2012
Heart and Vascular
OUTCOMES REPORT

Rogue Regional Medical Center
Welcome to the 2012 Heart and Vascular Outcomes Report for the Heart and Vascular Center at Rogue Valley Medical Center. Among the many new aspects of our program is the hospital’s new name: Asante Rogue Regional Medical Center. It’s the same buildings and the same capable staff, but there is an increased emphasis on creating an integrated, collaborative system of patient care.

The cardiologists, cardiac surgeons, and vascular surgeons now all have offices in the same building—the Cardiovascular Institute on the Medford campus. This working arrangement facilitates communication and consultation among the various cardiovascular specialists. There is an active satellite cardiology program at Asante Three Rivers Medical Center in Grants Pass, staffed by cardiologists who also manage patients in Medford. The weekly cardiology conference, which began in 1974, continues and is video-linked from Asante Rogue Regional to Asante Three Rivers and to Sky Lakes Medical Center in Klamath Falls. The satellite TV link allows active participation from the remote sites. We believe that top-quality patient care requires collaboration and teamwork. The teamwork begins when the primary care physician refers a patient to one of our physicians; continues as that patient is served by our skilled nurses, technicians, and therapists; and ends only after that patient has been treated and educated and returns to his or her community.

We work hard to provide excellent cardiovascular care to the patients we serve. This report outlines our approach to giving the patient a positive experience, and it details the statistics we use to objectively evaluate our outcomes. How does one evaluate a cardiovascular program? It isn’t simple because many factors must be considered. In this report we present our statistics supporting program volumes and outcomes. We describe the variety of databases and quality assessment organizations in which we participate. A commitment to ongoing quality improvement is essential; and as discussed in the Quality: Our Approach section of this report, we describe the new Performance Improvement in Cardiac Care Team (PICCT), which took the lead in optimizing patient outcomes.

As in previous editions, this report will also review new technologies and procedures as well as provide an overview of our programs.

We hope you find this information both interesting and helpful in choosing the best treatment options for your patients. Together we can provide our patients the best cardiovascular care.

—The physicians and surgeons of the Heart and Vascular program at Asante Rogue Regional Medical Center
Our Mission
Asante exists to provide quality healthcare services in a compassionate manner, valued by the communities we serve.

Our Vision
Asante will be recognized for medical excellence, for outstanding customer service, and as a great place to work.

The Values in Which We Believe
Excellence in everything we do
Respect for all
Honesty in all our relationships
Service to the community, physicians, and each other
Teamwork always

The Heart of Asante Rogue Regional Medical Center
Cardiac disease is the leading cause of death in Oregon and California. Fortunately, effective therapy is available. Asante Rogue Regional Medical Center is a tax-exempt 378-licensed-bed facility created more than 50 years ago by and for the people of Southern Oregon and Northern California. Our heart and vascular program is nationally recognized and provides highly specialized heart and vascular care.

<table>
<thead>
<tr>
<th>Year</th>
<th>Event</th>
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<tbody>
<tr>
<td>1958</td>
<td>Asante Rogue Regional opens</td>
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<tr>
<td>1968</td>
<td>Cardiac Intensive Care Unit opens</td>
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<td>1973</td>
<td>First Cardiac Catheterization Laboratory opens</td>
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<td>1977</td>
<td>First open heart surgery</td>
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<td>1981</td>
<td>First coronary balloon angioplasty</td>
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<tr>
<td>2003</td>
<td>ASSET program established</td>
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<tr>
<td>2005</td>
<td>Patient Tower constructed</td>
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Cardiac Facilities at Asante Rogue Regional Medical Center
- Cardiac Intensive Care Unit (16 beds)
- Heart Center (40 telemetry beds)
- Cardiac catheterization laboratories
  - 2 outpatient labs
  - 5 inpatient labs
- Cardiovascular Recovery Unit
- 3 operating rooms for cardiovascular procedures
  - 2 dedicated to open heart procedures
  - The region’s only endovascular angiographic suite
- Imaging Services
  - Echocardiography
  - Stress nuclear
  - Cardiac CT

Physicians (all board certified)
- 13 cardiologists
- 4 cardiothoracic surgeons
- 6 vascular surgeons
- 8 cardiac anesthesiologists
- 6 intensivists
- 15 hospitalists

Other Team Members
The first numeral represents the total number of people working in that department. Numerals in parentheses represent people with 10 or more years of experience in that particular field.
- Operating room: 10 (7)
- Cardiac perfusionists: 4 (4)
- Cardiac surgery physician assistants: 4 (4)
- Cardiac Intensive Care Unit: 54 (21)
- ICU-based nurse practitioner: 1 (0)
- ICU-based physician assistant: 1 (0)
- Cardiac catheterization laboratory
  - Asante Rogue Regional: 20 (10)
  - Asante Rogue Regional Cardiovascular Lab at the Cardiovascular Institute: 12 (5)
- Cardiovascular recovery: 18 (6)
- Heart Center: 112 (36)
- Cardiac Clinical Case Managers: 7 (6)
- Cardiac Rehabilitation: 7 (5)
- Echocardiographers: 12 (7)
- Vascular ultrasound: 3 (2)
- Stress testing: 13 (9)
- Cardiopulmonary: 7 (3)
- Clinical quality analysts: 6 (2)
- STEMI nurse coordinator: 1 (0)
- Critical Care clinical practice adviser: 1 (0)
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Quality: Our Approach

Leapfrog Guidelines

Coronary Artery Bypass Grafting

- Favorable hospital volume (450 or more procedures per year)
- Participation in STS data collection
- STS score exceeds the national average for risk-adjusted mortality
- Minimum surgeon volume per year for coronary artery bypass grafting (CABG) (100 cases per year)

Percutaneous Coronary Intervention

- Favorable hospital volume (400 or more procedures per year)
- Participation in the American College of Cardiology National Cardiovascular Data Registry or > 80 percent adherence to the Leapfrog Expert Panel
- Endorsed Process Measures for Quality Score better than the national average for risk-adjusted mortality
- Minimum surgeon volume per year for percutaneous coronary intervention (PCI) (75 cases per year)

American Heart Association’s ACTION Registry-Get with the Guidelines® Award for Coronary Artery Disease: Gold Status in 2008 to 2010 and Platinum Status in 2011

Quality: How We Measure It and Continuously Strive to Improve

Asante Rogue Regional Medical Center has a rigorous quality improvement program. Patient volumes and outcomes are carefully tracked and compared with external benchmarks. Quarterly Morbidity and Mortality (M&M) conferences are held to review program statistics and individual patient experiences. These conferences provide our physicians and staff with the opportunity to see what is going well and to identify areas in need of improvement. The recently organized Performance Improvement in Cardiac Care Team has been charged with identifying areas in which the care process can be improved and facilitating those improvements. The team consists of a senior cardiologist, an experienced nurse data coordinator, and a clinical nurse specialist. The PICCT organizes the quarterly M&M conferences, reviewing and presenting statistical data as it becomes available. The team meets with various members of the care team to help solve problems and improve patient flow.

Asante participates in a variety of national quality improvement initiatives and databases, including the American College of Cardiology and the Society of Thoracic Surgeons (STS). We strive for a high level of compliance with subspecialty guidelines and with the Centers for Medicare & Medicaid Services (CMS) core measures for best practice guidelines.

We support the transparent public reporting of healthcare quality data by participating in the following quality initiatives:

- CMS Hospital Compare www.hospitalcompare.hhs.gov
- STS Consumer Reports www.sts.org
- Healthgrades www.healthgrades.com

Asante Rogue Regional Medical Center performance improvement staff
CMS Quality Measures

Acute Myocardial Infarction: 2011 CMS Quality Measure

- Top 10 Percent of Hospitals in the Nation
- Asante Rogue Regional Medical Center

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<thead>
<tr>
<th>Compliance</th>
<th>Aspirin at Arrival</th>
<th>Aspirin at Discharge</th>
<th>ACE Inhibitor/Angiotensin Receptor Blocker for Left Ventricular (LV) Systolic Dysfunction at Discharge</th>
<th>Smoking Cessation</th>
<th>Beta-Blocker at Discharge</th>
<th>Primary Percutaneous Coronary Intervention within 90 Minutes</th>
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Coronary Artery Bypass Graft Surgery: 2011 CMS Quality Measure

- Top 10 Percent of Hospitals in the Nation
- Asante Rogue Regional Medical Center

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<tr>
<th>Compliance</th>
<th>Prophylactic Antibiotics within 1 Hour</th>
<th>Prophylactic Antibiotics Discontinued within 48 Hours</th>
<th>Beta-Blocker within Peri-Operative Period</th>
<th>Clear Discharge Instructions</th>
<th>ACE Inhibitor/Angiotensin Receptor Blocker for LV Systolic Dysfunction at Discharge</th>
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American Heart Association Mission Lifeline Recognition for Heart Attack Care Performance Achievement Award in 2012

Acumentra Health Hospital Quality Awards for Excellent Care: High Performance (95 percent) on SCIP and Heart Failure Measures in 2010 and 2011.
Cardiac Catheterization and Coronary Intervention

Cardiac catheterization facilities at Asante Rogue Regional Medical Center were established in 1973. Five catheterization and angiographic laboratories are dedicated to state-of-the-art diagnostic coronary angiography, coronary interventions, peripheral angiography and interventions, electrophysiologic procedures, and device implants. Board certification in cardiology is required of all cardiologists. Cardiologists who perform coronary interventions are board certified in interventional cardiology.

Expertise is maintained by focusing procedural experience within a small group of high-volume, experienced interventionalists whose low complication rates and excellent outcomes exceed national benchmarks. Coronary interventional volume for the institution and for each interventionalist exceeds volume recommendations established by the Leapfrog Group, Thomson Healthcare, and the American College of Cardiology. A proven record of satisfactory outcomes and active participation in quality improvement programs is mandatory for all physicians.

Asante Rogue Regional Medical Center continues to adhere to the PCI guidelines written and recommended by the American Heart Association, the American College of Cardiology, and the Society for Cardiac Angiography and Interventions. These guidelines are as follows:

- Operators perform at least 75 procedures at high-volume hospitals (more than 400 procedures per year) with on-site cardiac surgery.
- Operators and institutions should have outcomes comparable to those reported in contemporary national data registries.
- For ST-segment elevation myocardial infarction (STEMI), emergent PCI should be performed by experienced operators who do more than 75 elective PCI procedures per year and, ideally, at least 11 PCI procedures for STEMI each year. Ideally, these procedures should be conducted in institutions that perform more than 400 elective PCIs per year and more than 36 primary PCI procedures for STEMI per year.


The five interventional cardiologists are board certified in both cardiovascular disease and interventional cardiology and provide around-the-clock coverage.

14,751 coronary interventions have been performed since 1981.

13 cardiologists and four cardiothoracic surgeons work together to provide care around-the-clock.

1981: Coronary interventional program started at Asante Rogue Regional Medical Center

14,751 coronary interventions have been performed since 1981.

**Myocardial Infarction: The ASSET Program**

ASSET (Acute ST-Segment Elevation Task Force) is a regional heart attack response team that coordinates the simultaneous activation of paramedics, emergency departments, and the cardiac catheterization laboratory at Asante Rogue Regional Medical Center for rapid identification, triage, and treatment of ST-segment elevation myocardial infarction patients (severe heart attacks) throughout Southern Oregon and Northern California. The ASSET program has received national recognition for its dramatic reduction in death rates from heart attacks and is serving as a model for other programs in development across the country. The program represents the integration of care supported by the efforts of hospitals within the direct ASSET service area, hospitals within the regional support services area whose initial management may include thrombolytic therapy followed by emergent transfer for possible rescue PCI, and those hospitals having PCI capability supported by the cardiothoracic surgical program at Asante Rogue Regional Medical Center.

