invasive options have replaced the need for open surgical procedures for many patients.

Volume

*Cardiac procedures performed in the operating room

Risk-Adjusted Mortality — The Society of Thoracic Surgeons (STS)

Source: STS Harvest Report, period ending 12/31/2020
**STS Composite Quality Rating**

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Froedtert Hospital</th>
<th>STS Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coronary Artery Bypass Graft (CABG)</td>
<td>98%</td>
<td>100%</td>
</tr>
<tr>
<td>Aortic Valve Replacement (AVR)</td>
<td>96%</td>
<td>98%</td>
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<tr>
<td>AVR + CABG</td>
<td>94%</td>
<td>96%</td>
</tr>
<tr>
<td>Mitral Valve Replacement/Repair</td>
<td>92%</td>
<td>94%</td>
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</table>

Source: STS Harvest Report, period ending 12/31/2020

**Median Length of Stay, Cardiothoracic Surgeries**

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Froedtert Hospital</th>
<th>STS Average</th>
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<tbody>
<tr>
<td>Coronary Artery Bypass Graft (CABG)</td>
<td>10 days</td>
<td>15 days</td>
</tr>
<tr>
<td>Aortic Valve Replacement</td>
<td>9 days</td>
<td>10 days</td>
</tr>
<tr>
<td>Aortic Valve Replacement + CABG</td>
<td>10 days</td>
<td>10 days</td>
</tr>
<tr>
<td>Mitral Valve Replacement</td>
<td>10 days</td>
<td>10 days</td>
</tr>
<tr>
<td>Mitral Valve Replacement + CABG</td>
<td>10 days</td>
<td>10 days</td>
</tr>
<tr>
<td>Mitral Valve Repair</td>
<td>5 days</td>
<td>5 days</td>
</tr>
<tr>
<td>Mitral Valve Repair + CABG</td>
<td>5 days</td>
<td>5 days</td>
</tr>
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</table>

Source: STS Harvest Report, period ending 12/31/2020
Clinical Outcomes: Cardiothoracic Surgery Complications

**Coronary Artery Bypass Grafting (CABG)**

<table>
<thead>
<tr>
<th>Condition</th>
<th>Froedtert Hospital</th>
<th>STS National Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deep Sternal Infection/Mediastinitis</td>
<td>0%</td>
<td>STS National Average</td>
</tr>
<tr>
<td>Permanent Stroke</td>
<td>1%</td>
<td>STS National Average</td>
</tr>
</tbody>
</table>

Source: STS Harvest Report, period ending 12/31/2020

**Aortic Valve Replacement (AVR)**

<table>
<thead>
<tr>
<th>Condition</th>
<th>Froedtert Hospital</th>
<th>STS National Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deep Sternal Infection/Mediastinitis</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Permanent Stroke</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Reoperation</td>
<td>0%</td>
<td>0%</td>
</tr>
</tbody>
</table>

Source: STS Harvest Report, period ending 12/31/2020

**Mitral Valve Replacement (MVR)**

<table>
<thead>
<tr>
<th>Condition</th>
<th>Froedtert Hospital</th>
<th>STS National Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deep Sternal Infection/Mediastinitis</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Prolonged Vent</td>
<td>15%</td>
<td>10%</td>
</tr>
<tr>
<td>Renal Failure</td>
<td>5%</td>
<td>0%</td>
</tr>
<tr>
<td>Reoperation</td>
<td>0%</td>
<td>0%</td>
</tr>
</tbody>
</table>

Source: STS Harvest Report, period ending 12/31/2020
Clinical Outcomes: Isolated Coronary Artery Bypass Graft

Arterial Graft Use

Percent

Source: STS Harvest Report, period ending 12/31/2020

Risk-Adjusted Prolonged Ventilation

Percent

Source: STS Harvest Report, period ending 12/31/2020

Perioperative Medications

Percent

Source: STS Harvest Report, period ending 12/31/2020

*Three-Star Rated Program, The Society of Thoracic Surgeons (STS)
Clinical Outcomes: Structural Heart

