

STANFORD CARDIOVASCULAR SERVICES:

Clinical Activity & Outcomes



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DEAR COLLEAGUES:

We are pleased to present the 2008 edition of the cardiovascular outcomes report. At Stanford Hospital & Clinics, we consistently measure the outcomes of health care services to track our performance and to inspire us to be even better. According to the data, we continue to have outstanding patient outcomes despite the fact that we serve higher-risk populations.

Clinical outcomes are the ultimate validation of the effectiveness and quality of medical care: They encourage effective health care decisions and drive informed health care policy. Our cardiovascular programs are committed to sustaining scrupulous evaluation, advanced technology, evidence-based practice, clinical research, professional education and our national reputation.

Stanford consistently ranks among *U.S. News and World Report's* top hospitals for cardiovascular care. In 2007, we ranked 9th in the nation and first among hospitals in the western United States. While we continue to deliver many of the latest breakthroughs in cardiovascular care to our patients, quality of care is our primary goal. We strive to demonstrate our success by surpassing national quality benchmarks year after year. Our clinical team specializes in a multitude of cardiovascular conditions providing some of the nation's most important clinical breakthroughs, experience and quality service with a sustained commitment to innovation and applied research.

Our achievements during 2007 reflect a wide-ranging commitment to high quality cardiovascular care – an approach that embraces both common conditions and those associated with high risk for complications and mortality. Stanford remains a primary resource for patients requiring complex procedures for coronary artery disease, structural heart disease, valve disease (including multiple valve repair and replacement), multivessel angioplasty, adult congenital heart conditions, Marfan syndrome, peripheral and cerebrovascular disease, thoracic and abdominal aortic aneurysms, heart failure and arrhythmias.

We hope you, our referring physicians and allied health professionals, will find this report informative and useful. Looking toward the future, our teams remain committed to provide outstanding clinical service to you and your patients. Thank you for your consideration and continued support.

Sincerely,

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Cardiac Surgery



Stanford continues to define the future of cardiac surgery with promising research and advancing surgical techniques.

With a history of surgical firsts, Stanford continues to define the future of cardiac surgery with promising research and advancing surgical techniques. Our physicians are experienced in some of the most complex and challenging procedures, from established surgeries such as coronary artery bypass grafting, valve replacement, and congenital cardiac repairs to ground-breaking therapies that include valve sparing aortic root replacements (VSARR), thoracic aortic endovascular stent grafting and complex valve repairs that are not possible elsewhere.

The Stanford cardiac surgery program has been built on novel discoveries and improvements such as some of the first cardiac operations performed on the west coast, the first heart and heart-lung transplantation in the US, the introduction of hypothermic circulatory arrest, and the development and use of mechanical devices (VADs) as a bridge to transplantation. Building on this experience, we can offer unique therapies and benefits to patients including the most experienced surgeons in the US for VSARRs, endovascular, percutaneous and interventional based procedures, and correction of complex congenital heart disease. Our past experience, current work and active research are leading the way to even greater advancements in cardiac surgery including mitral valve repair, hypertrophic cardiomyopathy, aortic repairs, and stem cell therapy.

FULL RANGE OF CARE

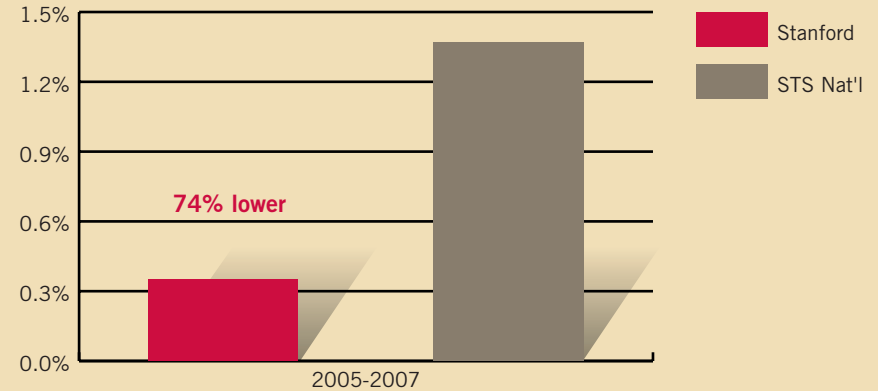
In addition to offering ground-breaking technology, Stanford's surgical program provides patients with an onsite multidisciplinary team of cardiologists, electrophysiologists, vascular surgeons, interventional radiologists, physician assistants, nurse practitioners, clinical nurse specialists, physical therapists and social workers. Our collaborative approach allows us to provide a holistic and tailored approach for every patient.

STS

Stanford monitors its outcomes data and voluntarily submits its clinical surgical data to the Society of Thoracic Surgeons (STS). This allows us to continually compare outcomes on all types of surgical procedures with hospitals nationwide. The STS data found in this report for years 2005, 2006 and 2007 is taken from the Spring 2006, Spring 2007 and Fall 2007 editions of the Data Analyses of The Society of Thoracic Surgeons National Adult Cardiac Surgery Database.

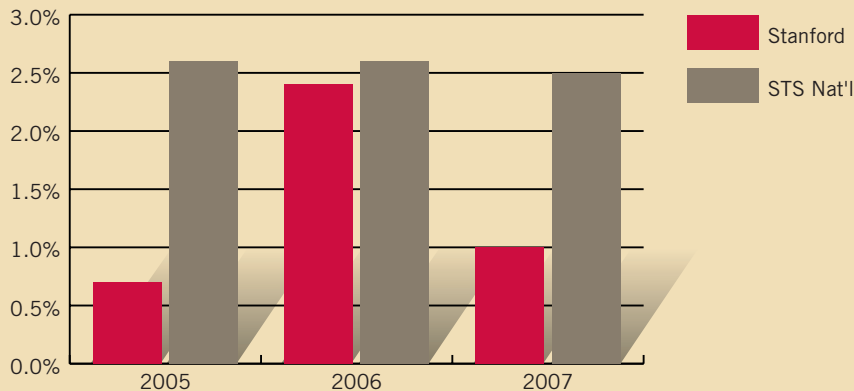


STS Major Procedures Stroke Complication Rate



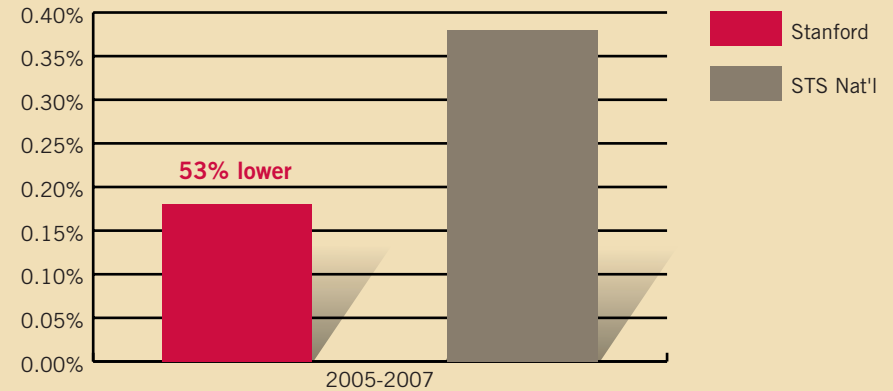
The periprocedural stroke complication rate is 74% lower at Stanford than at the average STS national hospital.

STS Major Procedures Risk Adjusted Operative Mortality Rate (RAMR%)



This RAMR shows the mortality rate for the average national patient for CABG, Valve and Valve + CABG procedures combined. It takes into account patients pre-op risk factors and co-morbidities and then compares outcomes between the hospitals and the national average performance. This risk adjustment method “levels the playing field” for comparing hospitals regardless of severity of patient illness. Patients coming to Stanford, of which many have complex surgical needs and multiple risk factors, consistently have a decreased chance of mortality compared to the average national hospital.

STS Major Procedures Deep Sternal Wound Infection Complication Rate



The chance of post-operative deep sternal wound infection is 53% lower than the average STS national hospital.

Tirone David V Stanford Modification Valve Sparing Aortic Root Replacement 2005-2007

2005	2006	2007
<ul style="list-style-type: none"> 27 total cases with 1 reoperative case & 3 ASD repairs 14 root + ascending aorta 13 root + ascending aorta + arch 	<ul style="list-style-type: none"> 26 total cases with 3 reoperative cases, 2 MV Repairs & 1 VSD 15 root + ascending aorta 2 root + ascending + hemiarch 9 root + ascending + arch 	<ul style="list-style-type: none"> 33 total cases with 2 reoperative cases, 4 MV repairs + 1 ASD 22 root + ascending aorta 2 root + ascending + hemiarch 9 root + ascending + total arch

In Stanford's 15 year history of elective Tirone David operations there have been 2 operative mortalities, a 1.2% rate.

In the last 3 years there have been no mortalities.

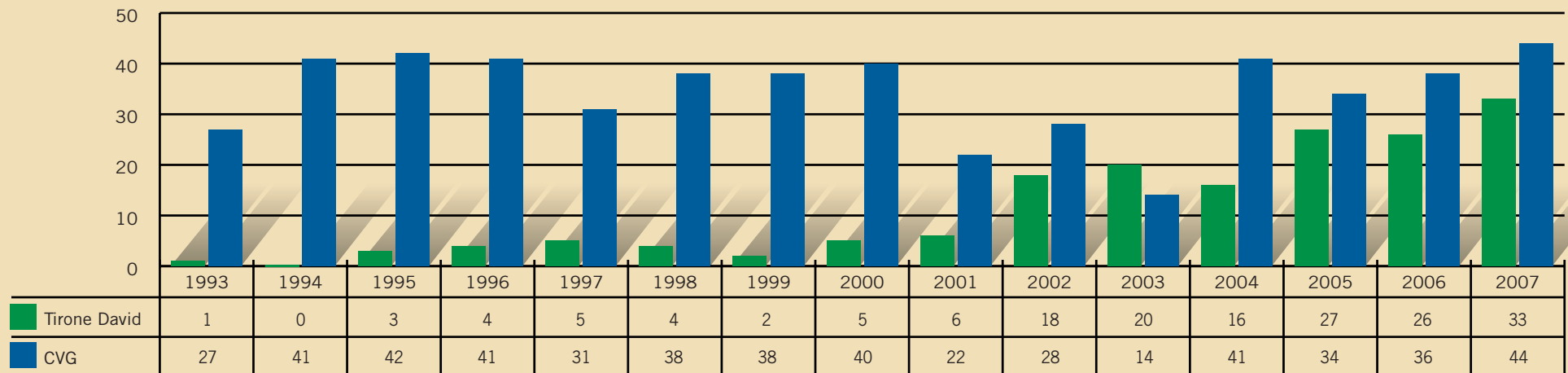
AORTIC SURGERY

Although not the most common form of cardiovascular disease, disorders of the aorta can be life-threatening. Aortic aneurysms, aortic dissections (tears in the layers of the aorta), and penetrating ulcers are all types of aortic diseases that require treatment.

Stanford has an unmatched history in aortic disease treatment. The Stanford-developed classification system for defining aortic dissections and guiding their treatment is currently used across the world. We have helped accelerate technical progress which has resulted in today's state-of-the-art medical and surgical approaches to aortic disease. Today, we are able to treat even the most difficult aortic conditions in high-risk patients with aortic surgery.

Our surgeons have developed techniques and are actively performing procedures to correct aortic aneurysms and save the patients' native aortic

15 Years of Tirone David Valve Sparing Aortic Root Replacement (VSARR) and Composite Valve Graft (CVG – mechanical & bioprosthetic/homograft) Aortic Root Replacement Volumes



A Tirone David valve-sparing aortic root replacement operation utilizes the native aortic valve so the patient doesn't need life-long anti-coagulation therapy. This is a great benefit to patients with Marfan's syndrome or Bicuspid Aortic Valve, particularly the young and middle-aged. Dr D. Craig Miller has performed 90% of Stanford's Tirone David procedures from onset through 2007.

valves. This reduces the need for life-long anti-coagulation therapy and may eliminate the need for subsequent valvular operations to replace worn-out porcine or bovine bioprosthetics. Dr. D. Craig Miller, one of a handful of surgeons in the world who have performed aortic valve-sparing surgeries in any great numbers, has performed over 170 such surgeries here at Stanford since 1993.

Stanford introduced the concept of attaching balloon expandable stents to the ends of a vascular graft to repair abdominal aortic aneurysms. Dr. Scott Mitchell and his colleagues were some of the first physicians in the world to perform thoracic aortic endovascular stent grafts. Today, we are paving the way for the endovascular repair of thoracic aneurysms by improving surgical techniques and the selection of stent grafts through clinical trials.