**ASSET Program Mission Statement**

To facilitate the accurate and rapid diagnosis, treatment, and transport of patients with acute ST-segment Elevation Myocardial Infarction (STEMI) from throughout the region to the Asante Rogue Regional Medical Center cath lab for emergent percutaneous coronary intervention (PCI).

**ASSET Service Area**

![ASSET Service Area Map]

- **ASSET Regional STEMI receiving hospital for primary PCI**
  - Asante Rogue Regional Medical Center
    - Meets all American Heart Association Class I criteria for STEMI

- **ASSET STEMI receiving hospital for primary PCI if patient requested**
  - Providence Medford Medical Center

- **ASSET Service Area STEMI referring hospitals for primary PCI**
  - Ashland Community Hospital
  - Fairchild Medical Center
  - Asante Three Rivers Medical Center

- **ASSET Regional Support Services Area hospitals providing thrombolytic therapy with emergent transfer to Asante Rogue Regional Medical Center**
  - Curry General Hospital
  - Lake District Hospital
  - Sutter Coast Hospital

- **Cardiothoracic Surgery Support**
  - Mercy Medical Center
  - Sky Lakes Medical Center

- **Core Partnership—Emergency Services**
  - American Medical Response (AMR)
  - Ashland Fire & Rescue
  - Jackson County Fire District 3
  - Medford Fire Department
  - Mercy Flights
  - Northern Siskiyou Ambulance
  - Rogue River Fire District

- **Participating Heart Specialists**
  - Asante Cardiovascular and Thoracic Surgery
  - Southern Oregon Cardiology, LLC
The Chain of Survival

Gloria Ferguson, 52
Vancouver, Washington

Gloria, a math and science coordinator, was accompanying her 13-year-old son on a five-day Boy Scout bicycling trip that began at Crater Lake National Park. On the first day, she was bicycling and developed severe angina. A Boy Scout leader recognized the symptoms and drove her to the park’s north entrance, where she lost consciousness soon after arrival. “Fast and deep” chest compressions were promptly begun by two Boy Scout leaders. Seven park rangers quickly descended on the scene, and a physician from a waiting car arrived as well. Approximately six to seven minutes after Gloria lost consciousness, an automated external defibrillator (AED) was brought to the scene. Three shocks were given over three to four minutes, with chest compressions in between, before a pulse was noted.

The Mercy Flights helicopter crew promptly arrived, diagnosed an acute anterolateral STEMI, and brought the critically ill patient directly to the Asante Rogue Regional Medical Center cardiac catheterization laboratory. Emergent coronary angiography revealed a thrombotic occlusion in the proximal LAD (i.e., widowmaker lesion) (figure 1). Emergent mechanical thrombectomy was successful (figure 2) and reestablished flow, followed by stent deployment (figures 3 and 4). Gloria was in cardiogenic shock and required epinephrine boluses, norepinephrine, dopamine, and an intra-aortic balloon pump. She also had 12 episodes of ventricular tachycardia/fibrillation requiring electrical cardioversion.

She was then transferred to the Cardiac Intensive Care Unit and improved over the next hour to the point that hypothermia could be initiated. She improved on a daily basis, was taken off the ventilator five days after admission, and 12 days later was discharged home functional and neurologically intact. Gloria is now back to work full-time and has resumed playing golf.

This resuscitation exemplifies what can happen when each link in the chain of survival works: the prompt recognition of cardiac symptoms by the Boy Scout leader; the quick decision to head to the ranger station; the “fast and deep” chest compressions; the AED availability and prompt and proper use; the rapid arrival and transport of a critically ill patient by helicopter; the direct transport from the helipad to the awaiting cath lab for emergent angiography, mechanical thrombectomy, and stent deployment (door-to-balloon time of 29 minutes, including intubation); the cardiac support with intra-aortic balloon pumping; the subsequent hypothermia protocol to prevent brain injury; and the round-the-clock vigilant care in the Cardiac Intensive Care Unit. Her situation was precarious throughout, and any failures along the way would probably have resulted in her death.
2003-2011 ASSET Patients Average (Median) Time to Treatment for STEMI

Myocardial Infarction: Time Is Muscle
Cross-sectional image of the left ventricle during an inferior myocardial infarction

- Healthy heart muscle
- Dead heart muscle
- Blood within the heart

Healthy heart muscle
Dead heart muscle
i.e., myocardial infarction (heart attack)
Blood within the heart

Arrival at Asante Rogue Regional Medical Center
Coronary Artery Disease

Coronary Artery Stenting

- Coronary artery atherosclerotic plaque
- Low-profile stent and balloon advanced across blockage
- Balloon inflation results in stent deployment
- Balloon removed; stent maintains an open artery

ASSET STEMI Patients

- Transfer from Referring Hospital
- Paramedic
- Asante Rogue Regional Medical Center
- Total

STEMI In-Hospital Mortality

Patients with Door-to-Balloon Time within 90 Minutes

Total number of STEMI patients from 2003 through 2011 = 1,193
3.9 percent is the mortality rate for 2011 and is also the cumulative mortality rate for the ASSET program since its inception in 2003 (1,193 patients)—among the lowest reported in the nation.

89 percent of patients had hospital door-to-balloon times within 90 minutes in 2011, making ASSET one of the elite myocardial infarction programs in the country.

1,193 patients were treated at Asante Rogue Regional Medical Center for STEMI from June 2003 through December 2011.
Primary percutaneous coronary intervention is the most complex, multidisciplinary, and time-sensitive therapeutic intervention in the world of medicine today.

_The process is measured in minutes._

_The outcomes are measured in mortality._

_Teamwork and smooth transitions are essential._

— Ivan Rokos, MD

STEMI Systems, May 2007

National Recognition for the ASSET Program

“An Approach to Shorten Time to Infarct Artery Patency in Patients with ST-Segment Elevation Myocardial Infarction”


“Integration of Pre-Hospital Electrocardiograms and ST-Elevation Myocardial Infarction Receiving Center (SRC) Networks: Impact on Door-to-Balloon Times Across 10 Independent Regions”

67,200 cardiac procedures have been performed at Asante Rogue Regional Medical Center since 1973.
Asante Rogue Regional Medical Center Cardiovascular Lab at the Cardiovascular Institute

Each year 13 cardiologists and six vascular surgeons perform a high volume of diagnostic cardiac catheterizations, peripheral angiograms, and peripheral vascular interventions at the Asante Rogue Regional Medical Center Cardiovascular Lab. Located in a comfortable, state-of-the-art facility within the outpatient facilities of the Cardiovascular Institute (CVI) on the Medford campus, our lab allows elective studies to be performed conveniently; total stays average just four hours.

Includes carotid angiography, upper- and lower-extremity angiography, renal angiography, mesenteric angiography, and abdominal angiography.

No stroke, myocardial infarction, or death occurred at the time of coronary angiography/cardiac catheterization from 2007 to 2011.
Radial Artery Access

The radial artery is increasingly being used as the access site to the arterial system when performing coronary angiography, cardiac catheterization, and percutaneous coronary intervention (i.e., coronary stent) procedures. Historically, the brachial and femoral arteries have served as the points of access to the arterial system. Radial artery access is associated with greater patient comfort, shorter bed rest times, shorter hospital stays, and less bleeding. If a coronary intervention is performed via the radial approach, same-day discharge is an option in some circumstances. Femoral artery access is still used for complex catheterization and interventions, depending on the patient’s situation. Radial artery access was first performed on a routine basis at Asante Rogue Regional Medical Center in 2009 (the first program in Southern Oregon) and is now routinely performed by five of the cardiologists.

We use the American College of Cardiology’s National Cardiovascular Data Registry database to track patient outcomes.

Appropriate-Use Criteria for Percutaneous Coronary Intervention

Over the past 10 years, there has been a paradigm change in the treatment of patients with coronary artery disease. In the past, if a patient had a 75 percent coronary artery stenosis resulting in symptoms, a cardiologist would have felt compelled to mechanically fix that blockage. We now know it is the patient with unstable or intractable symptoms who benefits. The American Heart Association and American College of Cardiology evidence-based treatment guidelines have reviewed the large cardiology research trials and have found that revascularization is beneficial in patients with acute coronary syndrome (i.e., plaque rupture resulting in unstable angina, non-ST-segment elevation myocardial infarction, or ST-segment elevation myocardial infarction), a high-risk stress test or pressure wire assessment, congestive heart failure, or debilitating stable angina despite optimal medical therapy.

A wide range of diagnostic and interventional procedures are performed in seven state-of-the-art catheterization laboratories—five at Asante Rogue Regional Medical Center and two at CVI.
Coronary Artery Disease

Intravascular ultrasound image (cross-sectional view) of a coronary artery with an eccentric atheromatous plaque
Courtesy of Volcano

Pressure wire measurement of a hemodynamically significant coronary artery blockage
Courtesy of Volcano

Drug-eluting stent
Courtesy of Fairman Studios

Stent between fingers
Courtesy of Cordis

Workhorse balloon for angioplasty
Courtesy of Boston Scientific

Diamond-coated burr that spins at 150,000 revolutions per minute to drill through heavily calcified lesions
Courtesy of Boston Scientific

Intravascular ultrasound image (cross-sectional view) of a coronary artery with an eccentric atheromatous plaque
Courtesy of Volcano
Fractional Flow Reserve Measurement with a Pressure Wire

Coronary anatomy is best assessed by coronary angiography. If a patient has unstable symptoms and a severe stenosis, revascularization is clearly indicated. There are many other instances in which it is unclear if a specific coronary lesion is the culprit in causing the patient’s symptoms. Coronary physiology can be assessed using a pressure wire to measure the fractional flow reserve (FFR), which is the mean proximal pressure divided by the mean distal pressure. A pressure wire is a 0.014-inch soft coronary wire with a pressure transducer on its tip. The pressure wire transducer is placed distal to the coronary lesion. The pressure distal to the coronary lesion is measured via the pressure wire, and the pressure proximal to the lesion is measured via the guiding catheter, permitting measurement of the pressure gradient (i.e., FFR). Adenosine (a short-acting vasodilator) is then given, and the FFR is measured. A normal fractional flow reserve is 1.0. Clinical outcome studies have shown that a fractional flow reserve < 0.80 is best treated with revascularization (i.e., coronary stent or CABG surgery) and > 0.80 is best treated with medical therapy.

Pressure wire and intravascular ultrasonography provide additional physiologic and anatomic information regarding coronary artery plaques.