Aortic Valve Program Growth

Volume

Source: STS/ACC TVT Registry™ Outcomes Report 2020 Q4

Paul Pearson, MD, PhD
Professor of Surgery
Chief, Division of Cardiothoracic Surgery

SAVR
TAVR

Annualized

Source: STS/ACC TVT Registry™ Outcomes Report 2020 Q4
Cardiovascular Teams Earn Three-Star STS Rating

The Cardiovascular Surgery and Cardiology teams at Froedtert Hospital, the academic medical center of the Froedtert & the Medical College of Wisconsin health network, have earned distinguished three-star ratings for its patient care and outcomes in both isolated coronary artery bypass grafting (CABG) from The Society of Thoracic Surgeons (STS) and transcatheter aortic valve replacement (TAVR) procedures from the American College of Cardiology and STS. The three-star rating, which denotes the highest category of quality, places our Cardiovascular Surgery and Cardiology teams among the elite for these cardiac procedures in the United States and Canada.

The STS star rating system is one of the most sophisticated and highly regarded overall measures of quality in health care, rating the benchmarked outcomes of cardiothoracic surgery programs across the United States and Canada. The star rating is calculated using a combination of quality measures for specific procedures performed by an STS Adult Cardiac Surgery Database participant.

Historically, approximately 6%-10% of participants receive the three-star rating for these procedures.

About STS

The Society of Thoracic Surgeons (STS) is a not-for-profit organization that represents more than 7,300 surgeons, researchers and allied health care professionals worldwide who are dedicated to ensuring the best possible outcomes for surgeries of the heart, lung and esophagus, as well as other surgical procedures within the chest. The Society's mission is to enhance the ability of cardiothoracic surgeons to provide the highest quality patient care through education, research and advocacy.
Clinical Outcomes: Structural Heart

MitraClip Complications

<table>
<thead>
<tr>
<th>Condition</th>
<th>Froedtert Hospital</th>
<th>U.S. Registry Patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cardiac Arrest</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Perforation</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Transseptal Complication</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Mitral Leaflet or Subvalvular Injury</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Transient Ischemic Attack</td>
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<td>0%</td>
</tr>
<tr>
<td>Stroke</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Acute Kidney Injury</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Major Bleeding</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Mitral Valve Reintervention</td>
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<td>0%</td>
</tr>
</tbody>
</table>

Source: STS/ACC TVT Registry™ Outcomes Report 2020 Q4

MitraClip Length of Stay

<table>
<thead>
<tr>
<th>Days</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>0.5</td>
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<td>0</td>
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</table>

Source: STS Harvest Report, period ending 12/31/2020

Lower is Better
Teamwork Makes Vascular Surgery Less Invasive for Patient

"Talent wins games, but teamwork and intelligence win championships," said basketball great Michael Jordan. That's true on the court and accurate in the operating room.

To address various arterial blockages, Duerk Bruhl, of Brown Deer, needed vascular surgery at Froedtert Menomonee Falls Hospital, part of the Froedtert & the Medical College of Wisconsin health network. Abby Rothstein, MD, vascular surgeon and MCW faculty member, and Robert Beres, MD, vascular and interventional radiologist and MCW faculty member, worked together in a single surgery to provide a less invasive experience for Duerk that led to a faster recovery.

A good walker who was logging 15,000 steps a day, Duerk began having trouble last summer. “When I got close to 5,000 steps a day, I had soreness,” Duerk said. “By September, I needed ibuprofen to make it through the day.”

Blockages in Duerk’s femoral artery had reduced the blood flow to his legs, resulting in pain that made walking difficult and often woke him up at night, as well as an ulcer between his toes. To clear the blockage, or stenosis, Dr. Rothstein performed a bilateral femoral endarterectomy.

“We made small incisions in the groin to access the artery, cleaned out the plaque and placed a patch so we didn’t narrow the artery when we closed it,” Dr. Rothstein said.