Composite Valve Graft (CVG) Aortic Root Surgery (mechanical & bioprosthetic/homograft)

	2005	2006	2007
Total Cases	34	36	44
Reoperative Cases	14	8	14
Emergent cases	2	8	12
Acute Type A Dissections	2	0	8
Valve Dysfunction	0	1	4
Root Only	2	2	5
Root & Ascending Aorta	13	13	11
Root, AscAo & Hemi Arch	16	11	13
Root, AscAo & Total Arch	3	10	15
CABG Included	4	9	3
Bioprosthetic or Homograft Valve	13	14	15
Mechanical Valve	21	22	29

Stanford is the West Coast leader for diagnosis and treatment of aortic disease.

<http://ctsurgery.stanford.edu>

From 2005 to 2007 the observed operative mortality rate for all elective and urgent CVG procedures was 1%. A CVG procedure is far more complex and time consuming than an isolated AVR, yet Stanford's CVG mortality rate is 66% less than the 2007 STS national observed mortality rate (2.9%) for a basic isolated AVR procedure. The 3 year perioperative stroke rate for these CVG procedures is 1%, 33% better than the 2007 STS national rate (1.5%) for a basic isolated AVR only operation. Due to the complexity and specialization of these procedures, the STS does not provide CVG national comparison data.



Since 2001, our Marfan clinic volume has grown more than 800%. And, in 2007, 73 Marfan-related surgeries were performed here at Stanford.

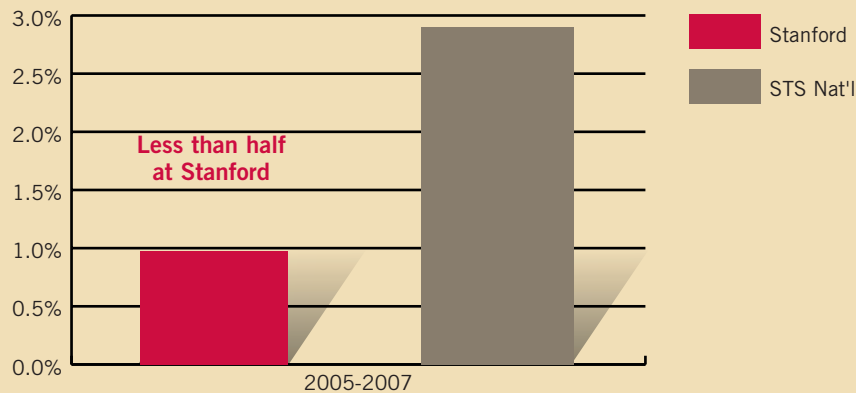
VALVULAR SURGERY

Stanford Hospital and Clinics has always led the way in valve repair and replacement. Dr Bruce Reitz has extensive experience performing the Ross procedure, using the patient's own pulmonary valve to replace the malfunctioning aortic valve, then implanting a homograft valve in the pulmonary position. This allows the patient to avoid anti-coagulation therapy.

Our valvular surgery services include:

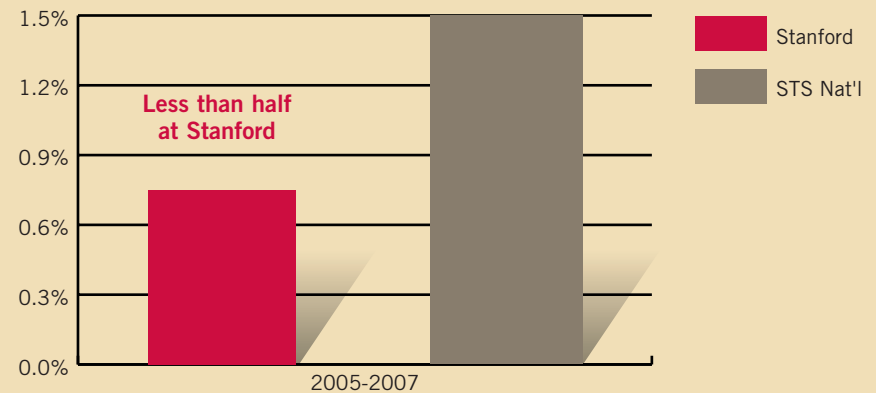
- Minimally invasive and limited incision valve replacement
- Valve-sparing aortic root replacement
- Composite valve graft aortic replacement
- Stentless aortic valves
- Autologous pulmonary valve for aortic valve replacement(the Ross procedure)
- Adjunctive procedures for atrial fibrillation
- Advanced mitral valve repair for mitral prolapse
- Mitral valve repair for congestive heart failure

Isolated Aortic Valve Replacement (AVR) STS Risk Adjusted Operative Mortality Rate (RAMR)%



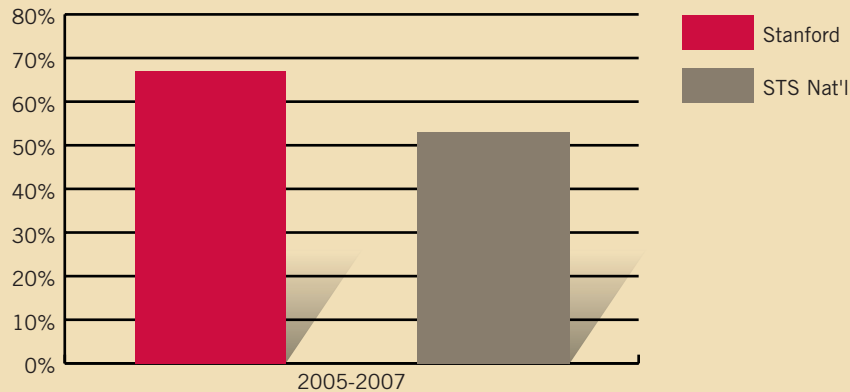
The combined three year isolated AVR STS risk adjusted operative mortality rate at Stanford is less than half of that at an STS National hospital.

Isolated AVR Stroke Complication Rate



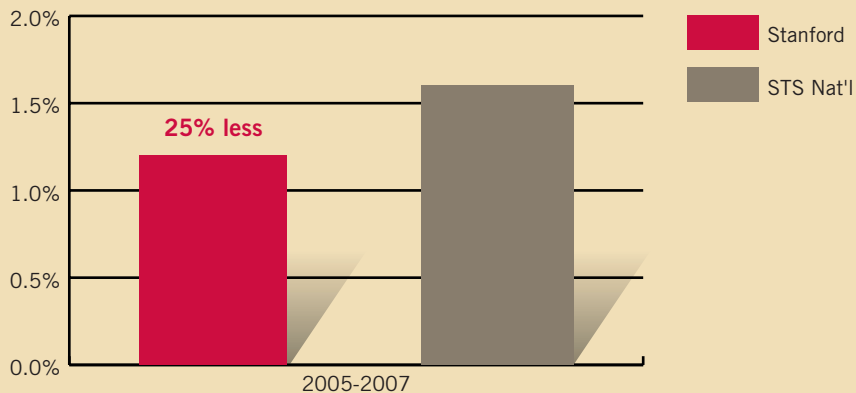
The stroke complication rate for the past three years has been on average half of that of a STS national hospital.

Mitral Valve (MV) Repairs in Isolated Mitral Valve Surgery



Because Mitral valve repair is associated with better patient outcomes, Stanford makes great efforts to repair rather than replace the mitral valve. In the past 3 years, 67% of Stanford's isolated mitral valve procedures have been repairs, compared to the STS national rate of 53%.

Combined Isolated MV Replacement & Repair Stroke Complication Rate



The perioperative stroke for mitral valve repair and replacement is 25% less at Stanford than at the average STS national hospital

MARFAN SYNDROME

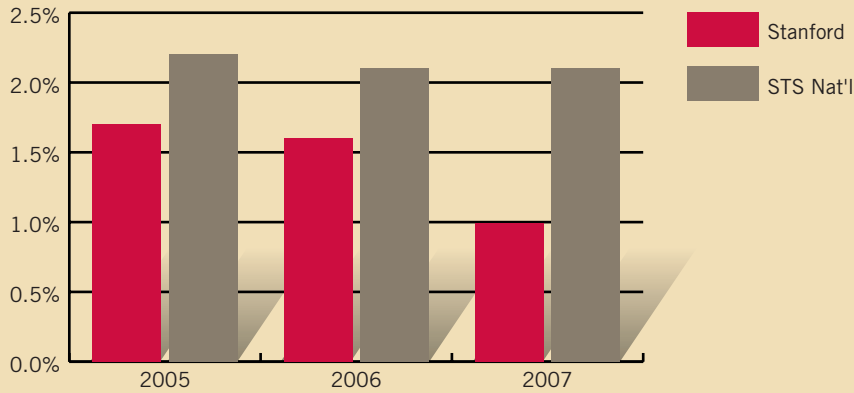
Marfan syndrome (MFS) is a connective tissue disorder that can affect the heart, blood vessels, lungs, eyes, bones and ligaments. In Marfan syndrome, the protein necessary for strengthening the connective tissue, fibrillin 1, does not work properly, affecting the growth and development of the body. Approximately 90 percent of patients with Marfan syndrome experience changes in their heart or blood vessels. The most serious problem associated with Marfan syndrome is weakness of the aorta (the body's largest artery). People with Marfan syndrome often develop thoracic aortic aneurysms, typically at the aortic root, and without treatment, they are at risk of death from dissection or tearing of the aorta.

The Stanford University Marfan Clinic was established in 1988 by Dr. D. Craig Miller at the urging of the Northern California Chapter of the National Marfan Foundation. The Stanford University Center for Marfan Syndrome and Related Aortic Disorders was the first of its kind in the western United States. Through our multidisciplinary approach, patients with the MFS now have a normal life expectancy.

Stanford specializes in aortic root replacement surgery, repairing the aneurysm while preserving the patient's own aortic valve to avoid the use of long-term anti-coagulants and reducing the risk of stroke or endocarditis. Genetic molecular research is taking place to identify genetic changes believed to be related to Marfan syndrome and other inherited aortic disorders. We are one of only a few centers in the US actively researching new medical treatments for MFS that could potentially eliminate the development of vascular complications and subsequently decrease the need for operative interventions in our patients.

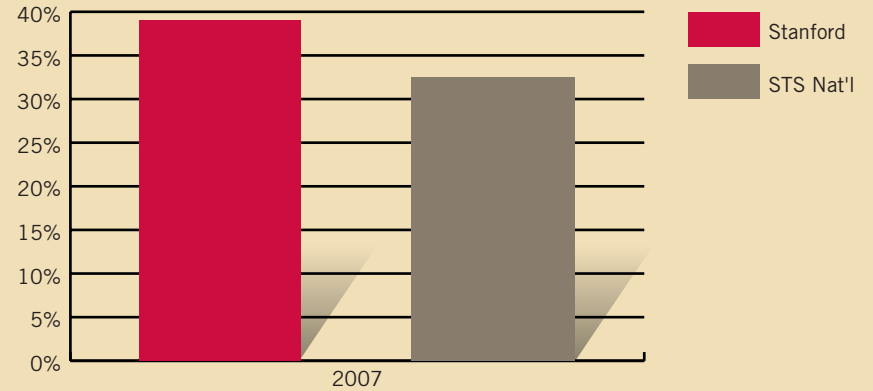
Today, Stanford's Center for Marfan Syndrome and Related Connective Tissue Disorders is the most comprehensive program for Marfan syndrome and related aortic diseases in California and one of the largest in the country. It also serves as a global model and is often visited by guests from hospitals looking to build their own center.

STS Isolated CABG Risk Adjusted Operative Mortality Rate (RAMR%)



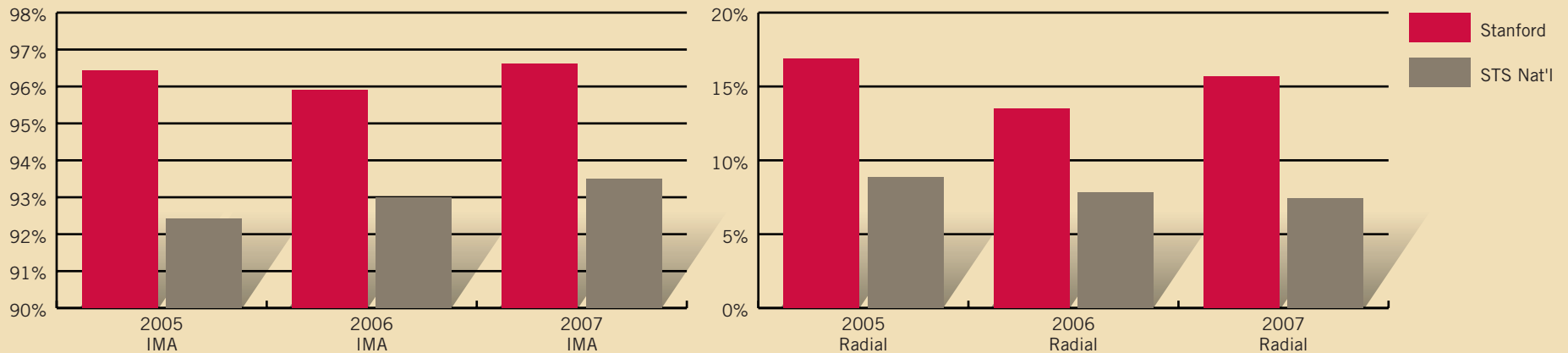
Isolated CABG (coronary artery bypass graft) is an operation where no other additional operative procedures are done. Again, the data show consistently better mortality outcomes at Stanford than the average national hospital despite higher complexity of cases.