Chronic Total Occlusion: Increasing Success with Percutaneous Coronary Intervention

Huntley Barns, 80
Medford, Oregon

Huntley is a retired pastor who had debilitating exertional angina despite optimal medical therapy. He had a large 3+ reversible perfusion defect in the inferior wall. Wall thickening in the inferior wall confirmed viability. Angiography revealed a chronic total occlusion in the mid-right coronary artery with collateral flow to the distal vessel (figure 1). New coronary wire technology and techniques permitted crossing of the tough fibrous cap in the chronic total occlusion with subsequent stent deployment. A good angiographic result was noted (figure 2), and the patient was discharged home the next day.

figure 1—Chronic total occlusion (> 3 months old by definition) in mid-right coronary artery

figure 2—Patent right coronary artery after stent deployment
Percutaneous Cardiac Assist Devices: Impella and Tandem Heart

For acutely ill patients with failing hearts, temporary cardiac assist devices can mean the difference between life and death. The Impella device is a low-profile pump (impeller) mounted on a pigtail catheter that is advanced across the aortic valve into the left ventricle via femoral artery access. It provides up to 2.5 liters per minute (L/min) of blood flow for cardiac support. The inlet is in the left ventricle, and the outlet is in the ascending aorta. Only the left ventricle can be supported at the moment. This device can be placed solely by the interventional cardiologist and is currently available. The Impella 4.0 L/min device should be available in February 2013.

The Tandem Heart device can provide left heart support, right heart support, or both and is placed either in the operating room or in the cardiac catheterization laboratory. A centrifugal pump is used. For right heart support, the inflow cannula is placed in the right atrium and the outflow cannula in the pulmonary artery. For left heart support in the cath lab, the inflow cannula is placed in the left atrium via a transseptal puncture, and the outflow cannula is placed in the iliac artery. This device requires a team approach with the interventional cardiologist, the electrophysiologists, and the cardiothoracic surgeons. This device has already been used by the cardiothoracic surgeons and will hopefully be available for use in the cath lab in February 2013.

These devices serve as a bridge to coronary artery repair (e.g., high-risk percutaneous coronary intervention such as distal left main bifurcation stenting in a patient with low left ventricular ejection fraction (LVEF) who is not felt to be a candidate for CABG surgery by the CT surgeons) or to provide time for the left ventricle to recover (e.g., acute anterolateral ST-elevation myocardial infarction with cardiogenic shock, metabolic acidosis, and pulmonary edema).
Impella Use in High-Risk Coronary Stenting

Ken Harrison, 55
Yreka, California

Ken was admitted with unstable angina and was subsequently diagnosed with a non-ST-elevation myocardial infarction and acute systolic heart failure. Despite optimal medical therapy, he had debilitating angina frequently at rest and simply walking across the room. Coronary angiography revealed a 95 percent stenosis in the distal left main trunk extending into both the left anterior descending and the left circumflex arteries. Given his liver disease, the cardiothoracic surgeons felt he was at prohibitively high risk for coronary artery bypass graft surgery. He then underwent high-risk percutaneous coronary intervention of the distal left main while simultaneously using a percutaneous left heart assist device (Abiomed Impella 2.5) for circulatory support (2.5 L/min). The coronary intervention involved simultaneous kissing-stent deployment into both the left anterior descending and the left circumflex coronary arteries. Despite the 14F access sheath and the complex nature of the intervention, Ken was discharged home the following day. Six months later he has no angina, is active, and has markedly improved his lifestyle. His liver function has also improved.
Enhanced External Counterpulsulation

For patients with debilitating chronic angina not amenable to coronary revascularization (stent or bypass surgery), enhanced external counterpulsation (EECP) is a well-tolerated, atraumatic, noninvasive procedure that can reduce the symptoms of angina pectoris, presumably by increasing coronary blood flow to ischemic areas of the heart.

The EECP device uses a series of compressive cuffs wrapped around the patient’s calves, thighs, and buttocks and synchronizes their inflation and deflation to the cardiac cycle. During diastole the cuffs inflate sequentially from the calves proximally, resulting in augmented diastolic central aortic pressure and increased coronary perfusion pressure (when coronary artery flow is maximal). Rapid and simultaneous decompression of the cuffs at the onset of systole reduces the systolic pressure and the cardiac workload.

Although the mechanism at work is unclear (possibly improved collateral flow), studies have repeatedly shown that 60 to 80 percent of patients experience the following results:
- Reduced frequency and intensity of chest pain
- Increased exercise tolerance
- Reduced need for anti-anginal medications (such as nitroglycerin)
- Improved sense of well-being and quality of life

Patients typically undergo 35 one-hour sessions over a seven-week period and should first be evaluated by a cardiologist. We have had 189 such patients since the program was established in 2003.

70 percent of patients noted an improvement in distance that can be walked in six minutes.

Hypothermia for Cardiac Arrest Patients

Cardiac arrest (ventricular fibrillation) results in impaired blood flow to the brain. A prolonged cardiac arrest (more than five minutes) can cause brain damage (anoxic encephalopathy). On occasion the heart can be stabilized, but the patient remains unresponsive due to inadequate cerebral perfusion. Inducing mild hypothermia to a core body temperature of 33 degrees C via an external cooling blanket reduces cerebral metabolism and edema and increases the likelihood of making a meaningful neurologic recovery. This treatment has been proven to save one additional life for every seven patients treated and is currently recommended by the American Heart Association.

At Asante Rogue Regional Medical Center, 75 patients were treated from November 2006 through December 2011. Thirty-three patients survived, and 11 required rehabilitation care.
Henry Trujillo, 49  
Grants Pass, Oregon

Henry is a US Navy veteran and a former truck driver who had a sudden cardiac arrest while sleeping. His wife awoke to hear him say, “Ahhhh!” before he lost consciousness. His wife initiated cardiopulmonary resuscitation (CPR) and paramedics found him in ventricular fibrillation. Electrical cardioversion was successful, and he required mechanical ventilation. Upon arrival at Asante Rogue Regional Medical Center, Henry was comatose and his 12-lead electrocardiogram (EKG) showed ST-elevation in leads V1 and V2 consistent with myocardial infarction or Brugada syndrome (figure 1). Emergent coronary angiography showed mild luminal irregularities with no spasm, ulceration, or thrombus, confirming Brugada syndrome (sodium channel mutation). The hypothermia protocol was initiated to minimize cerebral edema. Henry’s neurologic function recovered four days later, an intracardiac defibrillator was implanted, and he was discharged home 10 days after his cardiac arrest.

**figure 1**—12-lead EKG showed ST-elevation in leads V1 and V2 with right bundle branch block pattern.

Hospital Physicians

Asante Rogue Regional Medical Center hospitalists

front row: Nha Le, MD; Erin Brender, MD; EeLin Wan, MD; and Elizabeth Hirni, DO;
back row: Jose Mondesi, MD; Ahsan Jaffar, MD; Thu Han Aung, MD; Jonathan Gell, MD;
Tim Johnston, MD
not pictured: Ahmed T. Ahmed, MD; Tino Bauer, MD; Theresa Chan, MD;
Agnieszka Dobiecka, MD; Kenneth Sanford, MD; Donna Tribelhorn, MD

Six intensivists at Asante Rogue Regional Medical Center are board certified in critical care medicine; one is additionally board certified in pulmonary medicine.

An intensivist is present in the hospital around-the-clock. Hospitals with an intensivist program are associated with better outcomes and lower mortality rates.
**Electrophysiology Program**

Asante Rogue Regional Medical Center’s electrophysiology (EP) program provides comprehensive diagnostic and therapeutic management of simple and complex heart rhythm disorders, device management for heart failure, evaluation and management of syncope, and sudden-death risk assessment and management. Our large procedure volumes, well-equipped electrophysiology laboratories, and highly experienced electrophysiologists and staff account for the excellent patient outcomes and are comparable to the nation’s highest-rated programs. Both of our electrophysiologists are certified by the American Board of Internal Medicine in cardiovascular disease and electrophysiology.

**Diagnostic Electrophysiology Studies**

Diagnostic EP studies are routine heart catheterization procedures used to identify and guide the treatment of heart rhythm disorders. Sophisticated, state-of-the-art three-dimensional (3D) electroanatomical mapping systems are used (like a global positioning system for the heart) to guide the clinician’s understanding and treatment of complex arrhythmia mechanisms. Often these diagnostic procedures are done in the same setting as therapeutic intracardiac ablations, pacemaker insertions, and defibrillator implants as indicated. These tests have a complication rate well below 1 percent.

**Tilt Table Testing**

This simple, noninvasive test is used to evaluate for neurocardiogenic (vasovagal) physiology as a part of the evaluation of patients with syncope. The test is often used to evaluate patients with recurrent syncope of unknown cause unlikely to be related to pathologic arrhythmia, such as those with structurally normal hearts.
Donna Wyant, 74  
Medford, Oregon

Donna suffered acute systolic heart failure with left ventricular ejection fraction 10 percent. She also had severe, central mitral regurgitation secondary to her cardiomyopathy. A 12-lead EKG showed left bundle branch block. Coronary angiography revealed a 90 percent stenosis in her mid-left circumflex artery that was successfully treated with a coronary stent. Despite coronary revascularization and maximal medical therapy, her left ventricular ejection had increased to only 15 to 20 percent eight months later and she still had severe mitral regurgitation. A biventricular pacemaker/intracardiac defibrillator was subsequently implanted due to persistent systolic heart failure (LVEF < 35 percent) and bundle branch block resulting in dyssynchronous contractility of the left ventricle. Her heart failure subsequently resolved, and an echocardiogram eight months later showed normal left ventricular size and systolic function (LVEF 60 percent) and mild mitral regurgitation. Donna is currently asymptomatic from a cardiac perspective.

Intracardiac Ablation

Ablations are catheter-based procedures performed to treat a variety of arrhythmias, including many forms of supraventricular tachycardia, atrial flutter, atrial fibrillation, and some types of ventricular tachycardia. Radiofrequency energy is used to ablate arrhythmia foci and reentrant circuits to manage tachyarrhythmias. Cure rates for many arrhythmias exceed 95 percent, with complication rates of usually less than 1 percent.

Patients with highly symptomatic atrial fibrillation who failed anti-arrhythmic therapy often benefit from intracardiac ablation therapy.

Number of Ablation Procedures

From 2000 to 2011, there has been only one procedure-related death (patient with severe ischemic cardiomyopathy and electrical storm [i.e., refractory ventricular tachycardia]).

Intracardiac Ablation Complications

<table>
<thead>
<tr>
<th>Year</th>
<th>Death</th>
<th>Myocardial Infarction</th>
<th>Stroke</th>
<th>Tamponade</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008</td>
<td>0.3%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>2009</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>2010</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>2011</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
</tbody>
</table>
Pulmonary Vein Antral Isolation

Pulmonary vein antral isolation, also known as atrial fibrillation ablation, is used to treat problematic atrial fibrillation when anti-arrhythmic medications fail. The procedure isolates nests of atrial fibrillation–generating tissue in the posterior part of the left atrium and sometimes the superior vena cava. Mapping systems are used to generate atrial geometry that is then merged with CT scans of the posterior atria and the pulmonary veins to guide ablation and electrical isolation of areas of the heart that trigger and sustain atrial fibrillation. Cure rates vary with the extent of cardiac pathology and range from 50 to 80 percent.

Gordon Self, 70
Talent, Oregon

Gordon had a prior anteroapical myocardial infarction, has congestive heart failure, and previously had an implantable cardioverter defibrillator (ICD) placed for prevention of sudden cardiac death. On March 26, 2012, he presented with an “electrical storm” due to incessant ventricular tachycardia at more than 200 beats per minute. His ICD had shocked him 26 times. His condition was refractory to high-dose intravenous amiodarone and lidocaine and a medically induced coma. On the day of the procedure, he had recurrent ventricular tachycardia, requiring a 40-minute code blue. He was added urgently to our schedule for a high-risk ventricular tachycardia ablation.