Duerk also had stenosis higher up in his pelvis, in the common iliac artery that stems from the aorta. This is where Dr. Beres stepped in.

“Rather than performing a larger surgery in the belly, we used the site of Dr. Rothstein’s procedure to pass a series of catheters and wires up to the common iliac artery where we placed a stent,” Dr. Beres said.

“The surgery went fantastic,” Duerk said. “I had it on Monday and went home on Friday. I was up and walking in no time and am back up to 7,000 steps a day with no pain.”

“When I have patients with vascular disease in arteries near the groin, we often employ this collaborative hybrid approach,” Dr. Rothstein said. “It’s less invasive and people have a quicker recovery.”

“It’s nice to work together across specialties, to put minds and skills together in a synergistic effort to do the best for the patient,” Dr. Beres said.
Patient Experience: Atrial Fibrillation

Rhythm Restored

For more than three years, Tina Stumpf’s struggle with atrial fibrillation (AFib), an irregular and rapid heartbeat, worsened steadily, leaving her physically and mentally exhausted. “You feel shaky, like when you’ve run as fast as you can and then have to stop and catch your breath,” said the 45 year-old Menasha resident, who helps her parents run a landscaping business. “Then you feel spent and have to lie down. There were times I felt like my heart was beating out of my chest. With a job and two kids, I have to keep going. But I just couldn't keep living like that.”

Tina no longer does, thanks to an innovative heart procedure called a vein of Marshall alcohol ablation performed at Froedtert Hospital, the academic medical center of the Froedtert & the Medical College of Wisconsin health network.

Tina first experienced AFib, caused by disorganized electrical currents that throw the heart out of sync, in October 2017. In the years since, she received several treatments in the Fox Valley, including radio frequency ablations, during which doctors use thermal electrical impulses, delivered via a catheter, to create scar tissue that renders the affected tissue unable to conduct electricity. Tina also had several cardioversions, when doctors shock the heart to restore its normal rhythm. In addition, she took various medications, all to no avail. Her cardiologist in the Fox Valley referred her to the heart specialists at Froedtert Hospital. “It’s not unusual for AFib patients to require multiple ablations,” said Marcie Berger, MD, electrophysiologist and MCW faculty member, who began treating Tina in July 2020. “We determined that the prior ablations didn’t destroy tissue through the entire width of the muscle wall. Therefore, electrical pathways still remained.” A last resort was to ablate the electrical connection between the top (atria) and bottom (ventricles) of the heart, blocking the rapid electrical rhythm of the atria from getting to the ventricles, but this would require installation of a pacemaker — not an optimal option for Tina. “We had to try something that could ablate the external part of the atrium,” Dr. Berger said. “We chose to do a vein of Marshall alcohol ablation.”

During the procedure, Michael Salinger, MD, interventional cardiologist and MCW faculty member, threaded a balloon catheter through Tina’s heart and into the vein of Marshall. Named by English surgeon John Marshall in the 1800s, the vein runs along the outside of the heart. For the highest level of accuracy during the procedure, Dr. Salinger used 3D heart maps created by Dr. Berger that showed where the arrhythmia was occurring, as well as live images produced by Dr. Meskin. “We inserted an ultrasound probe through the esophagus until it was adjacent to the heart, where it took images during the procedure,” Dr. Meskin said. Then, Dr. Salinger slowly injected several milliliters of pure alcohol into the portion of Tina’s heart where chaotic electrical signals were causing AFib. The alcohol, in effect, kills the tissue, while the balloon prevents the alcohol from backing up into the body's bloodstream. “You literally create a line of blockages that electrical signals can’t pass through,” Dr. Salinger said. “Sometimes if a patient is in an abnormal rhythm, we can see it stop right before our eyes.”