STS Isolated CABG Post Op Mechanical Ventilation Time < 6 Hrs



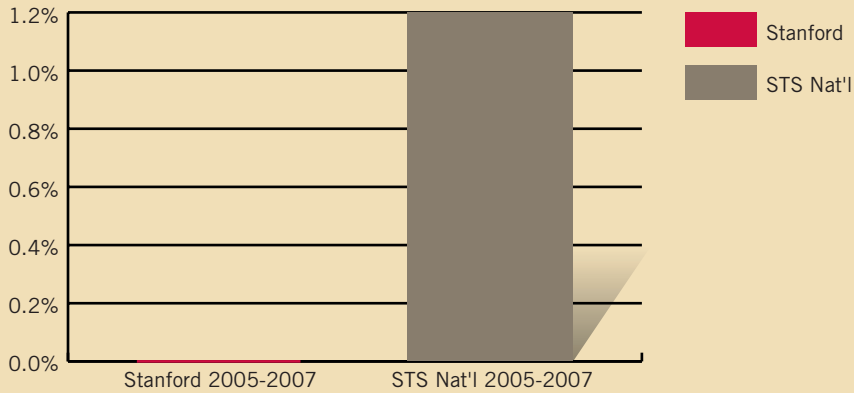
Stanford's proactive early extubation protocol reduces risk of ventilator acquired pneumonia, and increases patient comfort while contributing to shorter ICU stays.

Internal Mammary Artery (IMA) & Radial Artery Usage with STS Isolated CABG



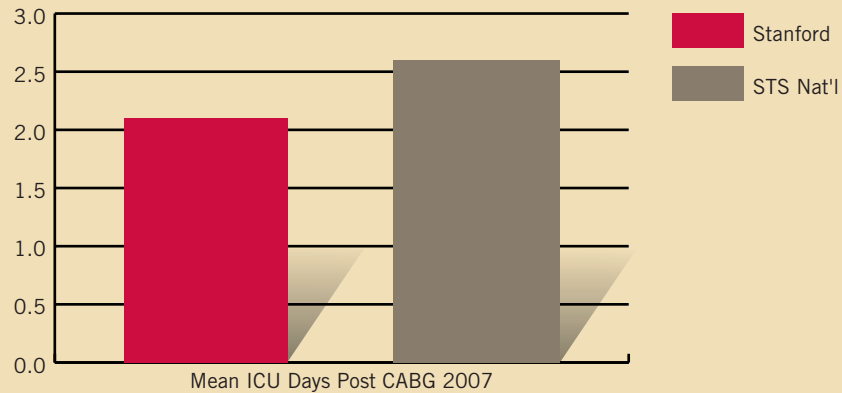
The use of the internal mammary artery is a national CABG quality metric and arterial grafts have been shown to provide longer durability and better performance. Stanford utilizes arterial grafts whenever possible, at a greater rate than the average STS hospital.

**STS Isolated CABG
Stroke Complication Rate**



In the past three years, Stanford has maintained a 0% stroke complication rate.

**STS Isolated CABG
Initial ICU Post Procedure Length of Stay (PLOS)**



Stanford patients are leaving the ICU sooner providing increased family support and increased activity levels for a more rapid, less complicated return to their normal status.



Stanford pioneered endovascular treatment of thoracic aneurysms by improving surgical techniques and developing stent graft technologies through clinical trials.

Heart Failure/Heart Transplant



“Half of patients listed at this center had received a transplant as of 1.8 months after being placed on a waiting list”

SRTR Center Activity (07/01/2006-06/30/2007)

In 1968, Norman Shumway performed the first successful heart transplant in the United States here at Stanford. Since then, we’ve performed more than 1,200 heart transplants, and our expertise has allowed us to have broader inclusion criteria for heart transplants than many other heart centers. For example, we have given new hearts to adults well past the age of 70, and to patients diagnosed with insulin dependent diabetes.

Every patient referred to the Stanford Heart Transplant Program is first thoroughly evaluated to be sure that a transplant is the optimum treatment option. The Heart Failure group has access to the most recent and promising treatment options available. Among these are proven state-of-the-art medications, mechanical heart assist devices and surgical interventions including resynchronization therapy that may allow patients to avoid a heart transplantation.

ADVANCED OPTIONS

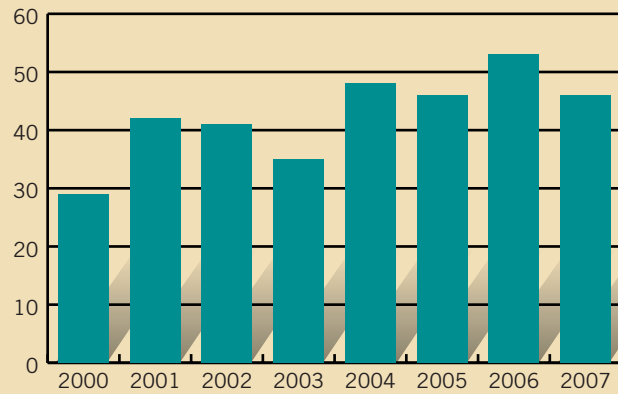
More than 5,000 patients and almost every type of end-stage heart disease has been treated here at Stanford, and our program remains a leader in introducing new concepts and treatments to improve outcomes for transplant patients.

Treatment options include:

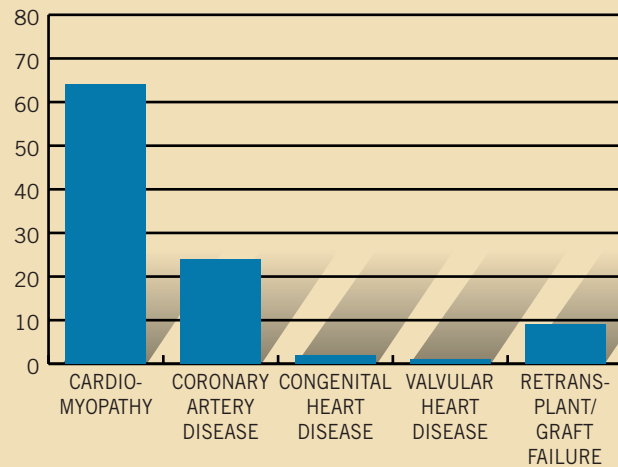
- Advanced medical therapies, including beta blockers, ACE inhibitors, intravenous vasoactive medications and investigational inotropic agents
- Behavior self-management and monitoring
- Complex surgical therapies including ventricular assist devices, remodeling, resynchronization therapy and transplantation

Ongoing research in heart failure includes studies of catheter-delivered biotherapies to replace damaged heart cells, new drugs to inhibit chronic rejection of transplanted hearts and permanent LVAD implants.

Number of Adult Heart Transplants 2000-2007



Primary diagnoses for Patients Transplanted in 2006 and 2007

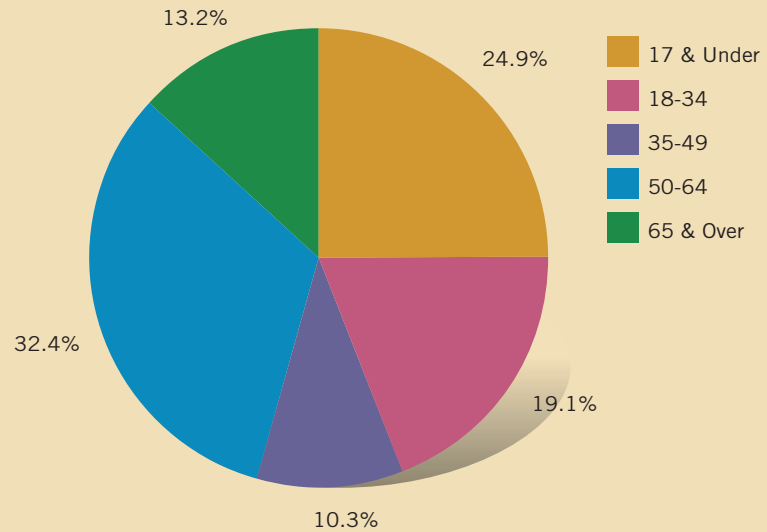


Heart Transplant Survival – 1 Month, 1 Year, 3 Years

Time	Survival Rate	National Average
1 Month	97.25%	95.04%
1 Year	85.32%	87.8%
3 Years	86.46%	80.03%

Source: ustransplants.org

Percent of Heart Transplant Recipients by Age

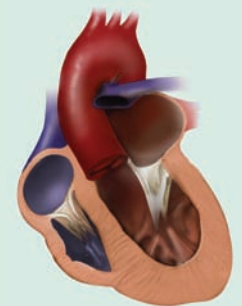


Source: Scientific Registry of Transplant Recipients (SRTR) data for patients transplanted 7/01/06-6/30/07

HYPERTROPHIC CARDIOMYOPATHY CENTER

Stanford's Hypertrophic Cardiomyopathy Center is the only specialist center in the western United States. We take a team-based approach to treating patients with hypertrophic and other forms of familial cardiomyopathy. Assessment services range from the latest imaging techniques to sophisticated genetic profiling.

The Center collaborates closely with specialists in interventional cardiology, heart surgery, imaging and sports medicine to provide the widest range of diagnostic tools and treatment options. Research is opening new understanding of the molecular genetics of the disease, and Stanford patients are among the first to take part in clinical trials of new treatments.



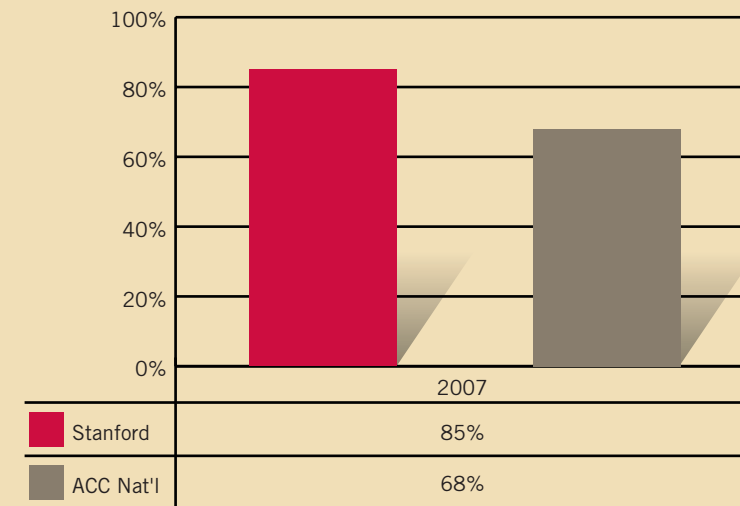
Interventional Cardiology



Today's non-surgical options for coronary artery disease, valvular heart disease and congenital heart disease are safer and more effective than ever before. More than 4,000 interventional procedures are performed each year at Stanford. We utilize state-of-the-art technology, devices and procedures, many of which were developed and tested at Stanford and are not available elsewhere.

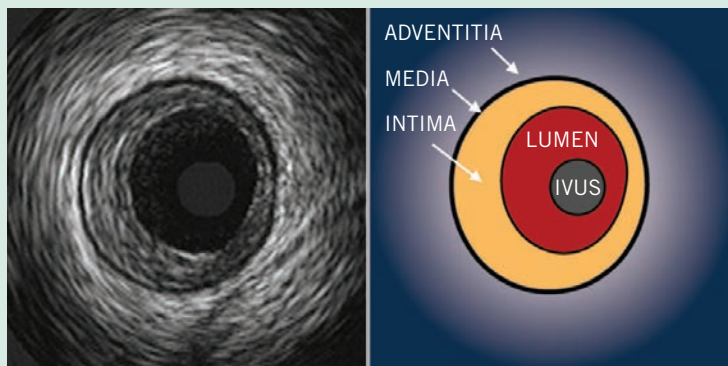
The latest cutting-edge treatments are available for patients, including the latest in coronary artery revascularization, septal defect repair, percutaneous valve repair/replacement, and stem cell therapy.