At the electrophysiology lab, his ventricular tachycardia was not hemodynamically tolerated, so he required a substrate map–guided approach (figure 1). This allowed us to identify putative ventricular tachycardia circuits for empiric ablation. The patient then had an extensive lesion set along the identified ventricular tachycardia corridors (figure 2). He was extubated on the following day and discharged from the hospital shortly thereafter. Since the procedure, Gordon has had no recurrent ventricular tachycardia and is doing well.

figure 1—First step in a substrate map is to reconstruct the left ventricle on our computer. Our software allows for color-coded representation of ventricular voltage. Here purple is normal tissue, and red is dense scar. Colors in between are transitional tissues, which usually contain the ventricular tachycardia circuits. The pink and blue dots represent double potentials and mid-diastolic potentials recorded with our mapping/ablation catheter. They are characteristic of ventricular tachycardia circuits.

figure 2—Our ablation strategy in unmappable ventricular tachycardia involves applying empiric lesions (red dot) along corridors of transitional tissues, diastolic potentials, and double potentials. These lesions are in diseased, poorly contracting tissue, so they usually do not impair LV function any further. Our endpoint is failure to induce ventricular tachycardia by program electrical stimulation. That was met on this patient.
Gregory Meyer, 65  
Central Point, Oregon

Gregory had highly symptomatic, longstanding, persistent atrial fibrillation since 2004. He had severe left atrial enlargement at 5.4 centimeters and had already failed therapy with amiodarone and cardioversions. On December 1, 2010, he underwent an operative Maze procedure at another institution without success. He was referred to us for further management. On June 13, 2011, he agreed to undergo a percutaneous atrial fibrillation ablation. At the time of catheter deployment, he was found to have three separate arrhythmia mechanisms coexisting in the left atrium: atrial tachycardia originating from the pulmonary veins (figure 1); perimitral atrial flutter (figure 2); and continuous fibrillatory activity in the posterior wall of the left atrium (figure 3). The radiofrequency ablation strategy involved reconstruction of the left atrium and pulmonary veins in three-dimensional space (figure 4) and making the following lesion sets: antral isolation of the pulmonary veins eliminated the atrial tachycardia; posterior wall isolation using a “box” procedure eliminated the continuous fibrillatory activity (figure 5); and isolation of the mitral annulus from the left inferior pulmonary vein terminated the perimitral flutter and restored sinus rhythm (figure 6).

Gregory has remained in normal sinus rhythm since that time and is currently off all antiarrhythmic therapy.
Device Implantation

Asante Rogue Regional Medical Center’s electrophysiology laboratory implants the full range of cardiac rhythm management devices, including pacemakers, implantable cardioverter defibrillators, implantable loop recorders, and cardiac resynchronization (biventricular, or Bi-V) devices for the management of heart failure. ICDs have dramatically reduced arrhythmic and all-cause mortality in at-risk individuals. Biventricular pacing (with and without an ICD) has become a routine part of managing patients with advanced heart failure. Pacing leads are used to synchronize activation of the right and left ventricles to improve contractile dynamics, left ventricular ejection fraction, exercise capacity, and survival.

Lead Extractions

The effectiveness and the dramatic increase in the use of implanted cardiac devices have resulted in the need for complex device management and, at times, the removal of implanted pacing and ICD systems, including leads that have been in place for an extended time. Laser lead extraction is used to remove highly fibrosed lead systems from the heart and the vascular system after extended use. Although serious intrathoracic bleeding can occur during lead removal, careful planning, monitoring, and technique by experienced physicians have led to a high success rate.

Asante Rogue Regional Medical Center participates in the American College of Cardiology’s ICD Registry.

There were no device-related complications in 2011.
Arrhythmias

Indications for ICD Therapy

1. Cardiac arrest due to ventricular fibrillation (VF) or ventricular tachycardia (VT) unrelated to a reversible cause
2. Sustained VT associated with structural heart disease
3. Syncope of undetermined origin with inducible VT at time of electrophysiologic studies (EPS)
4. Nonsustained VT in patients with ischemic cardiomyopathy, ejection fraction (EF) ≤ 40 percent, and inducible sustained VT at EPS
5. “Cardiac syncope” in patients with cardiomyopathy and no explanation of mechanism of syncope after EPS
   a. Syncope in setting of cardiomyopathy warrants hospitalization and referral to arrhythmia specialist
6. Patients with potentially lethal genetic disorders and high-risk characteristics:
   a. Prolonged QT syndrome
      i. Recurrent syncope despite treatment with beta-blockers
      ii. Significant family history of unexplained sudden cardiac death (SCD), especially if patient has syncope
      iii. VF
   b. Brugada syndrome
      i. Syncope with spontaneous Brugada EKG
      ii. VF
   c. Hypertrophic cardiomyopathy
      i. Hypertrophy ≥ 30 millimeters
      ii. Significant family history
      iii. Nonsustained VT
      iv. Syncope
      v. Abnormal blood pressure response to exercise
      vi. VT/VF
   d. Right ventricular dysplasia
      i. Syncope
      ii. Significant family history of SCD
      iii. VT/VF
7. Primary prevention of SCD in patients with ischemic cardiomyopathy and EF ≤ 35 percent
   a. Receiving optimal medical therapy
   b. At least 40 days after myocardial infarction
   c. Life expectancy of at least one year with good functional status
   d. Class I–III congestive heart failure (CHF)
   e. Class IV CHF if candidate for biventricular pacing
8. Primary prevention of SCD in patients with nonischemic cardiomyopathy and EF ≤ 35 percent
   a. Receipt of optimal medical therapy for past three to nine months
   b. Class II–III CHF
   c. Class IV CHF if candidate for biventricular pacing

Based on the 2002 Device Implantation Guidelines and the September 2006 Prevention of Sudden Cardiac Death Guidelines

Indications for Biventricular Pacing

1. Class I–IV heart failure symptoms with left bundle branch block or intraventricular conduction defect with QRS > 120 milliseconds
   a. Receipt of optimal medical therapy for past three to nine months
   b. EF ≤ 35 percent
2. Any patient with significant cardiomyopathy that requires sustained ventricular pacing support
   a. Right ventricular apical pacing is known to be detrimental in this patient subset
   b. It is reasonable to upgrade a patient from a dual-chamber pacing device if EF ≤ 35 percent and Class III–IV CHF symptoms are present
3. Patients with atrial fibrillation who require atrioventricular nodal ablation
   a. Heart failure symptoms
   b. Left ventricular dysfunction

Distribution of Device Implantation

- ICDs
- Pacemakers
- Bi-V Pacemakers/ICDs
- Bi-V Pacemakers

Pacemakers and defibrillators are implanted and managed only by physicians who are certified by the Heart Rhythm Society.
New Anticoagulants: Dabigatran, Rivaroxaban, and Apixaban

In patients with atrial fibrillation and a CHADS2 score ≥ 1, anticoagulation with warfarin (Coumadin), dabigatran (Pradaxa), rivaroxaban (Xarelto), and apixaban (not yet FDA approved) should be considered to prevent embolic stroke.

Dabigatran is a direct thrombin inhibitor that has a lower risk of stroke and intracranial hemorrhage than warfarin but a similar rate of overall bleeding (RELY Trial, *New England Journal of Medicine* 2009;361:1139-51).

Rivaroxaban is a factor Xa inhibitor with a mechanism of action similar to low-molecular-weight heparin. It is equivalent to warfarin with regard to stroke prevention and bleeding risk (ROCKET-AF Trial, *New England Journal of Medicine* 2011;365:883-91).

Apixaban is a factor Xa inhibitor that had a lower risk of stroke and a lower risk of bleeding when compared with warfarin (ARISTOTLE Trial, *New England Journal of Medicine* 2011;365:981-92). FDA approval is pending, but it was included in the evidence-based guidelines titled “Oral antithrombotic agents for the prevention of stroke in nonvalvular atrial fibrillation: a science advisory for healthcare professionals from the American Heart Association/American Stroke Association” (*Stroke* 2012;43:00-00).

When compared with warfarin, these new medications have the advantage of fewer drug interactions and no dietary restrictions, and they do not require international normalized ratio (INR) monitoring. Disadvantages include their cost (approximately $8 per day, or $240 per month) and no clear method for reversing their effect if bleeding occurs. Fresh frozen plasma reverses the effects of warfarin. Dialysis is required for dabigatran. Prothrombin complex concentrates are currently being studied.

<table>
<thead>
<tr>
<th>CHADS2 Risk Criteria</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prior stroke, transient ischemic attack, or embolic event</td>
<td>2</td>
</tr>
<tr>
<td>Age &gt; 75 years</td>
<td>1</td>
</tr>
<tr>
<td>Hypertension</td>
<td>1</td>
</tr>
<tr>
<td>Diabetes mellitus</td>
<td>1</td>
</tr>
<tr>
<td>Heart failure (LVEF &lt; 40%)</td>
<td>1</td>
</tr>
</tbody>
</table>

Other high-risk factors requiring anticoagulation include mitral stenosis and any prosthetic heart valve.

<table>
<thead>
<tr>
<th>CHADS2 Score</th>
<th>Recommended Therapy to Prevent Embolic Stroke</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Antiplatelet therapy</td>
</tr>
<tr>
<td>1</td>
<td>Antiplatelet therapy or anticoagulation</td>
</tr>
<tr>
<td>2</td>
<td>Anticoagulation</td>
</tr>
</tbody>
</table>

Adult Congenital Heart Disease

Care of the adult congenital heart disease (ACHD) patient is a rapidly growing subspecialty of cardiology. These patients are survivors of childhood congenital heart operations and interventional procedures and include those adults who have undiagnosed cardiac disease of a congenital origin. Based on conservative estimates of 800,000 such patients in the United States, it is estimated that there are 12,000 Oregonians with ACHD.

Care of these patients is highly complex and can often involve multiple specialties. Unique issues during non-cardiac surgery, general medical care, and high-risk obstetrical care are some of the concerns addressed by ACHD specialists.

At Asante Rogue Regional Medical Center, and in conjunction with the Pediatric and Adult Congenital Cardiac Units at Oregon Health & Science University, we are able to deliver state-of-the-art care with multimodality imaging, electrophysiological evaluation and treatment, outpatient follow-up, and cardiac surgical care. Other issues addressed by the ACHD section include preparticipation screening for young athletes, patients with Marfan syndrome, and other inherited diseases of the cardiovascular system.

Brian Morrison, MD, FACC, specializes in the care of ACHD patients. He trained at the internationally known UCLA Adult Congenital Heart Disease Center—the first and one of the largest of its kind in the United States. He has served as an assistant clinical professor at the OHSU Division of Pediatric Cardiology for the past 12 years and has spoken at national meetings.

There are five echosonographers who are board certified in pediatric echocardiography.

Pediatric Echocardiography Volumes—Asante Rogue Regional Medical Center
Cardiothoracic Surgery

The cardiothoracic program at Asante Rogue Regional Medical Center has been in existence for more than 35 years, during which time our surgeons have performed more than 16,000 cardiac operations. Excellence in cardiothoracic surgery requires an integrated team effort. It represents the collective experience gained over the many years of the program as well as a continuing commitment to innovation and expertise provided by physicians, operating-room staff, Coronary Care Unit (CCU) nurses, and support staff. A team of four cardiothoracic surgeons, each of whom individually performs more than 100 operations per year, along with their cardiac anesthesia colleagues performs approximately 500 cardiac operations each year. Excellence in postoperative care is achieved by a team of highly experienced CCU nurses, who along with intensivists and cardiologists have cared for thousands of cardiac patients.