A vein of Marshall alcohol ablation is only available at select health centers across the country. The procedure’s success underscores the health network’s collaborative approach to medicine. “Dr. Berger researched this new procedure and thought it would be an option for Tina but needed to work with a physician with a specific catheter skill set,” Dr. Salinger said. “We treated Tina by combining our different areas of expertise, and we leveraged my understanding of venous anatomy and his expertise in alcohol ablations,” Dr. Berger said. “This collaborative approach allows us to perform innovative treatments not widely available.”

Tina stayed at Froedtert Hospital overnight and returned home the next day. Since then, she’s had only one AFib incident and says she now leads a fairly normal life. “I’m not 100% normal yet, but at least I feel really good,” she said. “I love to take my own EKG and see it say, ‘sinus rhythm’ (a normal heart rate). I didn’t even know what that was before all of this happened.” Tina said she’s grateful she was referred to Froedtert Hospital, where she received excellent care. “The doctors did a wonderful job,” she said. “Dr. Berger refused to let me give up. I was so impressed by her determination. She knew I didn’t feel good and was determined to do something about it. And she did.”

Michael Salinger, MD, interventional cardiologist and MCW faculty member, passed away unexpectedly Sept. 24, 2021. An outstanding physician, he was also a devoted friend, teacher and mentor, as well as husband and father.

Under Dr. Salinger's direction and mentorship, the Froedtert & MCW Structural Heart Program grew to prominence, with patients being referred from across the region to seek treatment options from our team. Dr. Salinger aggressively sought to bring the latest innovations to the Froedtert & MCW health network in an effort to provide patients leading-edge treatments in structural heart interventions. He was a mentor and friend to many, and we will proudly carry his legacy forward by providing the very best for your patients.
Clinical Outcomes: Extracorporeal Membrane Oxygenation (ECMO)

ECMO Patient Volume

Source: Extracorporeal Life Support Organization (ELSO) Registry

ECMO Survival to Discharge – 2020
Unadjusted Venoarterial ECMO (cardiac)

*ELSO Registry Report

ECMO Survival to Discharge – 2020
Unadjusted Venovenous ECMO (respiratory)

*ELSO Registry Report

Heart and Vascular Services | 21
Clinical Outcomes: Electrophysiology

Left Atrial Appendage Occlusion (LAAO) Procedures

Percent

- Evaluated for Stroke Using CHA2DS2-VASc Score
- Evaluated for Stroke Using HAS-BLED Score
- LAAO Procedures That Meet FDA Indications

Source: ACC NSDR LAAO Registry Outcomes Report, Q4 2020

LAAO Intra- and Post-Procedure Complications

Percent

- Major Complication
- Disabling Bleeding
- Stroke or Systemic Embolism or Mortality

Source: ACC NSDR LAAO Registry Outcomes Report, Q4 2020
Clinical Outcomes: Interventional Cardiology

Percutaneous Coronary Intervention (PCI) Procedures

PCI In-Hospital Risk-Adjusted Mortality (All Patients)

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<tr>
<td>U.S. Hospital 50th Percentile</td>
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Low is Better

Source: ACC NCDR CathPCI Registry Outcomes Report, Q4 2020

Median Transfer Time From Door to Door (Patients With STEMI)

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<th></th>
<th>Minutes</th>
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<tbody>
<tr>
<td>Froedtert</td>
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<td>U.S. Hospital 50th Percentile</td>
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Low is Better

Source: ACC NCDR CathPCI Registry Outcomes Report, Q4 2020

Composite: Guideline Medications Prescribed at Discharge

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Higher is Better

Source: ACC NCDR CathPCI Registry Outcomes Report, Q4 2020

Radial Artery Use

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Higher is Better

Source: ACC NCDR CathPCI Registry Outcomes Report, Q4 2020
PCI In-Hospital Complication Acute Kidney Injury Risk-Adjusted

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<th>Hospital</th>
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<td>U.S. Hospital 50th Percentile</td>
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Source: ACC NCDR CathPCI Registry Outcomes Report, Q4 2020