Door to Balloon Time (D2B) \leq 90 minutes



Proportion of primary (emergency) PCI patients with D2B \leq 90 minutes. The goal is to have a D2B of \leq 90 minutes for all non-transferred patients having a STEMI and having primary PCI. The time interval is from entry to Emergency Department or STEMI onset to PCI revascularization. Morbidity and mortality improves when revascularization is done within 90 minutes. ACC recommended goal is for hospitals to achieve 90 minute D2B in 75% of these cases.

INTRAVASCULAR ULTRASOUND



Intravascular ultrasound of coronary vessel showing significant atherosclerosis.

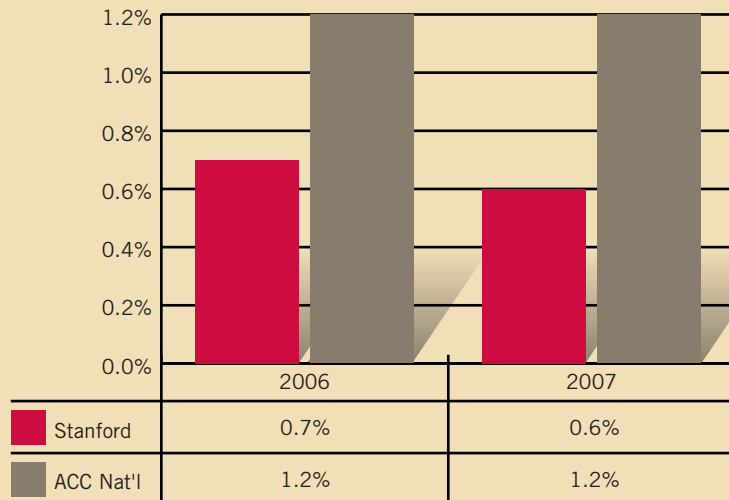
ADVANCED TECHNOLOGIES

The Stanford interventional cardiology team is a world leader in percutaneous coronary revascularization, which re-establishes blood flow to the heart when its vessels have been damaged or blocked. Our specialists offer the latest technology in percutaneous coronary revascularization to re-open arteries that have been occluded by atherosclerosis. And in 2006, Stanford became one of the first heart centers in the West to offer biotherapies to induce angiogenesis – introducing growth factors to promote new blood vessel growth – and stem cell therapy to improve heart muscle function and reduce angina.

Stanford's cardiac catheterization labs are equipped with the latest in imaging technologies, like digital imaging, which enhance accuracy and accessibility of data for physicians caring for patients. The labs provide a complete range of interventional procedures, including both standard and investigational therapies, such as:

- Alcohol septal ablation
- Atrial Septal Defect (ASD) closure
- Balloon angioplasty
- Balloon mitral valvuloplasty & balloon aortic valvuloplasty
- Coronary stenting, including next-generation drug-eluting stents
- Endomyocardial biopsy
- Patent Foramen Ovale (PFO) repair
- Percutaneous AVR
- Pericardiocentesis
- Peripheral Vascular Intervention (PVI)
- Rotational atherectomy
- Stem cell therapy (catheter-based)

Post-Op Myocardial Infarction (MI) Complication Rate for PCI



ACC

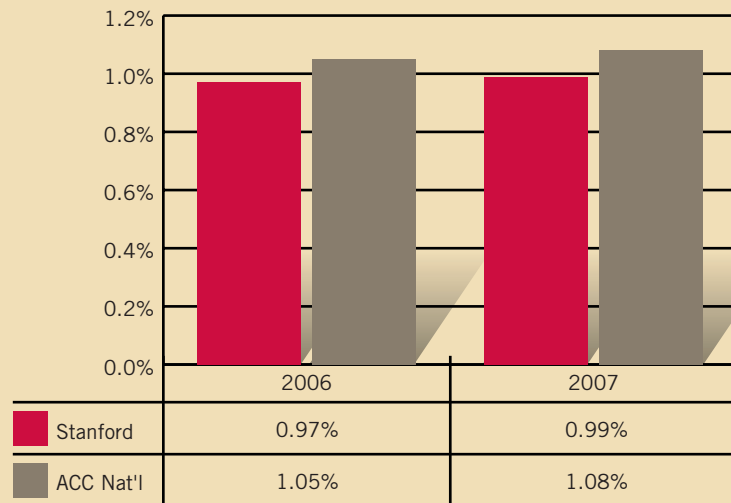
The NCDR™'s flagship registry, the national CathPCI Registry™, allows Stanford to benchmark against nearly 600 hospitals with its quarterly ACC_NCDR CathPCI Registry Outcomes reports. It is recognized by CMS*, JCAHO, the FDA and The Leapfrog Group as the gold standard for measuring quality in the cath lab.



PERCUTANEOUS CORONARY INTERVENTION (PCI) MORTALITY

The American College of Cardiology (ACC) uses risk adjustment of patient risk factors & co-morbidities to calculate an expected or predicted mortality to “level the playing field” when comparing individual hospitals. Stanford, while treating complex, high severity of illness patients (53% higher predicted mortality than the ACC national average), has a low risk adjusted mortality, demonstrating expertise and a high level of care.

PCI Risk Adjusted Mortality Rate (RAMR)



The RAMR gives an estimation of a the average (national) patient's mortality at a specific hospital. For 2007 Stanford has a 8.3% lower RAMR than the average hospital nationally while treating complex high severity of illness patients.



WOMEN'S HEART HEALTH AT STANFORD

In 2007, Women's Heart Health at Stanford was established to address the unique issues of women's heart health through patient care, education and research. The clinic offers sex-specific, individualized screening and symptom assessment to help determine each woman's personal risk factors and appropriate prevention, lifestyle management or treatment strategies. The clinic also provides tools and lifestyle guidance for managing the disease.

The clinic offers personalized, patient-centered services, including:

- Risk-assessment questionnaires to pinpoint factors for heart disease
- Comprehensive cardiac evaluations to determine appropriate diagnostic tests and specialist consults
- Educational tools, including blood pressure measurement and control, personalized exercise program, healthy eating plans, smoking cessation advice and stress management techniques
- Referrals to Stanford's advanced diagnostic, therapeutic and surgical services

Adult Congenital Heart Program



It is estimated that there are currently as many as one million adults living with congenital heart disease, most requiring ongoing specialized care. With more than 30 different forms of congenital heart disease, the adult congenital heart population exists because of advances in diagnostic modalities, medical management, and pioneering reparative surgical techniques, many of which were developed at Stanford.

Patients benefit from coordinated access to a multidisciplinary health care team. The Adult Congenital Heart Program includes specialists in adult cardiology and heart failure, interventional congenital cardiology and transplant and cardiothoracic surgery. Services include the most up-to-date arrhythmia mapping systems and nonsurgical alternatives to deal with the aftereffects of procedures, including the patient's physical, emotional and psychological needs.

Stanford is one of the few heart centers in the country equipped to provide advanced care for adults with congenital heart disease, with dedicated programs in pulmonary hypertension and reproductive counseling. Experienced practitioners offer follow-up care for patients with previous corrective or palliative procedures, such as Fontan, Senning or RV-PA conduits.

Stanford's is one of a few heart centers in the county equipped to provide advanced care for adults with congenital heart disease, with dedicated programs in pulmonary hypertension and reproductive counseling.

Cardiac Arrhythmia Service



“After catheter ablation, 81% of patients with paroxysmal, chronic, and persistent atrial fibrillation were in sinus rhythm at most recent follow-up or free of atrial fibrillation...”

Over the past two decades, tremendous advances have been made in understanding the mechanisms of cardiac arrhythmias. The Stanford Cardiac Arrhythmia Service has a history of innovation and has emerged as a leading state-of-the-art center, bringing together experts from around the country to produce on the nation’s finest arrhythmia services.

We provide patients with a wide range of diagnostic and therapeutic approaches for conditions ranging from atrial fibrillation to atrial flutter, syncope and ventricular and supraventricular arrhythmias.

COMPREHENSIVE SERVICES

The Arrhythmia Service’s full spectrum of activity translates into increased options for patients, including treatment plans tailored to meet individual needs.

Each patient undergoes a comprehensive evaluation to determine the most promising pharmacologic and non-pharmacologic options, including catheter ablation or device implantation when required. Because of the high volume of procedures, which are carefully followed and documented, the Arrhythmia Service is in a unique position to ensure efficiency and expertise in identifying the most appropriate treatment.

Comprehensive diagnostic and treatment services include a variety of diagnostic monitoring techniques, active electrophysiology laboratories, ongoing research projects, drug therapy programs and patient education classes.

Therapeutic options include:

- Catheter ablation of atrial fibrillation, atrial flutter, supraventricular tachycardias, and ventricular tachycardias
- Implantation of pacemakers, implantable defibrillators, resynchronization devices, implantable loop recorders
- Cardioversion
- Cardiac surgery for epicardial lead placement or arrhythmia ablation
- Device and lead extraction

BREAKTHROUGH TREATMENTS

Stanford arrhythmia specialists are investigating the causes and developing new methods to treat the disorder. Their pioneering work in introducing new techniques, such as cryoablation and advanced mapping and catheter ablation, give Stanford arrhythmia specialists the ability to treat many of the most complex and previously untreatable arrhythmias. We use the most advanced techniques for treating atrial fibrillation. We have developed novel ways of using advanced imaging systems, some of which are only available at Stanford and several other centers in the country, to enhance catheter ablation. Stanford is helping to pioneer the next-generation devices that will pave the way for the future advances in treating atrial fibrillation, the most prevalent cardiac arrhythmia. In our most recent series of patients, after catheter ablation 81% of patients with paroxysmal, chronic, and persistent atrial fibrillation were in sinus rhythm at most recent follow-up (chronic and persistent atrial fibrillation patients) or free of atrial fibrillation (paroxysmal atrial fibrillation patients), with 14% of the patients receiving repeat ablations.

Stanford is one of the few medical centers focusing on catheter ablation to treat ventricular tachycardia (VT), one of the most problematic cardiac conditions. This technologically demanding procedure may prove to be a promising adjunct to device therapy, which does not prevent recurrences, and to pharmacologic treatment, which often causes multiple side effects. Newer mapping and ablation technologies are being studied that may further enhance the potential of VT ablation.

The Stanford arrhythmia team members are experts in the implantation and follow-up of patients with resynchronization devices, implantable defibrillators, and pacemakers. They are often called in when previous attempts at device implantation have failed.

The Stanford Arrhythmia team works closely in collaboration with the Stanford Hypertrophic Cardiomyopathy Center, the Stanford Heart Failure Service, the Stanford Transplantation Service, the Stanford Adult Congenital Heart Center, and the Stanford Cardiothoracic Surgery Department.

Collaborative surgical and catheter-based approaches to atrial fibrillation and ventricular tachycardia treatment are available.

Stanford arrhythmia specialists are involved in clinical trials and research studies to discover new strategies and to fine tune existing technologies. These trials give patients access to many new therapies, devices and medications that may be more effective than traditional methods.

Very few institutions are able to deliver world-class treatment of the most complex arrhythmias. The expertise at Stanford allows patients to receive the latest and most advanced care.