The open heart surgery team has seven people with 30 or more years of experience.

In 2010 and 2011, 95 percent of first-time CABG surgery patients (475/501) received an internal mammary graft.
Preston Mitchell, 95
Medford, Oregon

Preston is a photographer and an active musician who had syncope as a result of ventricular tachycardia. Physical examination showed a healthy-appearing man. Echocardiography was unremarkable, including normal biventricular size and systolic function and normal valvular function. Coronary angiography showed an 80 percent stenosis in the distal left main involving the origin of both the left anterior descending and the left circumflex arteries. Pressure wire assessment showed that these lesions were clearly hemodynamically significant (FFR = 0.79). Because Preston’s health was quite good despite his being 92 years old, he underwent two-vessel coronary artery bypass graft surgery. He made a full recovery and is still playing the string bass in the symphony at age 95.
Asante Valve Clinic

Patients with valvular heart disease managed by Southern Oregon Cardiology, LLC, are automatically enrolled in the Asante Valve Clinic if they have moderate to severe aortic stenosis, severe aortic regurgitation, or severe mitral regurgitation. The nurse coordinator tracks these patients via a database to ensure that they are evaluated on a regular basis and that appropriate follow-up care is maintained.

The American Heart Association and American College of Cardiology Valvular Heart Disease Guidelines recommend annual clinical evaluation and echocardiography for patients with moderate to severe aortic stenosis, severe aortic regurgitation, and severe mitral regurgitation (Journal of the American College of Cardiology 2008;52:e1-e142). Of note, patients with mild aortic stenosis are recommended to have an echocardiogram every three years.

For symptomatic patients with aortic stenosis, the standard approach is surgical aortic valve replacement. For patients considered at increased risk for open heart surgery, treatment options include:

- Transcatheter aortic valve replacement (TAVR)
- Palliation with percutaneous balloon aortic valvuloplasty
- Comfort care

Management of these patients is discussed at the cardiology conference each Wednesday morning, with cardiologists and cardiothoracic surgeons in attendance. The optimal treatment strategy is chosen for each patient in a manner similar to Tumor Board Review for oncology patients.

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Percutaneous balloon aortic valvuloplasty is available at Asante Rogue Regional Medical Center. Transcatheter aortic valve replacement is performed by cardiologists at Oregon Health & Science University in Portland, with whom we have an excellent working relationship. The pre-TAVR evaluation is performed by cardiologists from the Asante Valve Clinic and typically involves cardiac catheterization with an aortic valve study, coronary angiography, CT angiography of the iliac/common femoral arteries, STS risk scoring, percutaneous coronary intervention (i.e., coronary stenting) if necessary, and percutaneous balloon aortic valvuloplasty if necessary.

Contact Southern Oregon Cardiology, LLC, at (541) 282-6606 if you would like to enroll a patient in the Asante Valve Clinic.

<table>
<thead>
<tr>
<th>Aortic Stenosis</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Moderate</strong></td>
</tr>
<tr>
<td>Mean gradient 25–40 mm Hg</td>
</tr>
<tr>
<td><strong>Severe</strong></td>
</tr>
<tr>
<td>Mean gradient &gt; 40 mm Hg</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Aortic Regurgitation</th>
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</thead>
<tbody>
<tr>
<td><strong>Severe</strong></td>
</tr>
<tr>
<td>3–4+ on 0–4 severity scale</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Mitral Regurgitation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Severe</strong></td>
</tr>
<tr>
<td>3–4+ on 0–4 severity scale</td>
</tr>
</tbody>
</table>
Minimally Invasive Valve Procedures

The minimally invasive thoracoscopic video-assisted mitral/tricuspid valve procedure allows valve repair or replacement to be performed without sternotomy. Asante Rogue Regional Medical Center cardiac surgeons use this technique primarily for patients who require mitral valve replacement, mitral valve repair for degenerative prolapse, or tricuspid valve repair.

Minimally invasive surgery offers a better cosmetic outcome and can reduce pain, likelihood of infection, and length of hospital stay.
Scott Wolf, 64  
Chiloquin, Oregon

Scott suffered with progressive dyspnea and was subsequently noted to have a large left atrial mass that obstructed mitral inflow. He also had a small atrial septal defect. Resection of the large left atrial mass and closure of the atrial septal defect was made via a small right inframammary incision (i.e., minimally invasive open heart surgery). Pathology confirmed the mass to be a left atrial myxoma. Scott made a good recovery and is currently doing well.

Transesophageal echocardiography shows a large mass in the left atrium impairing flow across the mitral valve

After surgical resection
Prosthetic Heart Valves

- Pericardial tissue valve (bioprosthetic)
  Courtesy of Edwards Lifesciences

- St. Jude Medical mechanical valve
  Courtesy of St. Jude Medical

- Implanted mechanical aortic and mitral valves
  Courtesy of CarboMedics

- Porcine tissue valve (bioprosthetic)
  Courtesy of Medtronic

3D Echocardiography

Real-time, three-dimensional echocardiography is primarily used in patients with valvular heart disease undergoing transesophageal echocardiography. The most frequent and beneficial use is in patients undergoing mitral valve repair. The cardiologists and the cardiac anesthesiologists are both trained in this modality. The cardiologists evaluate the patient prior to surgery. During the operation, the cardiac anesthesiologists provide helpful feedback to the cardiothoracic surgeons to obtain the best possible repair.

Intraoperative transesophageal echocardiography is performed routinely on patients undergoing valve surgery at Asante Rogue Regional Medical Center.

There are eight board-certified cardiac anesthesiologists trained in transesophageal echocardiography.
2011 Distribution of Primary Valve Procedures (n = 186)

- Isolated Aortic Valve Repair/Replacement
- Isolated Mitral Valve Repair/Replacement
- Aortic Valve Repair/Replacement + CABG
- Mitral Valve Repair/Replacement + CABG
- Aortic/Mitral Valve Repair/Replacement + CABG
- Other Valve Procedures

**STS Risk Adjustment**

The purpose of the risk adjustment is to allow STS database participants to compare their performance with those of other participants (e.g., overall STS, like participants, region, or state). By accounting for and controlling patient risk factors that are present prior to surgery, risk adjustment “levels the playing field” as best as possible. Comparing unadjusted event rates would unfairly penalize participants who perform operations on higher-risk patients. Risk adjustment more accurately represents a participant’s performance relative to that of a reference group presented with the same patient population.

STS overall surgical benchmark: STS national database combined results (per surgical category) from more than 900 participants.
Endovascular Treatment of Thoracic Aortic Aneurysm

Until recently, treatment of a descending thoracic aortic aneurysm required an open and morbid surgical procedure associated with a significant risk of paraplegia. A new endovascular approach is safer and less invasive and involves accessing the femoral artery, advancing a stent graft to the descending thoracic aorta, and deploying the stent graft across the aneurysm to seal it off. Patients often go home in one to two days.

Wanda Talley, 86
Klamath Falls, Oregon

Wanda suffered from a massive thoracic aortic aneurysm. In the past this would have been an untreatable problem for a woman of her age. Using minimally invasive endograft stent technology, available at Asante Rogue Regional Medical Center, surgeons repaired the aneurysm, leaving only a small incision in the groin. Asante Rogue Regional Medical Center’s hybrid operating room was developed with the technology to complete such complex procedures. Wanda continues to enjoy spending time with her daughter, Sheryl, and family.
**Transmyocardial Revascularization**

Transmyocardial revascularization (TMR) is an option for patients with stable angina refractory to medical treatment and not amenable to standard coronary revascularization. A carbon dioxide laser is used to fire single, high-energy pulses to create smooth, straight microchannels in the wall of the left ventricle. TMR is occasionally used in conjunction with standard CABG to treat an area of myocardium that cannot be revascularized with bypass grafts or stents. Clinical trials have demonstrated TMR to be a safe and effective means of obtaining long-term relief of angina, improved heart muscle perfusion, and improved quality of life. This technology was introduced at Asante Rogue Regional Medical Center in 2001.

**Maze Procedure**

The Maze procedure uses a cryoablation technique to create lines of nonconducting scar tissue at the pulmonary vein orifices and within the walls of the atria to prevent the propagation of electrical excitation originating in the pulmonary veins into the atria and the sustained disorganized electrical activity within the atria which lead to initiation of sustained atrial fibrillation. The procedure is appropriate for individuals with highly symptomatic atrial fibrillation who have failed conventional therapy.

**Atrial Fibrillation**

Transmyocardial Revascularization Procedure Volume

**Maze Procedure Volume**

Asante Rogue Regional Medical Center Cardiac Intensive Care Unit staff

Asante Rogue Regional Medical Center Heart Center staff
Comprehensive Vascular Care

Six board-certified vascular surgeons provide around-the-clock elective and emergent care for a wide spectrum of peripheral vascular disorders. Outpatient angiography and peripheral vascular interventions are performed in the outpatient angiography suite within CVI. Complex surgical reconstructive procedures, including a high-volume endovascular program for the management of abdominal aortic aneurysms, are performed within the region’s only state-of-the-art dedicated endovascular angiographic operating room located at Asante Rogue Regional Medical Center.

Vascular surgeons, cardiothoracic surgeons, and cardiologists provide an integrated approach to the management of complex thoracic and abdominal aortic disease, combining thoracotomy and endovascular approaches to the management of thoracoabdominal aortic aneurysms and acute aortic dissections.

Vascular surgeons, interventional cardiologists, and neurologists work together to provide a comprehensive management of carotid artery disease, using either surgical endarterectomy or percutaneous stent procedures.

Peripheral Angiography Volume

Inpatient and Outpatient

Includes carotid angiography, renal angiography, mesenteric angiography, upper- and lower-extremity angiography, and abdominal angiography.
Leapfrog recommends that annual hospital volumes for abdominal aortic aneurysm repair be more than 50 per year.
Gordon Karnes, 79  
Klamath, California

Gordon suffered from progressive and debilitating exertional angina and dyspnea. He was subsequently noted to have severe aortic stenosis with peak gradient 93 mm Hg, mean gradient 55 mm Hg, and calculated valve area 0.9 cm². Coronary angiography revealed a 99 percent stenosis in the mid-left anterior descending, a 95 percent stenosis in the mid-left circumflex, and a 60 percent stenosis at the origin of the posterior descending artery. Routine preoperative carotid artery ultrasonography was abnormal and led to carotid angiography, which revealed a 98 percent stenosis in the proximal right internal carotid artery and a 75 percent stenosis in the proximal left internal carotid artery. The patient had no history of transient ischemic attack or stroke. He underwent high-risk simultaneous right carotid endarterectomy, aortic valve replacement, and four-vessel coronary artery bypass graft surgery. The surgical team procedure went very well, and the patient made a good recovery. Gordon is currently active and feeling well more than one year later.

Carotid Endarterectomy

While the patient is under general anesthesia, an incision is made in the skin over the carotid artery. The carotid artery is clamped and incised, and the atherosclerotic plaque is removed (endarterectomy). This is similar to removing the inner layers of an onion. The artery and the skin are then surgically closed.