Lower is Better

PCI Volumes

<table>
<thead>
<tr>
<th>Year</th>
<th>Froedtert Hospital</th>
<th>Froedtert Menomonee Falls Hospital</th>
</tr>
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<tbody>
<tr>
<td>2017</td>
<td>400</td>
<td>200</td>
</tr>
<tr>
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<tr>
<td>2021 Annualized</td>
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</table>

Source: ACC NCDR CathPCI Registry Outcomes Report
Clinical Research

The Cardiology, Cardiothoracic Surgery, Interventional Radiology and Vascular Surgery teams combine specialty expertise, leading-edge technology and consistent research leadership to provide the most up-to-date treatment options, including clinical trials. Leading facilitation of cardiovascular clinical research within the Froedtert & the Medical College of Wisconsin health network is Nicole Lohr, MD, PhD, medical director of cardiovascular clinical trials and MCW faculty member.

“Our team is continuously expanding cardiovascular research within our health network and currently boasts more available cardiovascular trials than ever before,” Dr. Lohr said. “We are proud to be a leader in researching new and more effective ways to treat patients with cardiovascular disease.”

Below are some of the active trials in which the team is currently participating.

**CATALYST Trial**
The CATALYST Trial will compare treatment with Abbott’s Amplatzer™ Amulet™ Left Atrial Appendage Occluder to treatment with nonvitamin K antagonist oral anticoagulants (NOACs) in patients with nonvalvular atrial fibrillation at high-risk for stroke.

**The C-TRACT Trial (Chronic Venous Thrombosis: Relief With Adjunctive Catheter-Directed Therapy)**
The goal of this study is to determine if the use of imaging-guided endovascular therapy (EVT) is an effective strategy with which to reduce post-thrombotic (PTS) disease severity and improve quality of life (QOL) in patients with established disabling iliac-obstructive post-thrombotic syndrome (DIO-PTS).

**Evaluation of Hemodynamic Parameters Following Transjugular Intrahepatic Portosystemic Shunt (TIPS)**
This study is being done to determine the impact of the TIPS procedure on cardiac function by collecting data (heart pressures) during the IPS procedure. Immediately after TIPS and at standard follow-up time points, labs and transthoracic echocardiograms (TTE or echo) will also be collected.

**IONIS: CARDIO-TTRansform**
This phase III global, double-blind, randomized, placebo-controlled study is evaluating the efficacy and safety of ION-682884 in patients with transthyretin-mediated amyloid cardiomyopathy (ATTR CM).

**PROACT Xa**
The purpose of this trial is to determine if apixaban is noninferior to warfarin (INR target range 2.0-3.0) for patients with an On-X mechanical heart valve implanted in the aortic position for the primary composite outcome of valve thrombosis and valve-related thromboembolism.

**PROACTIVE-HF**
This prospective, multicenter, randomized controlled, single-blind clinical trial is evaluating the safety and efficacy of the Cordella™ Pulmonary Artery Sensor System in New York Heart NYHA Class III heart failure patients.

**Venous Stent for the Iliofemoral Vein Investigational Clinical Trial Using the DUO™ Venous Stent System (VIVID)**
The VIVID Trial is studying an investigational device called the Vesper DUO Venous Stent System™, which includes both the DUO HYBRID™ and DUO EXTEND™ stents. These new venous stents are designed to endure the unique forces and motion that happen in the deep veins. They are being studied to treat iliac and common femoral vein blockages with or without a history of a blood clot in the legs.

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**Cardiovascular Academic Initiative Advancing Clinical Care**
The Cardiovascular Academic Initiative (CAI) at the Medical College of Wisconsin launched in 2020, bringing resources together to advance cardiovascular clinical care. The CAI aims to create collaborative spaces for innovation in cardiovascular research and clinical care; facilitate the translation of cardiovascular research between basic sciences, early human studies and clinical practice; and train the next generation of leaders in cardiovascular research and education. The goal of this work is to help clinicians solve clinical problems, including helping bring new interventions to the bedside, developing best-practice care models and introducing new clinical tools to the care team.
The Froedtert & MCW health network’s multidisciplinary team of heart and vascular physicians and staff are respected specialists in using the latest techniques and technologies to diagnose and treat all forms of cardiovascular disease.