STANFORD FIRSTS:

- **First to use commercially available catheter cryoablation system for SVT in West (as well as key role in development of first catheter cryoablation system)**
- **First real-time 3-dimensional CT scan reconstruction of left atrium and pulmonary veins in humans**
- **First publication of experimental use of robotic system for catheter ablation**
- **First combined surgical epicardial and catheter ablation for ventricular tachycardia using cooled radiofrequency ablation in a human**
- **One of the first West Coast centers to use an investigational cryoablation balloon catheter system for atrial fibrillation**
- **One of the first West Coast Syncope evaluation programs**

Figure 1: Electroanatomical Map and Linear VT Ablation

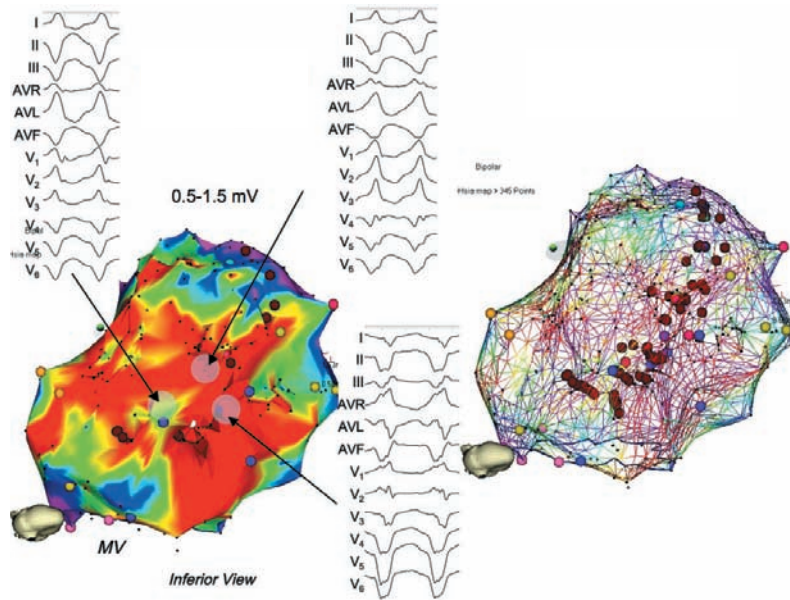


Figure 1: On the left, an electroanatomic voltage map of the left ventricle (LV) in a patient with an ischemic cardiomyopathy and multiple priormyocardial infarctions. Purple colored areas represent normal endocardium (amplitude (1.5 mV) with dense scar depicted as red (amplitude $< 0.5\text{ mV}$). The border zone (amplitude 0.5-1.5 mV) is defined as areas with the color gradient between red and purple. The voltage maps typically demonstrate a large low voltage endocardial scar, involving the entire inferior LV from apex to base. The locations of three similar VTs are shown relative to the scar. These VTs shared a common circuit. On the right is a “mesh” view of the LV, depicting the linear ablation lesions that transect the circuit for successful ablation result.

Figure 2: Epicardial Ablation in Non-Ischemic Cardiomyopathy

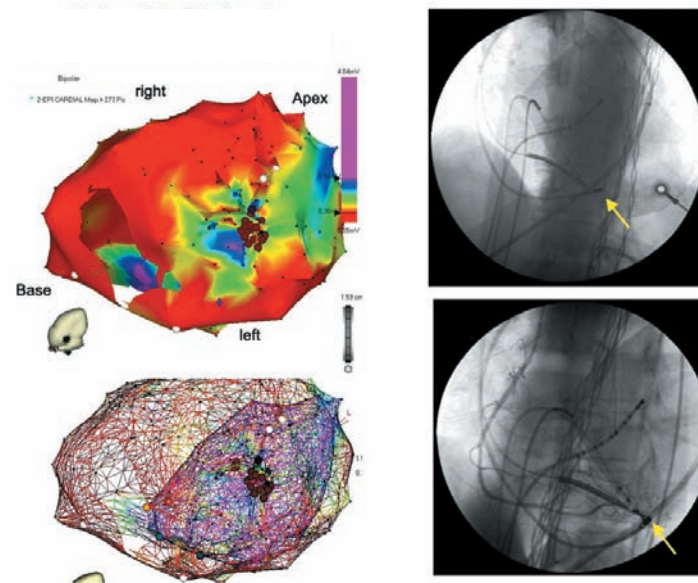


Figure 2: An epicardial map in a patient with a nonischemic cardiomyopathy. The color range is similar to that of figure 1. Namely, purple colored areas represent normal endocardium (amplitude (1.5 mV) with dense scar depicted as red (amplitude $< 0.5\text{ mV}$). The border zone (amplitude 0.5-1.5 mV) is defined as areas with the color gradient between red and purple. Figures on the left demonstrated low voltage recordings involving extensive epicardial surface. The lower panel is a “mesh” view that illustrates the LV within the epicardial “shell”, as well as site of successful ablation. Fluoroscopic images of the epicardial ablation procedure are depicted on the right and coronary angiography was performed to demonstrate the relationship between the epicardial ablation catheter (arrows) and the epicardial coronary arteries.

Figure 3: ECG Gated/30x40cm (segmentation of LA and RVOT)

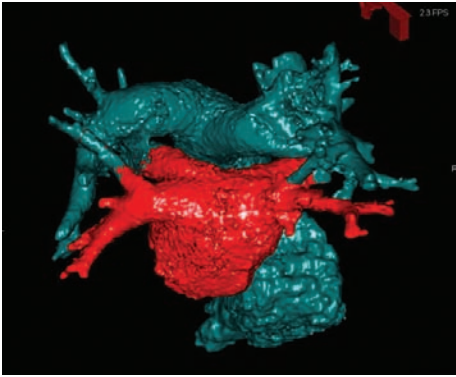


Figure 4: Non-ECG Gated/30x40cm (side by side: fused map and segmented LA)

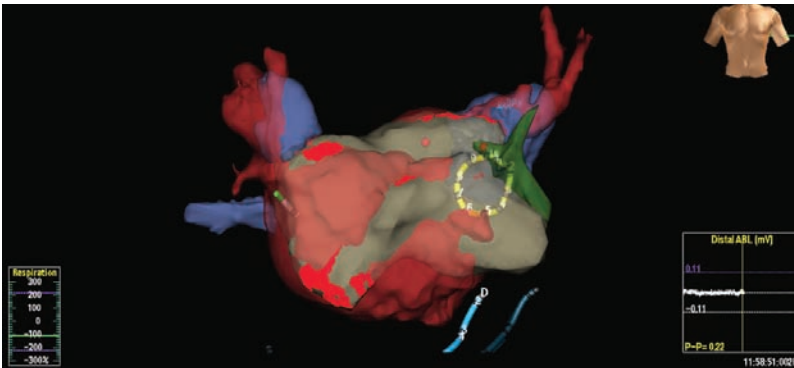


Figure 3: ECG gated DynaCT. The left atrium in red is created using a C-Arm fluoroscopy system that has the ability to generate a 3-D image of the heart.

Figure 4: Registration of the DynaCT map with the electroanatomical map for accurate guidance of ablation. All steps in this case were done in the EP lab, rather than using a CT scan previously obtained.

Pioneering the use of 3-D imaging in the EP lab with Cardiac Dyna-CT to guide therapeutic ablation in the left atrium, we are developing protocols for potential use in other complex ablations.

STANFORD ARRHYTHMIA SERVICE HIGHLIGHTS:

- Ventricular tachycardia ablation in ischemic and non-ischemic cardiomyopathy
- Atrial fibrillation ablation using most advanced techniques
- Ablation of complex arrhythmias, including congenital heart disease, previously failed ablations, and near A-V junction
- Implantation and troubleshooting of advanced devices including resynchronization devices and implantable defibrillators
- Evaluation of syncope
- Evaluation of athletes and patients with hypertrophic cardiomyopathy
- Collaborative procedures with cardiothoracic surgery

Vascular Center



Our vascular team is the West Coast leader for endovascular and surgical treatment of a multitude of vascular diseases, constantly deploying new technologies and therapeutic approaches.

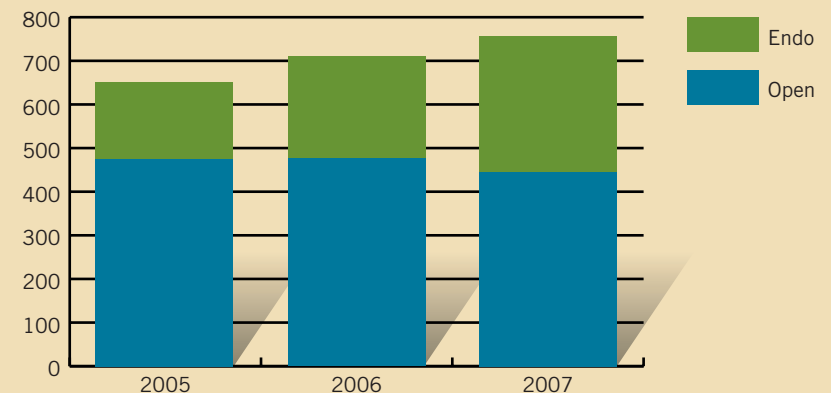
It began over a decade ago with our development of the stent graft, a revolutionary treatment for aortic aneurysms, which are the 13th leading cause of death worldwide. Since that time, Stanford's Division of Vascular Surgery has helped lead the transition from big, open procedures to minimally invasive, endovascular approaches that define the future for treatment of vascular disease.

Our interdisciplinary clinical training and research programs involve close interactions among surgeons, community physicians, engineers and other specialists. These unique collaborations have resulted in new and dramatically improved techniques for the diagnosis, management and treatment of vascular disease.

SPECIALIZED SKILLS

Stanford vascular surgeons are internationally recognized as leaders in aortic aneurysm treatment and research, with expertise in all FDA-approved devices for minimally invasive management of aortic aneurysms as well as unique access to specialized technologies for particularly challenging clinical problems.

**Stanford Vascular Surgery Cases
Three Year Trend**



In total, our vascular surgeons perform over 700 surgical procedures per year with expertise in:

- Open and endovascular repair of complex aortic aneurysms
- Carotid and vertebral surgery and stenting
- Renal and visceral artery revascularization
- Lower extremity revascularization and limb salvage
- Varicose veins and venous insufficiency
- Upper extremity and thoracic outlet syndromes
- Long term dialysis access procedures
- Treatment of vascular problems in high-performance athletes

Stanford's Vascular Surgery outcomes, as compared to peer university-based programs across the country, rank in the top 5th percentile on a risk adjusted basis. This makes Stanford Vascular Surgery one of the highest quality Vascular Surgery programs in the United States. The National Surgical Quality Improvement Program (NSQIP) data is based on surgeon-specific outcomes and the procedures are all performed by faculty Vascular Surgeons. NSQIP data

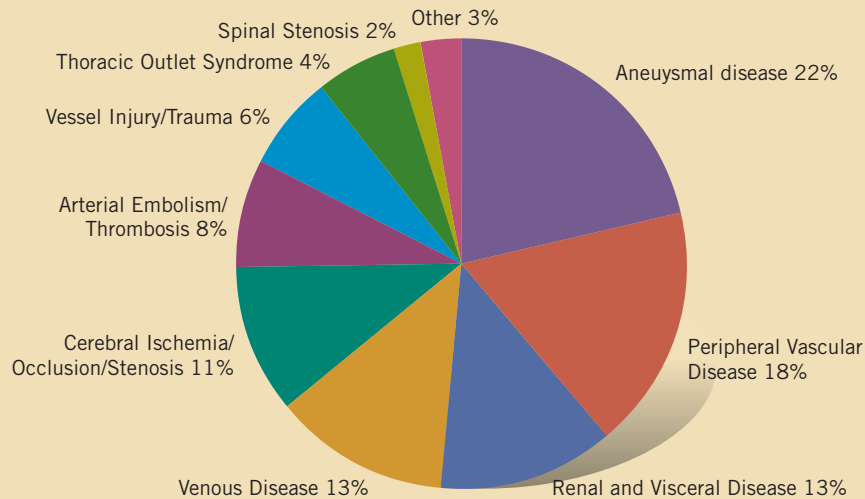
is prospectively acquired by independent chart reviewers, and represents the best validated risk-adjusted surgical outcomes database in the world.

COMMITTED TO CARE

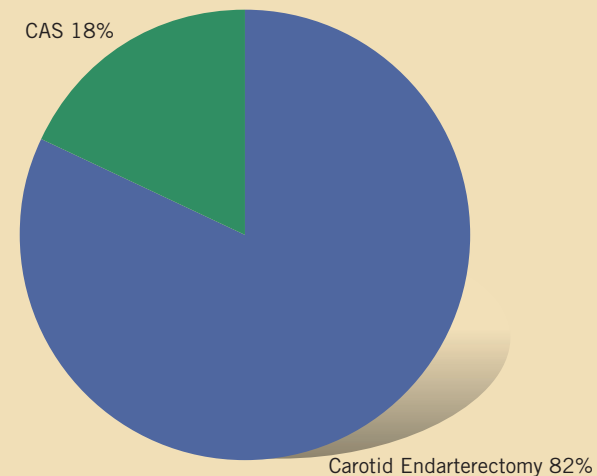
Specialists are particularly interested in providing solutions for failed prior attempts at endovascular aneurysm exclusion or revisions of previously placed endografts, and they are proficient in the management of cerebrovascular disease, including the prevention and treatment of strokes or transient ischemic attacks. Both open and catheter-based (angioplasty and stenting) treatment for carotid disease are provided to ensure that each patient receives the procedure that assures the best overall outcome.

The Stanford Vascular Center has a commitment to improving treatment for patients, providing them with the opportunity to participate in numerous clinical trials involving novel drug therapies, device development, applied technology, and vascular health-related outcomes.