Isolated Carotid Endarterectomy: In-Hospital Death and Stroke Rates

<table>
<thead>
<tr>
<th>Year</th>
<th>Deaths</th>
<th>Strokes</th>
</tr>
</thead>
<tbody>
<tr>
<td>2003</td>
<td>0.7%</td>
<td>0%</td>
</tr>
<tr>
<td>2004</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>2005</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>2006</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>2007</td>
<td>1.37%</td>
<td>1.76%</td>
</tr>
<tr>
<td>2008</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>2009</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>2010</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>2011</td>
<td>0%</td>
<td>0%</td>
</tr>
</tbody>
</table>

Total Carotid Artery Revascularization Procedures

- **Isolated Carotid Endarterectomy**
- **Simultaneous Carotid Endarterectomy and Cardiac Surgery**
- **Carotid Stent**

Carotid stent program began in 2005.
Natural History of Carotid Disease

Risk of Ipsilateral Stroke

Symptomatic patients—transient ischemic attack (TIA)/stroke:
- 70 to 99 percent stenosis: 13.0 percent per year
- 50 to 69 percent stenosis: 4.4 percent per year

Asymptomatic patients:
- > 60 percent stenosis: 2 to 3 percent per year

Source: NASCET, NASCET II, ACAS, and ACST trials.

Who Should Be Considered for Carotid Stenting?

High-risk surgical patient:
- Symptomatic patient with ≥ 50 percent stenosis
- Asymptomatic patient with ≥ 80 percent stenosis

Criteria for Increased Surgical Risk
- Congestive heart failure class III/IV and/or left ventricular ejection fraction < 30 percent
- Open heart surgery indicated
- Recent myocardial infarction
- Unstable angina
- Severe pulmonary disease
- Contralateral carotid occlusion
- Contralateral laryngeal nerve palsy
- Irradiated neck
- Previous carotid endarterectomy with recurrent stenosis
- High cervical internal carotid artery lesions
- Common carotid lesions below the clavicle
- Severe tandem lesions

Current CMS Coverage for Carotid Stents
- Symptomatic patients with ≥ 70 percent carotid stenosis at high risk for carotid endarterectomy
124 carotid stent procedures have been performed at Asante Rogue Regional Medical Center since 2005.

Asante Rogue Regional Medical Center awarded American Heart Association Get With The Guidelines® for Stroke in 2012.

Patients at Normal Surgical Risk: NIH-Sponsored CREST Trial
Asante Rogue Regional Medical Center was one of 110 centers in North America chosen to participate in the National Institutes of Health-sponsored CREST trial. This study randomized normal-risk surgical patients with carotid artery disease to carotid endarterectomy versus carotid stenting with distal emboli protection. The screening process for treating physicians is rigorous; only experienced physicians with an excellent track record are chosen. Eleven patients participated in the study, and nine received carotid stents. All patients did well, with no death, stroke, or myocardial infarction.
Noninvasive Diagnostic Testing

Asante Rogue Regional Medical Center offers a full spectrum of noninvasive diagnostic testing for cardiovascular diseases:

- Echocardiography (transthoracic, transesophageal, pediatric)
- Treadmill stress testing
- Nuclear stress testing
- Multigated acquisition (MUGA) scans
- Holter/event monitors
- Tilt table testing
- Vascular imaging
- Cardiac magnetic resonance imaging (MRI)
- CT coronary angiography (CTCA)
- Coronary calcium score

Echocardiography is a noninvasive ultrasonographic assessment of cardiac structure and function, including evaluation of ischemic and nonischemic ventricular dysfunction, cardiomyopathy, valvular heart disease, and congenital malformations. Invasive transesophageal assessment is also performed in the inpatient and outpatient settings, as well as intraoperative assessment of cardiothoracic surgical procedures.

Treadmill stress testing provides electrocardiogram assessment for exercise-induced ischemia or arrhythmias, including chronotropic competence. Treadmill testing is used predominantly for patients who are able to exercise and have a normal baseline EKG.

6,891 stress tests were performed at Asante Rogue Regional Medical Center and Asante Three Rivers Medical Center in 2011.

Transesophageal echo is available around-the-clock at Asante Rogue Regional Medical Center.

Echocardiography Volumes—Asante Rogue Regional Medical Center, Asante Three Rivers Medical Center, Asante Rogue Valley Cardiac Studies, and Asante Three Rivers Cardiac Studies

<table>
<thead>
<tr>
<th>Year</th>
<th>Echo</th>
<th>Transesophageal Echo</th>
<th>Pediatric Echo</th>
<th>Stress Echo</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>958</td>
<td>621</td>
<td>418</td>
<td>950</td>
</tr>
<tr>
<td>2011</td>
<td>10,545</td>
<td>466</td>
<td></td>
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</tbody>
</table>
Nuclear stress testing allows a noninvasive assessment of coronary blood flow and cardiac function; it is performed with exercise or pharmacologic stress protocols. It is useful in assessment of ischemia with a baseline abnormal EKG, a nonspecific or possibly false-positive treadmill result, moderate probability for coronary artery disease, localization of ischemia in known coronary artery disease, or risk stratification after a cardiac event.

MUGA scans are used for evaluation of right and left ventricular systolic performance.

A Holter monitor continuously records a patient’s heart rhythm for 24 hours. The patient notes any symptoms, which allows correlation of the heart rhythm to any concerning symptoms.

An event monitor is worn for approximately one month. When a patient has symptoms (such as palpitations, light-headedness, or dizziness), the patient pushes a button to record the heart rhythm. This information is then transmitted over the telephone to the physician for review.

Tilt table testing is a noninvasive assessment for vasovagal (neurocardiogenic) syncope.

Vascular imaging consists of ultrasonographic assessment of carotid and peripheral vascular disease, including atherosclerotic blockage, aneurysm formation, and deep venous thrombosis.

Cardiac MRI is used to evaluate for arrhythmogenic right ventricular dysplasia, constrictive pericarditis, and myocardial viability following infarction.

Peripheral Vascular Imaging Volumes—
Asante Rogue Regional Medical Center and Asante Three Rivers Medical Center

<table>
<thead>
<tr>
<th>Procedure</th>
<th>2010</th>
<th>2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arterial Ultrasound of Arms and Legs</td>
<td>2,171</td>
<td>2,111</td>
</tr>
<tr>
<td>Carotid Artery Ultrasound</td>
<td>901</td>
<td>919</td>
</tr>
<tr>
<td>Venous Ultrasound of Legs</td>
<td>3,432</td>
<td>3,503</td>
</tr>
</tbody>
</table>

Cardiologists trained in:

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transesophageal echocardiography</td>
<td>7</td>
</tr>
<tr>
<td>Nuclear stress tests</td>
<td>12</td>
</tr>
<tr>
<td>Cardiac CT</td>
<td>5</td>
</tr>
</tbody>
</table>
Cardiac CT

Coronary calcium score is a screening heart scan used to detect calcium deposits found in atherosclerotic plaque in the coronary arteries. The calcium score is then used to evaluate risk of future coronary heart disease and events.

Coronary arterial calcification is part of the development of atherosclerosis (hardening of the arteries), occurs almost exclusively in atherosclerotic arteries, and is absent in the normal vessel wall. A score of 0 implies a low likelihood of coronary obstruction but cannot totally exclude the presence of atherosclerosis. A high score indicates a significant plaque burden and an increased relative risk of future heart and vascular events. It should be understood that calcification does not imply significant obstruction, nor is it site specific for a stenotic lesion; rather, it indicates the extent of atherosclerosis throughout the coronary arteries.

CT coronary angiography consists of high-resolution 3D pictures of the moving heart and great vessels that are used to determine whether a patient has significant coronary atherosclerosis or any structural abnormality of the heart and the surrounding structures.

Medicare Coverage for CTCA

- Patients with acute chest pain presenting in an emergency room (or equivalent) when necessary to rapidly differentiate among reasonably probable aortic, pulmonary, and/or coronary etiologies
- First-line testing for coronary artery disease in nondiabetic patients with intermediate risk factors presenting in an emergency room (or equivalent) with chest pain syndrome or other symptoms strongly suggestive of coronary disease, and who have normal or borderline enzymes and EKGs, when negative findings will result in avoiding invasive coronary angiography
- Equivocal or suspected inaccurate stress (or stress imaging) test in patients with low to intermediate risk factors when a negative CTCA will result in avoiding invasive coronary angiography
- Clinical findings strongly suggestive of a congenital anomaly of the coronary vessels or great vessels

64-slice CT scanners are available at Asante Rogue Regional Medical Center and Asante Three Rivers Medical Center.
Cardiac Rehabilitation, Preventive Medicine, and Cardiac Education

Diagnosing and treating a cardiac condition are only the first steps in returning a person to the maximal level of function. Multiple studies have shown that participation in a formal program of cardiac rehabilitation (rehab) is the most cost-effective way to return cardiac patients to a full active life. Rehab programs improve exercise capacity (by an average of 50 percent) and decrease mortality (by as much as 25 percent). They also teach patients and their families how to stay healthy in the future. Prevention of cardiovascular disease is an important part of our mission.

Asante Rogue Regional Medical Center has had a vigorous rehab program since 1998, and Asante Three Rivers Medical Center’s program is even older. Both programs are certified by the American Association of Cardiovascular and Pulmonary Rehabilitation. The programs are directed by cardiologists and staffed by multidisciplinary teams. Exercise prescriptions are developed for each participant and include both monitored exercise and extensive education. The patient’s emotional health is evaluated, and appropriate support and counseling are offered. Educational lectures for patients and their families are given weekly on a variety of topics, including diet, exercise, medications, cardiac physiology, and stress reduction.

Goals of the Asante Cardiac Rehab program include:
- Determining the level at which a patient may safely exercise
- Educating patients about cardiac anatomy and function in health and in illness
- Developing the habit of regular exercise while improving endurance and a sense of well-being
- Facilitating smoking cessation
- Helping both patient and family understand the elements of a healthy diet and weight control
- Helping patients understand their medications and the need for medication compliance

Eligibility for participation in Asante Cardiac Rehab Medicare and most other insurers cover patients who in the previous year had any of the following: stable angina pectoris, myocardial infarction, coronary artery stenting, bypass surgery, valve surgery, or heart transplantation.

Achievements of the Asante Center Rehab program during 2010 and 2011 include:
- 250 patients participated each year.
- 95 percent of patients said they were either satisfied or very satisfied with their rehab experience.
- 97 percent of patients were on a heart-healthy diet.
- 85 percent of patients were exercising at home.
- Medication compliance was excellent. Of the patients appropriate for therapy, 98 percent were taking statins, 100 percent were taking aspirin, and 98 percent were taking beta-blockers.
- Patients demonstrated significant improvements in functional capacity, sense of vitality, social functioning, emotional well-being, and level of pain.
Cardiac rehabilitation is recommended by the American Heart Association and the American College of Cardiology.

Asante Rogue Regional Medical Center and Asante Three Rivers Medical Center are both certified by the American Association of Cardiovascular and Pulmonary Rehabilitation.

92 percent of participants noted improvement in strength and endurance.

87 percent of patients have good blood pressure control at the completion of the program.

87 percent of patients report continued home exercise compliance.