### Advanced Heart Failure and Transplant Cardiologists

- Nunzio, Gagianello, MD
- David Ishizawar, MD
- Renee Kursel, MD
- Eugenia Raichlin, MD

### Cardiologists

- Alexei Agapitov, MD
- Subh Agarwal, MD, MS
- Peter Bartz, MD
- Supreeti Behuria, MD
- Ivor J. Benjamin, MD
- Christopher Boyd, MD
- Sherry-Ann Brown, MD, PhD
- Matthew Buelow, MD
- Mercy Chandrasekaran, MD
- Scott Cohen, MD, MPH
- Kevin Cohoon, DO
- Stacey Gardiner, MD
- Noelle Garster, MD, MS
- Jennifer Gerardin, MD
- Salil Ginde, MD, MPH
Physician Listing continued

**Electrophysiologists**

- Graham Adsit, MD
- Marcie G. Berger, MD
- Evgueni Fayn, MD
- Ridhima Kapoor, MD
- James A. Oujiri, MD
- James A. Roth, MD
- Jason C. Rubenstein, MD
- Dalip Singh, MD

**Interventional Cardiologists**

- Salman Allana, MD
- Iyad Azzam, MD
- Michael P. Cinquegrani, MD
- Panayotis Fasseas, MD
- Kiran Kashyap, MD
- David S. Marks, MD, MBA
- Jesse Martin, MD
- Peter Mason, MD, MPH
- Jorge Saucedo, MD, MBA
- Salim Shammo, MD

**Cardiothoracic Surgeons**

- G. Hossein Almassi, MD
- Nilto De Oliveira, MD
- Lucian Durham III, MD, PhD
- Mario Gasparri, MD
- Viktor Hraska, MD, PhD
Cardiothoracic Surgeons continued

David Johnstone, MD
David L. Joyce, MD, MBA
Lyle D. Joyce, MD,
Takushi Kohmoto, MD, PhD, MBA
R. Eric Lilly, MD
Paul Linsky, MD
Michael Mitchell, MD
Paul J. Pearson, MD, PhD
Ronald Woods, MD, PhD
H. Adam Ubert, MD

Vascular and Interventional Radiologists

Robert A. Beres, MD
Mustafa Haddad, MD
Robert A. Hieb, MD
Eric J. Hohenwalter, MD
Brandon M. Key, MD
Parag J. Patel, MD, MS
William S. Rilling, MD
Matthew J. Scheidt, MD
Amanda R. Smolock, MD, PhD
Sarah B. White, MD, MS

Vascular Medicine Specialist

James B. Gosset, MD
Physician Listing continued

Vascular Surgeons

Shahriar Alizadegan, MD
Kellie R. Brown, MD
Joseph Hart, MD
Nathan Kugler, MD
Brian Lewis, MD
Mona Li, MD
Michael Malinowski, MD
Neel Mansukhani, MD
Peter Rossi, MD
Abby Rothstein, MD

Critical Care/Anesthesiology — Cardiovascular Intensive Care Unit

Michael Fierro, MD
Kim Jacobsen, MD
Matthew Jeranek, MD
Hemanckur Makker, MD
Rachel Morris, MD
Carolyn Pinkerton, MD
Chris Roberts, MD, PhD
Evan Robinson, DO
Amber Zdanovec, MD
Jessica Zenga, MD
M. Tracy Zundel, MD

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Contact Information

To refer a patient to our cardiovascular team, please call 414-805-3666 or visit froedtert.com/refer. For a physician-to-physician phone consultation or patient transfer, call 414-805-4700. To learn more about our programs and team of providers, visit froedtert.com/heart-vascular.

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