Patient Diagnoses



Carotid Endarterectomy Vs. Carotid Angioplasty and Stent (CAS) Volume for 2007



CEREBROVASCULAR DISEASE

Stanford Vascular Surgery is an international leader in the development of innovative approaches to treatment of cerebrovascular disease and the prevention of stroke. Dr. Ronald Dalman is currently the site Principal Investigator on the Abbott-sponsored PROTECT trial investigating a 5th generation distal protection device; Division faculty are currently participating in trials sponsored by several manufacturers. The Division continues to be recognized nationwide as leaders in open surgical techniques for carotid, vertebral, and subclavian disease as well. Thus patients can proceed with confidence knowing that their surgeon will provide the best possible care regardless of which method (stent or endarterectomy) is recommended.

9 out of 10 patients who visit the Vascular Surgery Clinic rate their overall experience as highly positive.



VASCULAR LAB

The Stanford Vascular Laboratory is a specialized diagnostic facility that is accredited by the Intersocietal Commission for the Accreditation of Vascular Laboratories (ICAVL).

The Vascular Laboratory's purpose is to serve health care providers and their patients by utilizing advanced, noninvasive, diagnostic, medical ultrasound technology while ensuring high quality results. Examinations are performed by clinically skilled registered vascular technologists with specialized training.

Vascular Lab 2007 volume

Category	Exam	No. Performed
Carotids	Carotid Duplex Exam	1,023
Peripherals	Ankle Brachial Index	674
	Arterial Lower Extremity	609
	Arterial Upper Extremity	132
	Venous Lower Extremity	415
	Venous Upper Extremity	188
Abdominals	Aorto-Iliac	357
	Renals	163
	Mesenteric	52
	Hepatic	2
Other	Other Exams	102

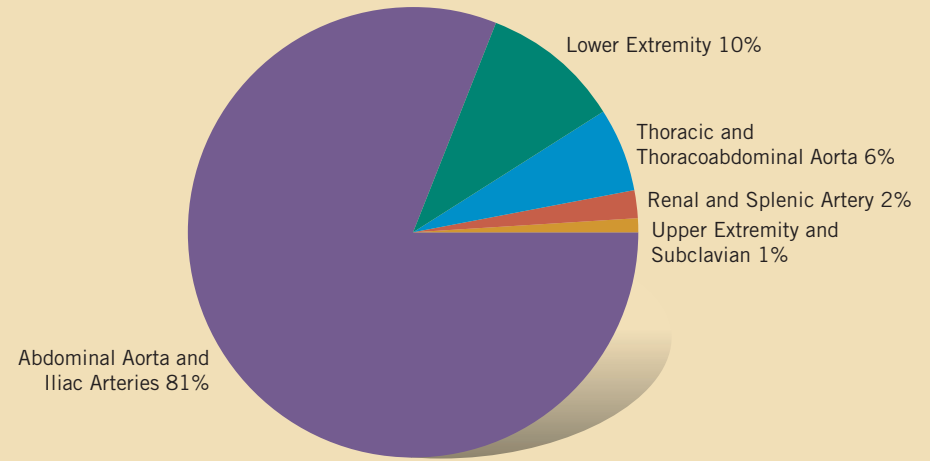
In Q1 2008, University HealthSystem Consortium (UHC) ranked Stanford's program 1st among 95 academic medical centers in vascular surgery service line quality.

ANEURYSM CENTER

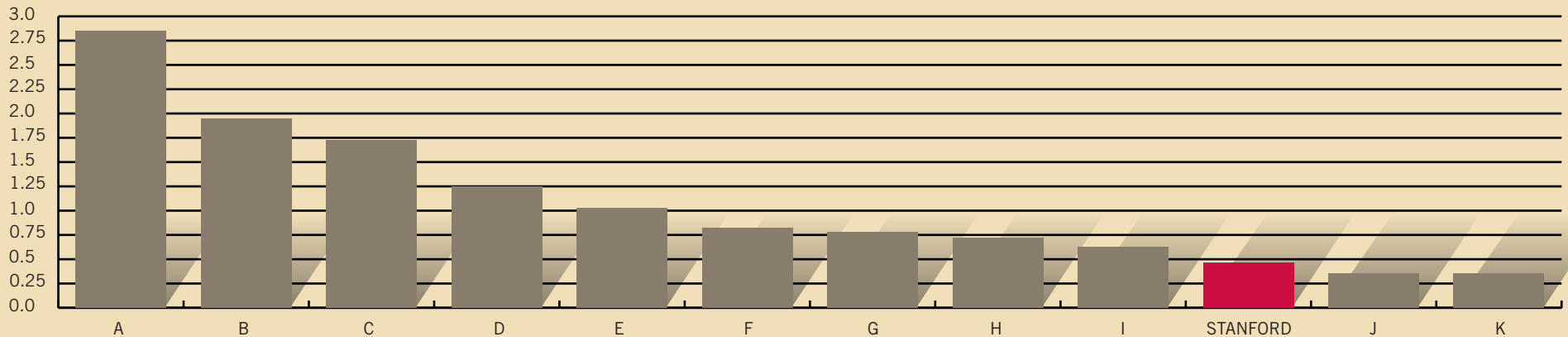
Our faculty has vast experience in the management of a variety of complex aortic aneurysms. Our surgeons have the greatest accumulated experience in major aortic disease management in the western United States; performing an average of 120 abdominal aortic aneurysm (AAA) operations a year, our team of doctors, nurses, and other health care professionals strives to provide the most comprehensive, cutting edge care to this group of patients.

Stanford Hospital's Aneurysm Center is a forerunner in the diagnosis and treatment of abdominal aortic aneurysms (AAAs). The median mortality index of hospitals with similar case volume is 0.81. Stanford hospital far exceeds that expectation with a mortality index of 0.45.

Types of Aneurysm Cases



Mortality Index for Abdominal Aortic Aneurysm Procedures



Stanford mortality rates for AAA procedures compared to other university-based hospitals in the nation with similar case volume.

Source: University HealthSystem Consortium (UHC) Clinical Database Jan.-Oct. 2007

STANFORD VASCULAR SURGERY TRIALS AND STUDIES

AAA: STOP – Abdominal Aortic Aneurysms: Simple Treatment or Prevention

Principal Investigator Ronald L. Dalman, MD

Purpose of Research The goal of this study is to gather information on AAA risk factors and determine whether an exercise program reduces the rate of AAA enlargement.

Basic Eligibility Criteria Men and women over the age of 50 with small infrarenal AAA less than 5.5 cm in diameter.

CORAL: Cardiovascular Outcomes in Renal Atherosclerotic Lesions – NIH

Principal Investigator Jason T. Lee, MD – Stanford
Wei Zhou, MD – VAPAHCS

Purpose of Research To test the hypothesis that medical therapy with stenting of significant renal artery stenoses in patients with systolic hypertension reduces the incidence of adverse cardiovascular and renal events compared with medical therapy alone.

Basic Eligibility Criteria Subjects must be >18 years of age with documented history of hypertension on ≥ 2 antihypertensive medications.

PIVOTAL: Positive Impact of endoVascular Options for Treating Aneurysm early – Medtronic

Principal Investigator Jason T. Lee, MD

Purpose of Research To compare endovascular repair versus surveillance, with respect to patient survival, AAA rupture, and AAA related death.

Basic Eligibility Criteria Subject is > 40 to 90 years of age and aneurysm diameter of 4 - 5 cm.

PYTHAGORAS Prospective aneurYsm Trial: High AnGle aORfix™ bifurcAted Stent graft – Lombard Medicals

Principal Investigator Jason T. Lee, MD – Stanford

Purpose of Research To evaluate the safety and effectiveness of the Lombard Medical endovascular Aorfix™ AAA bifurcated stent graft range in aneurysms with anatomy including angled aorta, angled aneurysmal body or both, where the patients have suitable anatomy.

Basic Eligibility Criteria Subject is > 21 to 85 years of age with diagnosed abdominal aortic aneurysm with aortic neck angles up to 90°, > 4.5 cm in diameter.

PROTECT: PROTECTed Carotid Artery Stenting in Subjects at High Risk for Carotid Endarterectomy (CEA) – Abbott Vasc.

Principal Investigator Ronald L. Dalman, MD – Stanford

Purpose of Research To evaluate the long-term safety, efficacy and durability of the Xact® Rapid Exchange Carotid Stent System used in conjunction with the Emboshield® Pro Rapid Exchange Embolic Protection System (Generation 5) and the Emboshield® BareWire™ Rapid Exchange Embolic Protection System (Generation 3), in the treatment of atherosclerotic carotid artery disease in high-surgical risk subjects.

Basic Eligibility Criteria The subject must be >18 years of age with carotid artery stenosis who are at high risk for carotid endarterectomy and are candidates for percutaneous angioplasty and stenting.

Visit our website:
<http://vascular.stanford.edu>

RECENT SIGNIFICANT PUBLICATIONS

- Zacharski LR, Chow BK, Howes PS, Shamayeva G, Baron JA, **Dalman RL**, Malenka DJ, Ozaki CK, Lavori PW. Reduction in iron stores and cardiovascular outcomes in patients with peripheral vascular disease. *JAMA* 2007;297:603-10.
- Tedesco MM, **Lee JT**, **Dalman RL**, Lane B, Loh C, Haukoos JS, Rapp JH, **Coogan SM**. Postprocedural microembolic events following carotid surgery and carotid angioplasty and stenting. *J Vasc Surg* 2007;46:244-50.
- Lin PH, **Zhou W**, Kougias P, El Sayed HF, Barshes NR, Huynh TT. Factors associated with hypotension and bradycardia after carotid angioplasty and stenting. *J Vasc Surg* 2007;46:846-53; discussion 853-4.
- Arko FR, Murphy EH, Davis CM 3rd, Johnson ED, Smith ST, **Zarins CK**. Dynamic geometry and wall thickness of the aortic neck of abdominal aortic aneurysms with intravascular ultrasonography. *J Vasc Surg* 2007;46:891-6; discussion 896-7.
- Benharash P, **Lee JT**, Abilez OJ, Crabtree T, Bloch DA, **Zarins CK**. Iliac fixation inhibits migration of both suprarenal and infrarenal aortic endografts. *J Vasc Surg* 2007;45:250-7.
- **Lee JT**, Karwowski JK, **Harris EJ**, Haukoos JS, **Olcott C**. Long-term thrombotic recurrence after non-operative management of Paget-Schroetter Syndrome. *J Vasc Surg* 2006;43:1236-1243.
- **Zhou W**, Reardon M, Peden EK, Lin PH, Lumsden AB. Hybrid Approach to Complex Thoracic Aortic Aneurysms in High Risk Patients: Surgical Challenges and Clinical Outcomes. *J Vasc Surg* 2006;44:688-93.

Directory and Physician Profiles



ADMINISTRATION

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Administrative Director
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(650) 498-4921

Scott Kronenberg
Cardiovascular Clinical Outcomes
Director
(650) 736-7920

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TRANSFER CENTER

(Inpatient transfer)
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Toll-Free: (800) 800-1551
Fax: (650) 723-6505

ADULT CONGENITAL DISORDERS

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Fax: (650) 724-1444

Daniel J. Murphy, Jr., MD



Dr. Murphy received his undergraduate degree from Stanford University and his medical degree from the University of Southern California.

He trained in Pediatrics and Pediatric Cardiology at Children's Hospital, Cincinnati, Ohio. He joined the faculty at Stanford in 2001 after previous faculty

appointments at Baylor College of Medicine and the Cleveland Clinic. Dr. Murphy is the Associate Chief of Cardiology at Lucille Packard Children's Hospital (LPCH) and the Director of the Congenital Cardiac Clinic at Stanford Hospital & Clinics. He serves on the Medical Advisory Board of the Adult Congenital Heart Association and the Executive Committee of the Pediatric & Adult Congenital Heart Section of the American College of Cardiology. Dr. Murphy's interests include echocardiography, adolescent transition to adult care, and care of the adult with congenital heart disease.

Joseph Wu, MD, PhD



Dr. Wu received his undergraduate degree from University of California-Los Angeles and his medical degree from Yale Medical School. He

trained in both general cardiology and adult congenital heart disease at the UCLA Medical Center. He is board certified in internal medicine and cardiology. Dr. Wu's professional interests include management of adults with congenital heart disease, echocardiography, nuclear cardiology, and basic research.

ARRHYTHMIA/ELECTROPHYSIOLOGY

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Fax: (650) 498-4531

24 Hr. Service: (650) 724-9509

Paul J. Wang, MD



Dr. Wang is the Director of the Stanford Cardiac Arrhythmia Service and Cardiac Electrophysiology Laboratory and is responsible

for overseeing the function and management of the Stanford Cardiac Arrhythmia Center. He received his undergraduate degree at Harvard University and his medical degree at Columbia University. He received his medical residency at Columbia-Presbyterian Medical Center and completed his cardiovascular training at Brigham and Women's Hospital, a major teaching institution of Harvard Medical School. Dr. Wang has co-authored textbooks on implantable defibrillators, sudden cardiac death, cardiac resynchronization/biventricular pacing therapy, and innovations in arrhythmia therapy. He has invented a number of new arrhythmia technologies. Dr. Wang participates on numerous national boards and panels in cardiac electrophysiology. He is involved in the range of implantable device and catheter ablation procedures and has been involved in the

initiation of the Syncope Evaluation Program and the Hypertrophic Cardiomyopathy Program.