Cardiac Educators
Asante Rogue Regional Medical Center has a group of Cardiac Clinical Case Managers who visit with patients both before and after cardiac surgery. They also see patients who have experienced heart failure, angina, myocardial infarction, coronary artery stenting, or required pacemaker or defibrillator implantation. Many of these educators also work in the Cardiac Rehab program. The educators teach patients about their illness using a variety of teaching aids, including actual stents, artificial valves, and pacemakers. The primary purpose of their visits is to be sure that patients understand their situation and have an opportunity to ask questions of an expert in a nontreating environment. We believe that education is key to good patient outcomes in both the short and long term.

Some Comments from Patients
“Fantastic staff and program...professional and friendly...I owe them everything.”

“Felt like part of the family.”

“Not only good for one's health but also for your emotional well-being...don't change a thing.”

“A sincere and unequivocal thank-you for all you did for me during the past three months. You helped me physically, emotionally, and intellectually; you created an environment of hope and optimism. Your work is deeply appreciated.”

95 percent of Cardiac Rehab patients were very satisfied with their experience.

3,360 Cardiac Rehab patients at Asante Rogue Regional Medical Center since 1998
220 patients at Asante Rogue Regional Medical Center in 2011
155 patients at Asante Three Rivers Medical Center in 2011

97 percent of previous smokers were smoke-free at the conclusion of their Cardiac Rehab program.

Cardiac Rehab is an effective way to reduce morbidity and mortality.
Cryptogenic Stroke and Patent Foramen Ovale

Paradoxical embolization via a patent foramen ovale (PFO) is a very infrequent but known cause of stroke. A question is whether closing the foramen ovale reduces the risk of recurrent stroke. Everyone has a PFO in utero, and it closes shortly after birth in approximately 75 percent of people. In the remaining 25 percent, this "door" in the atrial septum remains open to some degree. In young patients with stroke (age < 55 years), it has been observed that patients with a PFO have an increased risk of recurrent stroke.

Percutaneous closure devices have been designed to close the PFO, but the American Stroke Association, American Heart Association, American Association of Neurologists, American College of Cardiology, and Food and Drug Administration issued a statement recommending the completion of randomized clinical trials to determine if there is a clinical benefit for first-time stroke patients (Journal of the American College of Cardiology 2009;53:2014-18).

The recently published CLOSURE-1 study enrolled 909 patients with cryptogenic stroke and found no reduction in the rate of recurrent transient ischemic attack or stroke with the STARFlex PFO closure device (New England Journal of Medicine 2012;366:991-99). For 80 percent of patients with a recurrent stroke, an explanation other than paradoxical embolism was found.

The RESPECT and PC trials were presented in October 2012 at the Transcatheter Cardiovascular Therapeutics conference but have not yet been published in a peer-reviewed journal. These studies were randomized clinical trials of the Amplatzer PFO closure device versus medical therapy in first-time stroke patients. Neither trial met the primary end point of the study (i.e., reduction in embolic events in the intention-to-treat arms). However, secondary endpoint analysis looks encouraging. Final recommendations should be forthcoming in 2013.

Current recommendations are as follows:

- For cryptogenic stroke in patients < 55 years old, a careful evaluation is recommended and may include brain MRI with diffusion-weighted imaging, head/neck magnetic resonance angiogram (MRA) or cervicocerebral angiography, carotid ultrasonography, transesophageal echocardiography, Holter monitor, hypercoagulable screen, urine toxicology screen, and lower-extremity venous ultrasound.
- Antiplatelet therapy with aspirin or clopidogrel is the standard of care except in patients with atrial fibrillation, hypercoagulable state, or thromboembolic disease (e.g., pulmonary embolism, deep-venous thrombosis) who require anticoagulation with warfarin, dabigatran, or rivaroxaban.
- For PFO patients with recurrent transient ischemic attack or stroke despite optimal medical therapy, percutaneous PFO closure is recommended. There is no evidence of benefit, but the FDA has issued a Humanitarian Device Exemption for this use.

If percutaneous PFO closure is required, we have the training and the hospital privileges to perform the procedure. We follow the recommendations made by American Heart Association, American Stroke Association, Food and Drug Administration, and our professional societies.

Resistant Hypertension: Renal Artery Radiofrequency Ablation

We all know that the kidneys are important in blood pressure regulation. For patients with resistant hypertension defined as persistent hypertension despite maximal dose of three antihypertensive medications, bilateral renal artery denervation looks quite promising. It can be performed using an endovascular catheter that delivers radiofrequency energy to the luminal surface of the renal artery. The Symplicity HTN-2 trial showed a 32 mm Hg reduction in systolic blood pressure and a 12 mm Hg reduction in diastolic blood pressure at 18 months. The Symplicity HTN-3 trial will randomize patients to renal denervation versus a sham procedure to remove any placebo effect. This device is not yet approved by the FDA.
Atrial Fibrillation: Preventing Stroke Using a Left Atrial Appendage Occluder

The most feared outcome of atrial fibrillation is embolic stroke. The left atrial appendage is typically the site for thrombus formation. Left atrial appendage occluders (i.e., plugs) can be delivered from the inferior vena cava through the atrial septum via a transseptal puncture. In the PROTECT-AF study (*Lancet* 2009;374:534-42), patients with atrial fibrillation were randomized to warfarin versus a left atrial appendage occluder. For patients who received the left atrial appendage occluder, warfarin was stopped after 30 days and both groups were followed for an average of three years. The left atrial appendage occluder had a higher risk of adverse safety events at the time of implantation, such as pericardial effusion (4.8 percent), device embolization (0.6 percent), and stroke (1.1 percent). Despite these early risks, the left atrial appendage occluder group had a lower rate of stroke. As mandated by the FDA, a second clinical trial is under way to better clarify whether the benefits of the left atrial appendage occluder outweigh the risks. Other occlusion devices are being studied. If the left atrial appendage occluder is approved, it is unclear whether it will be available only for patients who are unable to take anticoagulation therapy (e.g., warfarin) or for all atrial fibrillation patients at increased risk of stroke.

Close Working Relationship with Oregon Health & Science University

There are certain cardiac procedures that are required infrequently. We believe patients requiring such procedures should be referred to a major university medical center that performs these on a regular basis. Fortunately, we have a close working relationship with the cardiologists at the Oregon Health & Science University in Portland, Oregon. Dr. Brian Morrison of Southern Oregon Cardiology, LLC, travels to Portland every month to teach cardiology fellows and see patients in the OHSU Adult Congenital Heart Disease clinic. Oregon Health & Science University received a $125 million grant from Nike’s Phil Knight in September 2012 to establish the OHSU Cardiovascular Institute. A patient’s evaluation always begins in Southern Oregon, but patients may require the following procedures, all of which are offered at Oregon Health & Science University:

- Heart transplantation
- Transcatheter aortic valve replacement either through the arteries in the groin or using a small incision through the ribs
- Percutaneous pulmonic valve replacement with the Melody Valve
- Percutaneous closure of atrial septal defect or patent ductus arteriosus
- Percutaneous closure of perivalvular leak involving a prosthetic heart valve
- Cardiac MRI for congenital heart disease, sarcoidosis, hemochromatosis, amyloidosis, and other conditions
Physician Biographies

Asante Cardiovascular and Thoracic Surgery

Charles Carmeci, MD, FACS
Cardiovascular and Thoracic Surgery
Specialties: Coronary artery bypass graft surgery, valve surgery, thoracic aortic aneurysm repair, minimally invasive valve surgery, thoracic oncology, minimally invasive thoracic surgery, thoracic aortic aneurysm surgery, stent grafts
Medical Degree: Medical College of Virginia
Internship/Residency: General Surgery at Stanford University Medical Center
Cardiothoracic Surgery Fellowship: University of Wisconsin
Board Certification: American Board of Surgery, American Board of Thoracic Surgery
Honors/Awards: Graduated with honors from George Washington University (undergraduate degree) and Medical College of Virginia
Office: Medford

David L. Folsom, MD, FACS
Cardiovascular and Thoracic Surgery
Specialties: Coronary artery bypass graft surgery, valve surgery, thoracic aortic aneurysm repair, minimally invasive valve surgery, thoracic oncology, minimally invasive thoracic surgery
Medical Degree: University of Utah
Internship/Residency: General Surgery at Case Western Reserve University
Cardiothoracic Surgery Fellowship: Case Western Reserve University
Board Certification: American Board of Surgery, American Board of Thoracic Surgery
Honors/Awards: Chairman, Department of Surgery at Asante Rogue Regional Medical Center 2002–2005; Allen Research Fellow at Wade Park VA Medical Center
Office: Medford

Roger V. Hall, MD, FACS
Cardiovascular and Thoracic Surgery
Specialties: Coronary artery bypass surgery with extensive experience in thoracic aortic aneurysm repair, re-do surgery, valve surgery, thoracic oncology
Medical Degree: University of Utah
Internship/Residency: General Surgery at Madigan Army Medical Center
Cardiothoracic Surgery Fellowship: Letterman Army Medical Center
Board Certification: American Board of Surgery, American Board of Thoracic Surgery (recertified 2006)
Honors/Awards: Past President, Medical Staff at Asante Rogue Regional Medical Center; Past Chairman, Department of Surgery at Asante Rogue Regional Medical Center
Office: Medford
George R. Wilkinson, MD, FACS
Cardiovascular and Thoracic Surgery
Specialties: Cardiovascular and thoracic surgery, valve repair, off-pump surgery, complete aortic reconstruction
Medical Degree: University of Iowa
Internship/Residency: General Surgery at Tripler Army Medical Center
Cardiothoracic Surgery Fellowship: Letterman Army Medical Center
Board Certification: American Board of Thoracic Surgery
Honors/Awards: Clinical Associate Professor of Surgery, Uniformed Services Medical School
Office: Medford

Jon R. Brower, MD, FACC
Cardiology
Specialties: Consultative cardiology, echocardiography, transesophageal echocardiography, nuclear cardiology, coronary angiography
Medical Degree: University of Arizona
Internship/Residency: Neurology and Internal Medicine at University of Arizona
Cardiology Fellowship: University of Arizona
Board Certification: Internal Medicine, Cardiovascular Disease
Honors/Awards: Residency Excellence in Teaching (three years)
Clinic: Medford, Grants Pass, Brookings

Kent W. Dauterman, MD, FACC, FSCAI
Cardiology
Specialties: Consultative and interventional cardiology including carotid stenting, radial artery access, cardiac assist devices (Impella), balloon aortic valvuloplasty
Medical Degree: Johns Hopkins School of Medicine
Internship/Residency and Chief Residency: University of California, San Francisco
Cardiology Fellowship: University of California, San Francisco
Interventional Cardiovascular Fellowship: Cleveland Clinic
Board Certification: Cardiovascular Medicine, Interventional Cardiology
Honors/Awards: Valedictorian, College of Arts and Sciences, University of Toledo; Top Three Graduate, Johns Hopkins School of Medicine
Dr. Dauterman served as a Peace Corps public health volunteer in Zaïre.
Research: Served as the local principal investigator for the NIH-sponsored CREST trial and CAPTURE I and II, and CHOICE carotid stent registries
Clinic: Medford, Grants Pass, Brookings

Southern Oregon Cardiology, LLC

Clinic: Medford, Grants Pass, Brookings
Southern Oregon Cardiology, LLC

Brian W. Gross, MD, FACC
Cardiology
Specialties: Consultative and interventional cardiology, heart catheterization, echocardiography, nuclear imaging
Medical Degree: University of Rochester School of Medicine and Dentistry, New York
Internship/Residency: Dartmouth Medical School, New Hampshire
Cardiology Fellowship: University of Washington
Board Certification: Internal Medicine, Cardiovascular Medicine, Interventional Cardiology
Honors/Awards: Carpenter Award 2012; Oregon American College of Cardiology Leadership Award, May 2009; Washington Research Award (American Heart Association), Intern and Resident of the Year; Oregon Fire Chief’s Award–Meritorious Service Award; All American Selection to the All New England Soccer Team
Dr. Gross served as an assistant professor at the University of Washington, Division of Cardiology.
Clinic: Medford, Grants Pass, Brookings

Mark M. Huth, MD, PhD, FACC
Cardiology
Specialties: General cardiology, heart failure, heart transplant, echocardiography, nuclear cardiology, coronary angiography
Medical and Doctoral Degrees: Louisiana State University
Internship/Residency: Louisiana State University
Cardiology Fellowship: University of Washington
Postdoctoral Fellowship: Physiology at University of Washington
Board Certification: Internal Medicine, Cardiology
Honors/Awards: Honors in physiology from Rutgers University (undergraduate); Outstanding Intern and Resident of the Year; Chairman of the American College of Cardiology’s Oregon GAP Project in Congestive Heart Failure
Dr. Huth served as an assistant professor at the University of Washington, Division of Cardiology.
Clinic: Medford, Grants Pass, Brookings

Todd S. Kotler, MD, FACC
Cardiology
Specialties: Consultative cardiology, interventional cardiology, general cardiology, nuclear cardiology
Medical Degree: Stanford University School of Medicine
Internship/Residency: Internal Medicine at University of California, Los Angeles (UCLA)
Cardiology Fellowship: Cedars-Sinai Medical Center, UCLA
Board Certification: Internal Medicine, Cardiology, Interventional Cardiology
Honors/Awards: Highest honors from University of California, Santa Cruz (undergraduate)
Clinic: Medford, Grants Pass, Brookings
Kenneth M. Lightheart, MD, FACC
Cardiology
Specialties: Consultative cardiology, transesophageal echocardiography, nuclear cardiology, coronary angiography, cardiac CT
Medical Degree: Oregon Health & Science University
Internship: Internal Medicine at Legacy Portland Hospitals
Residency: Internal Medicine at David Grant Medical Center, Travis Air Force Base, California
Cardiology Fellowship: Wilford Hall Medical Center, Lackland Air Force Base, Texas
Board Certification: Internal Medicine, Cardiology, Nuclear Cardiology
Honors/Awards: Summa cum laude from Brigham Young University, cum laude from Oregon Health & Science University, Alpha Omega Alpha Honor Society in medical school, Housestaff Scientific Research Second Place Award
Clinic: Medford, Grants Pass, Brookings

David J. Martin, MD, FACC
Cardiology
Specialties: Electrophysiology, intracardiac ablation, pacemakers, defibrillators, invasive and noninvasive cardiology
Medical Degree: Dartmouth Medical School
Internship/Residency: Internal Medicine at Cedars-Sinai Medical Center, UCLA
Cardiology Fellowship: Cedars-Sinai Medical Center
Board Certification: Clinical Cardiac Electrophysiology, Cardiovascular Disease
Honors/Awards: Alpha Omega Alpha Honor Society in medical school, Phi Beta Kappa
Clinic: Medford, Brookings

Mark G. Moran, MD, FACC, FSCAI
Cardiology
Specialties: Interventional cardiology, pacemaker and defibrillator implantation and follow-up, invasive and noninvasive cardiology
Medical Degree: University of California, Los Angeles (UCLA)
Internship/Residency: UCLA Medical Center
Cardiology Fellowship: UCLA Medical Center
Board Certification: Internal Medicine, Cardiology, Interventional Cardiology; Testamur NASPExAM; Certified Cardiac Device Specialist IBHRE
Honors/Awards: California Heart Association Research Fellow; bachelor’s degree in biology with highest honors from University of California, Santa Cruz; Department of Medicine Intern of the Year, UCLA Medical Center; Fellow Society for Cardiac Angiography and Interventions
Clinic: Medford, Grants Pass, Brookings
PHYSICIAN BIOGRAPHIES

Brian J. Morrison, MD, FACC
Cardiology
Specialties: Consultative cardiology, pediatric and adult congenital heart disease
Medical Degree: University of Illinois, Chicago
Internship/Residency: Internal Medicine at University of Colorado Health Sciences Center, Denver
Cardiology Fellowship: Massachusetts General Hospital, Harvard Medical School
Board Certification: Cardiology
Honors/Awards: Grove Outstanding Senior Award Finalist, University of Illinois College of Medicine; Outstanding Resident Teaching Award, University of Colorado Health Sciences Center; Affiliate Associate Professor of Pediatrics at Oregon Health & Science University
Dr. Morrison’s training included a senior clinical research fellowship at Boston Children’s Hospital. He also spent one year as an instructor and a staff physician at the Adult Congenital Heart Disease Center at the University of California, Los Angeles.
Clinic: Medford, Grants Pass, Brookings

Bruce Patterson, MD, FACC
Cardiology
Specialties: Consultative and preventative cardiology, echocardiography, transesophageal echocardiography, nuclear cardiology, coronary angiography
Medical Degree: University of Pennsylvania
Internship/Residency: Internal Medicine at Brigham and Women’s Hospital, Harvard Medical School
Cardiology Fellowship: Boston University Medical Center
Board Certification: Internal Medicine, Cardiology
Honors/Awards: Cook Memorial Prize in Economics at Pomona College, California; President, Alpha Omega Alpha Honor Society, University of Pennsylvania School of Medicine
Dr. Patterson earned his master’s degree from the Princeton Theological Seminary in New Jersey.
Clinic: Medford, Grants Pass, Brookings

Eric A. Pena, MD, FACC
Cardiology
Specialties: Cardiology, electrophysiology
Medical Degree: University of South Florida
Internship/Residency: Emory University, Atlanta, Georgia
Cardiology Fellowship: Emory University
Board Certification: Cardiology, Electrophysiology
Honors/Awards: Chief Medical Resident
Dr. Pena has served on the faculty of the Heart Rhythm Society’s International Meeting for the past three years.
Research: Primary investigator or co-investigator in many PIVOTAL clinical trials, Miracle ICD, Companion trial, PAVE trial, and MADIT CRT trial
Clinic: Medford, Brookings
Bradley E. Personius, MD, FACC
Cardiology
Specialties: Consultative and preventative cardiology, transesophageal echocardiography, pacemakers, complex lipid disorders, cardiac CT, nuclear cardiology, cardiac catheterization
Medical Degree: Loma Linda University School of Medicine
Internship/Residency: Internal Medicine at Wilford Hall Medical Center, Lackland Air Force Base, Texas
Cardiology Fellowship: Wilford Hall Medical Center
Board Certification: Internal Medicine, Cardiology, Cardiac Device Specialist
Clinic: Medford, Grants Pass, Brookings

Stephen J. Schnugg, MD, FACC
Cardiology
Specialties: Consultative cardiology, interventional cardiology, cardiac catheterization, echocardiography
Medical Degree: University of California, Los Angeles
Internship/Residency: Internal Medicine at Wadsworth VA Medical Center
Cardiology Fellowship: Wadsworth VA Medical Center
Board Certification: Internal Medicine, Cardiology, Interventional Cardiology
Clinic: Medford, Grants Pass, Brookings

Richard A. Schaefer, MD, FACC
Medical Director of the Process Improvement in Cardiac Care Team and of the Cardiac Rehabilitation program at Asante Rogue Regional Medical Center
Now retired from consultative and invasive cardiology, Dr. Schaefer received his bachelor’s degree with distinction and departmental honors from Stanford University and his medical degree from the University of Rochester School of Medicine and Dentistry. He completed his internship and first-year residency at Strong Memorial Hospital of the University of Rochester and his second-year residency and Cardiology Fellowship at Oregon Health Sciences University. He served as president of the Oregon Chapter of the American College of Cardiology from 1991 to 1994.

Dr. Schaefer’s board certification was in Internal Medicine and Cardiology. He published scientific articles on hearing in insects, measurement of cardiac function, cardiac auscultation and the mechanism of heart murmurs, and techniques for pericardiocentesis and coronary angiography.
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Vascular, General, and Bariatric Surgery
Specialties: Vascular, endovascular, bariatric, and general surgery, including laparoscopic surgery; certified in da Vinci robotic-assisted surgery
Medical Degree: New York University Medical Center
Internship/Residency: General Surgery at University of Texas Southwestern Medical Center and Parkland Memorial Hospital
Vascular Surgery Fellowship: New York University Medical Center
Board Certification: General Surgery, Vascular Surgery
Honors/Awards: Honors program at New York University Medical Center; Chairman, Committee on Cancer by American College of Surgeons for Asante Rogue Regional Medical Center and Providence Medford Medical Center; Chief of Staff, Asante Rogue Regional Medical Center
Fluent in English and Spanish
Research: Subinvestigator in PIVOTAL small aneurysm study, Endologix large neck aneurysm study, and CREST carotid stent studies
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Internship/Residency: General Surgery at University of Texas Southwestern Medical Center and Parkland Memorial Hospital
Vascular Surgery Fellowship: University of Tennessee
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Honors/Awards: Alpha Omega Alpha Honor Society in medical school; Trauma Director, Asante Rogue Regional Medical Center
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Special thanks to Karen Bales, Christal Paetz, and Paula Granger from the Performance Improvement Department at Asante Rogue Regional Medical Center for their hard work and commitment to this project.
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Medical Degree: Southern Illinois University
Internship/Residency: General Surgery at University of Utah
Vascular Surgery Fellowship: Southern Illinois University
Board Certification: General Surgery, Vascular Surgery
Honors/Awards: Alpha Omega Alpha Honor Society in medical school
Research: Subinvestigator in PIVOTAL small aneurysm study, Endologix large neck aneurysm study, and CREST carotid stent studies
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General Surgery
Specialties: General surgery, including laparoscopic, breast, and oncologic surgery; certified in da Vinci robotic-assisted surgery
Medical Degree: University of Texas Southwestern Medical School, Dallas
Internship/Residency: General Surgery at University of Texas Southwestern Medical Center and Parkland Memorial Hospital
Board Certification: General Surgery
Office: Medford

Mitchell M. Plummer, MD
Vascular and General Surgery
Specialties: Vascular, endovascular thoracic and abdominal aortic aneurysm repair, limb salvage, and general surgery
Medical Degree: University of Kentucky College of Medicine, Lexington
Internship/Residency: General and Vascular Surgery at University of Texas Southwestern Medical Center, Dallas (UTSW)
Vascular Surgery Fellowship: UTSW
Board Certification: General Surgery, Vascular Surgery
Honors/Awards: Graduation with high distinction, University of Kentucky College of Medicine, Lexington; active member of the American College of Surgery and the Society of Vascular Surgery.
Dr. Plummer was an assistant professor in the Division of Vascular and Endovascular Surgery, training fellows and residents in advanced vascular techniques at UTSW.
Research: Numerous clinical research projects at UTSW
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**Honors/Awards:** Graduation with distinction, Point Loma College  
**Research:** Primary investigator in Endologix large neck aneurysm study and CAPTURE II carotid stent study; subinvestigator in PIVOTAL small aneurysm study and CREST carotid stent study; and subinvestigator in CHOICE, CAPTURE I and II, and CREST carotid stent studies  
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**Medical Degree:** Medical College of Wisconsin  
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