Amin Al-Ahmad, MD



Dr. Al-Ahmad is the Associate Director of the Stanford Arrhythmia Service and Director of the Cardiac Electrophysiology Laboratory. He

received his medical degree at the Tufts University School of Medicine. Dr. Al-Ahmad completed his medical residency training at Tufts New England Medical Center in Boston. He has a particular interest in new advances in the catheter ablation treatment of arrhythmias, including atrial fibrillation, and in lead extraction. His research areas include new device development and clinical studies of cardiac arrhythmias.

Karen J. Friday, MD

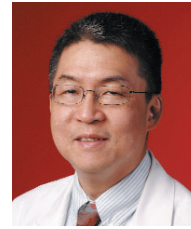


Dr. Friday is a Stanford Cardiac Arrhythmia Service and Clinical Professor of Medicine. She received her medical degree from Case

Western Reserve University. Dr. Friday completed her medical residency training at Johns Hopkins University in Baltimore and her cardiovascular training at St. Louis University in St. Louis. She serves as an arrhythmia specialist at Stanford

and the Palo Alto Veterans Health Care System. She has a particular interest in autonomic dysfunction, postural orthostatic tachycardia syndromes, and syncope.

Henry H. Hsia, MD



Dr. Hsia is the Associate Director of the Stanford Cardiac Arrhythmia Service and Cardiac Electrophysiology Laboratory. He received his

undergraduate and medical degrees from Tufts University. He received his medical residency training at the University of Michigan in Ann Arbor, MI and completed his cardiovascular training at the University of Texas Southwestern Medical Center in Dallas, TX. His cardiac electrophysiology training was completed at the Hospital of the University of Pennsylvania. Dr. Hsia has over 13 years of experience as an attending electrophysiologist. Prior to coming to Stanford, he served on the faculty of the University of Pennsylvania. Dr. Hsia has a particular interest in the catheter ablation of complex arrhythmias including atrial fibrillation, atrial tachycardias, supraventricular tachycardias, and ventricular tachycardia. He continues to be involved in a number of clinical trials involving implantable defibrillators, catheter ablation, and resynchronization therapy.

Andrea Natale, MD



Dr. Natale is a Consultant for the Stanford Cardiac Arrhythmia Service and Attending Physician at Stanford Hospital and Clinics. He

is the former Chief of Cardiac Electrophysiology at Cleveland Clinic Foundation, and an internationally recognized authority in arrhythmias and catheter ablation. He collaborates actively with the faculty at Stanford and spends a few days per month teaching and performing complex ablation procedures.

Paul Zei, MD



Dr. Zei earned his medical degree at Stanford, and he completed a PhD here as well in Molecular and Cellular Physiology, studying

the basic cellular and protein mechanisms responsible for normal and abnormal cardiac conduction. He completed his internal medicine internship and residency, cardiovascular medicine fellowship, and cardiac electrophysiology fellowship at Brigham and Women's Hospital in Boston, a major teaching affiliate of Harvard Medical School. Dr. Zei's clinical interests are in catheter ablation of arrhythmias, including SVT, atrial fibrillation, and in particular ven-

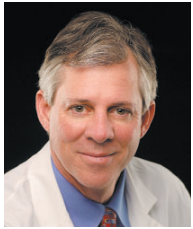
tricular tachycardia. He also has a clinical interest in device implantation, including pacemakers, defibrillators, and cardiac resynchronization devices.

CARDIAC SURGERY

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Robert C. Robbins, MD
Department Chair, Cardiac Surgery
(650) 725-3828

Robert C. Robbins, MD



Dr. Robbins is the Chair of the department of Cardiothoracic Surgery, Director of Stanford institute for Cardiovascular Medicine,

Co-Director of the Cardiac Clinical Center, Director of the Heart, Heart-Lung and Lung Transplant Program and Director of the Cardiothoracic Transplantation Laboratory. He received his medical degree from the University of Mississippi and is board certified in general surgery and thoracic surgery. He sits on the Executive Committee of the American Heart Associate's Council on Cardiothoracic and Vascular Surgery. His specialties include general cardiac surgery, heart and lung transplantation, valvular heart surgery, thoracic aortic surgery, adult congenital surgery,

arrhythmia surgery, ventricular assist device insertion, and myectomy surgery.

Ramin Beygui, MD, FACS



Dr. Beygui is an acting Associate Professor at Stanford University and the Director of the Stanford Cardiac Surgery Program at El

Camino Hospital. He holds a masters degree in electrical engineering from University of California-Berkeley and an MD degree from University of California-Irvine. Dr. Beygui completed a residency program in general surgery and a fellowship in vascular surgery at Stanford University. He also completed a residency program at UCLA in cardiothoracic surgery. He is board certified in cardiac, thoracic, vascular, and general surgery.

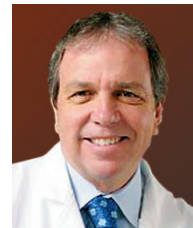
J.W. Randolph Bolton, MD, PhD



Dr. Bolton is the Director for the Cardiothoracic Surgery Program at St. Agnes Medical Center. He attended medical school in South Carolina and completed his cardiothoracic surgery and pediatric cardiac surgery training at Boston University Medical Center. Board certified in both general surgery and thoracic surgery, he served as Chief of Cardiothoracic Surgery at Wilford Hall Medical Center in San

Antonio, Texas and as an Associate Professor of Pediatric Cardiac Surgery at the University of Texas Health Science Center at San Antonio. Retired from the United States Air Force as Lieutenant Colonel, Dr. Bolton was the former consultant to the Surgeon General of the Air Force. Dr. Bolton specializes in minimally invasive cardiac and thoracic surgery, transmyocardial laser revascularization, MAZE procedure for atrial fibrillation and robotically assisted cardiac surgery.

Michael D. Dake, MD



Dr. Michael Dake is Acting Professor of Cardiothoracic Surgery. He recently returned to Stanford Medical Center after four years at the Uni-

versity of Virginia, where he was Chairman of the Department of Radiology. He previously served as Chief of Interventional Radiology and Co-Director of Cath/Angio Laboratories at Stanford. A graduate of Harvard College, he went on to earn his medical degree from Baylor College of Medicine in 1978. Dr. Dake received his residency training in internal medicine at Baylor College of Medicine and in Pulmonary Medicine and Radiology at UCSF. He served as Assistant Professor of Radiology at UCSF from 1987 to 1988 and as Clinical Associate in Radiology at the University of Miami from 1988 to 1990. Dr. Dake has done pio-

neering work in the field of endovascular therapies for arterial and venous disease, and is a world leader in endoluminal management of aortic disease. He is the author of more than 300 journal articles and 70 textbook chapters. He holds several editorial positions, numerous advisory boards and is the recipient of 14 patents. His research interests include vascular device development and vascular biology. He specializes in percutaneous endovascular procedures, aortic aneurysms, and aortic dissection.

Michael Fischbein, MD, PhD



Dr. Fischbein is an Assistant Professor of Cardiothoracic Surgery. He received his medical degree from Boston University School of Medi-

cine and his doctorate degree in Microbiology and Immunology from the University of California-Los Angeles. He completed his general surgery training at University of California-Los Angeles and his cardiothoracic surgery training at Stanford University School of Medicine. Dr. Fischbein has a special interest in adult cardiac and thoracic aortic surgery. His research interests include transplant immunology and the molecular pathogenesis of Marfan syndrome.

Kai Ihnken, MD, FACS



Dr. Ihnken is Clinical Assistant Professor of Cardiothoracic Surgery and Director of the Stanford CT-Surgery program at Valley Medical Cen-

ter. He is also a staff surgeon at Stanford's CT-Surgery programs at Regional Medical Center, El Camino Hospital and the Palo Alto VA. He is board certified in general and thoracic surgery. Dr. Ihnken graduated summa cum laude from medical school in Germany and completed residencies in general, cardiothoracic and vascular surgery. He then moved to UCLA for a two year research fellowship before coming to Stanford to complete residencies in general and cardiothoracic surgery. Shortly after, Dr. Ihnken took a faculty position at UC-San Diego, but returned a year later as Director of Stanford's Cardiothoracic Program at Regional Medical Center. He was the first in the world to describe and clinically apply: controlled limb reperfusion, normoxic cardiopulmonary bypass, simultaneous antegrade-and retrograde application of cardioplegia, and stent-grafting the ascending aorta for dissection. His research focuses on protection of the hypoxic immature and the ischemic adult myocardium, as well as skeletal muscle, to avoid ischemia/reperfusion injury. Dr. Ihnken has published more

than 60 articles in peer review journals and is a manuscript reviewer for several Journals in the field. He specializes in off-pump myocardial revascularization, mitral and aortic valve repair, aortic surgery, and minimally invasive surgery including ablation for atrial fibrillation. He is interested in robotic surgery, percutaneous valve replacement, quality improvement protocols and community outreach.

Hari R. Mallidi, MD, FRCSC



Dr. Mallidi is the Director of Cardiothoracic Surgery at Regional Medical Center of San Jose. He obtained his medical degree from the

University of Toronto in Canada and completed a residency in cardiac surgery at the University of Toronto, before completing fellowship training at Stanford University. Dr. Mallidi's research interests include outcomes of heart, lung, and heart-lung transplantation and the use of administrative databases in evaluating outcomes after heart surgery. Dr. Mallidi specializes in cardiothoracic transplantation, heart failure surgery including device implantation, valvular surgery, thoracic aortic surgery, and myocardial revascularization.

Craig Miller, MD



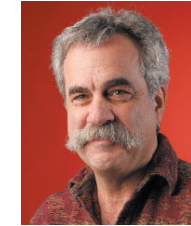
Dr. Miller is a graduate of the Stanford University School of Medicine, past President of the Western Thoracic Surgical Association and the AATS 2007-2008, and former Chairman of the American Heart Association's Cardiovascular Surgery Council. He is board certified in surgery, thoracic surgery, and vascular surgery. His research has advanced treatments for mitral valve disease and he is considered the leading authority on mitral valve anatomy, physiology, and pathophysiology. Through his innovative research, Dr. Miller has developed major advances in the treatment of mitral valve disease. Dr. Miller specializes in thoracic aortic diseases and treatment and cardiac valvular surgery.

Scott Mitchell, MD



Dr. Mitchell graduated from Northwestern University Medical School. He is board certified in surgery, thoracic surgery, and vascular surgery. His ground-breaking work in thoracic aortic surgery has advanced patient care. Dr. Mitchell specializes in vascular surgery, cardiothoracic surgery, thoracic aortic aneurysms, and cardiac valve disease.

Philip Oyer, MD, PhD



Dr. Oyer received his medical degree and a doctorate in biochemistry from the University of Chicago. He completed his internship and residency at Stanford, where he has been on staff since 1978. He performed the world's first successful ventricular assist device implantation as a bridge to transplantation. Dr. Oyer specializes in general cardiac surgery, heart transplantation, valvular surgery, thoracic aortic surgery and ventricular assist device insertion.

Bruce Reitz, MD

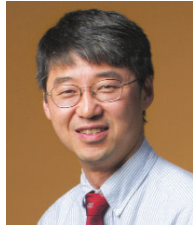


Dr. Reitz is a cum laude graduate of the Yale University School of Medicine and is board certified in surgery and thoracic surgery. He led the Stanford team that performed the world's first successful human heart-lung transplant in 1981. He has performed more than 90 advanced valvular surgeries (the Ross procedure) and has been a key member of the Stanford surgical team since 1992. Dr. Reitz specializes in general cardiac surgery, heart and lung transplantation, valvular surgery including the Ross procedure, thoracic aortic surgery, adult congenital surgery, arrhythmia surgery, ventricular assist device insertion, and myectomy surgery.

Marfan Syndrome & Aortic Disorders

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David H. Liang, MD, PhD



Dr. Liang is the Director of the Stanford Marfan Center and Associate Professor of Cardiovascular Medicine. Dr. Liang received his undergraduate degree in electrical engineering from MIT and his medical and doctorate degrees from Stanford University. He also completed his internship, residency and fellowship training here at Stanford. His research interests include non-invasive imaging; he specializes in Marfan syndrome, cardiac imaging and echocardiography.

HEART FAILURE/CARDIOMYOPATHY/ HEART TRANSPLANTATION

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Michael B. Fowler, MB, FRCP



Dr. Fowler is a Professor of Medicine, the Director of the Heart Failure Program, and Medical Director of the Cardiomyopathy Center.

He completed his medical degree at the Charing Cross Medical School in London, England. His residency training

was obtained at the Kent & Canterbury Hospital in London and the Brighton and Sussex Medical School, also in London. Dr. Fowler completed fellowship programs at Brighton and Sussex Medical School and Stanford University Medical School, before joining King's College Hospital as an honorary research registrar in cardiology. Dr. Fowler serves on the editorial boards of several medical journals, including *Congestive Heart Failure* and the *Journal of Clinical and Basic Cardiology*. He has authored over 100 articles in peer-reviewed journals and is a guest editor for the *American Journal of Cardiology Supplement* and other publications. Dr. Fowler specializes in heart failure and heart transplantation.

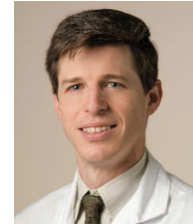
Randall H. Vagelos, MD



Dr. Vagelos is a member of the Stanford Heart Transplant team, as well as the interventional cardiology group. He is Professor of Medicine, and is the Medical Director of the Cardiac Care Unit of Stanford Hospital & Clinics. He completed his medical degree and internal medicine residency training at Columbia College of Physicians and Surgeons in New York City. Dr. Vagelos then continued his postgraduate

cardiology training at Stanford University School of Medicine, and completed fellowships in heart failure research and interventional cardiology. Dr. Vagelos serves as Secretary and Co-Founding Member of the Northern California Heart Failure Society. His clinical interests include studies of prognosis and novel therapies in congestive heart failure, as well as the chronic long-term cardiothoracic toxicities of radiation therapy.

Ronald Witteles, MD



Dr. Witteles is the Associate Director of the Cardiac Care Unit and Director of Stanford's AV-optimization Program. He received his medical degree from the University of Chicago Pritzker School of Medicine. He served as both chief resident and chief fellow at Stanford University. Dr. Witteles is board certified in internal medicine, nuclear cardiology and cardiovascular medicine. He specializes in the treatment of patients with heart failure/cardiomyopathy and in evaluation of cardiac transplantation. His clinical interests include heart failure in malignancies and pacemaker synchronization. His research interests include insulin resistance in heart failure, kidney dysfunction in heart failure and prevention of chemotherapy-associated cardiomyopathies.

Hypertrophic Cardiomyopathy (HCM)

Main: (650) 736-7878
FAX: (650) 725-3899

Euan A. Ashley, MRCP, DPhil



Dr. Ashley is an Assistant Professor and Director of the Stanford Hypertrophic Cardiomyopathy Center. He received his medical

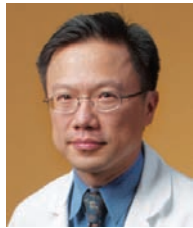
degree from the University of Glasgow in Scotland in 1996 and completed his fellowship at the University of Oxford and at Stanford University Medical Center. He has a special interest in the care of patients with hypertrophic cardiomyopathy and other forms of inherited cardiomyopathy and arrhythmia. With expertise in cardiovascular molecular genetics, he runs an NIH funded laboratory investigating the biology of heart muscle disease. In addition, he has a particular interest in the care of athletes with cardiovascular disease and works closely with the Stanford Sports Medicine program.

INTERVENTIONAL CARDIOLOGY

Contact/24 Hr. Service:
(650) 725-2621
Fax: (650) 725-6766

Alan C. Yeung, MD
Division Chief (Clinical),
Cardiovascular Medicine
(650) 723-0108

Alan C. Yeung, MD



Dr. Yeung is Li Ka shing Professor of Medicine, Director of Interventional Cardiology and Division Chief of Cardiovascular Medicine (Clinical).

He graduated from Harvard Medical School and received his training in cardiology at the Brigham and Women's Hospital in Boston. Dr. Yeung came to Stanford in 1993. His research interests include coronary artery remodeling, acute coronary syndromes, new device development and novel approaches to coronary revascularization including stem cell therapy. His specialties include complex coronary interventions, and mitral valvuloplasty.

Todd J. Brinton, MD



Dr. Brinton is an Instructor of Cardiovascular Medicine. He holds an undergraduate degree in biomedical engineering from the University of California-San Diego. Dr. Brinton received his medical degree from Chicago Medical School in Chicago, IL. He completed his residency and fellowship training here at Stanford University Medical Center. Dr. Brinton's research focuses on the development and evaluation of minimally invasive techniques for cardiac stem cell transplantation and imaging techniques for assessment of cell viability after transplant in pre-clinical models. His clinical expertise is in interventional cardiology with an emphasis on new device strategies for percutaneous coronary interventions. He specializes in coronary artery disease, chronic ischemic heart disease, novel therapies for revascularization and restoration of ischemic heart failure.

William Fearon, MD



Dr. Fearon is an Assistant Professor of Medicine (Cardiovascular Medicine) at Stanford University School of Medicine. He received his undergraduate degree from Dartmouth College and his medical degree from Colum-

bia University, College of Physicians and Surgeons. He completed a residency program in Internal Medicine at Stanford and served as Medical Chief Resident. He also completed a cardiology fellowship and interventional cardiology fellowship, here at Stanford, and has been on faculty since 2002. He is board certified in internal medicine, cardiology, and interventional cardiology. Dr. Fearon's clinical expertise is in interventional cardiology with an emphasis on evaluating the significance of coronary artery disease and its treatments. He also specializes in percutaneous aortic valve therapy and determining the cause of chest pain in patients with normal appearing coronary arteries.

David P. Lee, MD



Dr. Lee is the Director of the Cardiac Catheterization and Coronary Intervention Laboratories and the Interventional Cardiology Fellowship Program. He received his medical degree from the University of Minnesota and completed his residency and fellowships at Stanford University Medical Center. He is board certified in interventional cardiology and cardiovascular disease. He is an Assistant Professor of Medicine and his research includes new treatment strategies for acute myocardial infarction. Dr. Lee specializes in wide

ranging treatments of coronary artery disease and structural heart disease including ASD/PFO closure, and alcohol septal ablation.

Women's Heart Health

Main: (650) 736-0516
Fax: (650) 724-1444
24 Hr. Service: 650-725-2621

Jennifer A. Tremmel, MD, SM



Dr. Tremmel is the Clinical Director of the Women's Heart Health at Stanford Clinic. Dr. Tremmel received an undergraduate degree in

Psychology and her medical degree from the University of Iowa. She completed her internal medicine internship and residency at Dartmouth-Hitchcock Medical Center. Following that, she obtained a master's degree in Epidemiology at the Harvard School of Public Health. She completed her fellowship in cardiovascular medicine and interventional cardiology at Stanford University Medical Center, where she was also a postdoctoral research scholar at the Stanford Prevention Research Center. She specializes in interventional cardiology and preventive cardiology, and has a particular interest in sex differences in cardiovascular disease. She is currently evaluating the rela-

tive occurrence of endothelial dysfunction and microvascular disease in women compared to men.

VASCULAR CENTER

Contact/24 Hr. Service:
(650) 725-5227
Fax: (650) 723-3600

Ronald L. Dalman, MD
Division Chief, Vascular Surgery
(650) 725-5227

Ronald L. Dalman, MD



Dr. Dalman is the Director of the Vascular Center and Professor and Chief of Vascular Surgery. He graduated from the University of Michigan School of Medicine and he completed his general surgery residency from University of Washington. He obtained his fellowship training in vascular surgery at the Oregon Health Sciences University. Dr. Dalman is a distinguished fellow of the Society for Vascular Surgery. He specializes in minimally invasive revascularization techniques of the lower extremities, catheter-based and open management of carotid and extra-cranial cerebrovascular occlusive disease to prevent stroke, endovascular and open management of complex diseases of the thoracic and abdominal aorta, catheter-

based and open management of venous diseases including varicose veins, subclavian vein thrombosis and superior vena cava syndrome, novel drug therapies for lower extremity ischemia and leg pain with walking, upper extremity circulation disorders, and intestinal circulation disorders.

Fritz Bech, MD



Dr. Bech earned his undergraduate degree at Haverford College and his medical degree at Medical College of Pennsylvania. He received his

General Surgery training at the Dartmouth-Hitchcock Medical Center. After completing a Vascular Surgery fellowship at the University of Chicago Hospitals in 1993, Dr. Bech joined the Dartmouth faculty as an Assistant Professor of Surgery. Dr. Bech currently serves as an Assistant Professor at Stanford University. He specializes in open and endovascular management of complex aortic pathology, carotid artery disease, mesenteric and renal vascular disease, limb salvage, dialysis access, noninvasive vascular laboratory diagnosis, and surgical education.

E. John Harris, MD



Dr. Harris graduated from the St. Louis University School of Medicine. He completed his residency at Oregon Health Sciences University and

a fellowship in vascular surgery at Oregon Health Sciences University. He is board certified in both vascular surgery and general surgery. Dr. Harris serves as a Professor at Stanford University and a staff surgeon at Lucile Packard Children's Hospital. He is also on staff at the Palo Alto Veterans Administration Hospital. Dr. Harris is the Medical Director of the Stanford Vascular Laboratory. His research interests include role of thrombosis in stimulating venous wall morphologic change, and non-invasive vascular imaging. He specializes in minimally invasive revascularization techniques, diagnosis and treatment of venous diseases, treatment of critical limb ischemia, management of aortic aneurismal disease, and treatment of cerebrovascular occlusive disease.

Jason T. Lee, MD



Dr. Lee is the Director of Endovascular Surgery at Stanford Hospital and serves as an Assistant Professor of Surgery at Stanford University.

He is also Associate Program Director of the Vascular Surgery Fellowship Program

and on staff at Lucile Packard Children's Hospital. After graduating from the California Institute of Technology, Dr. Lee finished medical school at UC San Diego, and completed his general surgery residency at Harbor-UCLA. He then completed his Vascular and Endovascular Surgery fellowship here at Stanford University before joining the faculty. Dr. Lee is the site Principle Investigator for several national clinical trials involving advanced endovascular interventions. His research interests include outcomes of catheter-based interventions compared to open surgery, functional outcomes after thoracic outlet decompression, the application of endovascular technologies to thoracic and abdominal aneurysms, and the use of simulation in surgical education. He specializes in complicated open and endovascular treatment of abdominal aortic aneurysms, carotid angioplasty/stenting, percutaneous interventions for peripheral vascular disease, and thoracic outlet syndrome.

Cornelius Olcott, MD



Dr. Olcott graduated from Columbia University College of Physicians & Surgeons. He completed his general surgery residency at the Uni-

versity of California San Francisco and his fellowship in vascular surgery at the University of California San Francisco in

1975. Dr. Olcott is board certified in both general surgery and vascular surgery. Dr. Olcott serves as a Professor at Stanford University. He is also on staff at Lucile Packard Children's Hospital, Palo Alto Veterans Administration Hospital, and Sequoia Hospital. Dr. Olcott also serves as director of the clinical program at Stanford. His research interests are upper extremity venous thrombosis, and monitoring for colonic ischemia during aortic reconstructions. He specializes in complications and management of thoracic outlet syndrome, acute and chronic arterial injuries in high performance athletes, and major arterial reconstructions.

Christopher Zarins, MD



Dr. Zarins graduated from Johns Hopkins University School of Medicine. He completed his residency in general surgery at the University of

Michigan and a fellowship program in surgical research at Johns Hopkins University. He is board certified in both vascular surgery and general surgery. Dr. Zarins serves as a professor at Stanford University. He was appointed Division Chief of Vascular Surgery from 1993 - 2005. His research interests include hemodynamic factors in atherosclerosis, pathogenesis of aortic aneurysms,

carotid plaque localization and complication, anastomotic intimal hyperplasia, vascular biology of artery walls, computational fluid dynamics as applied to blood flow and vascular disease. He specializes in management of abdominal aortic aneurysms with both open and endovascular surgical techniques, management of complex thoracic and thoracoabdominal aortic aneurysms, aortic dissections, branch vessel diseases and related major aortic diseases.

Wei Zhou, MD



Dr. Zhou earned her undergraduate degree at the University of California-San Diego and her medical degree at the New York Medical College.

She received her General Surgery training at the University of California-San Diego Medical Center. Dr. Zhou completed a vascular surgery fellowship at the Baylor College of Medicine. She serves as an Associate Professor at Stanford University, Chief of Vascular Surgery at Palo Alto Veterans Administration Hospital and is on staff at Stanford Medical Center and Lucile Packard Children's Hospital. Dr. Zhou's research interests include new therapeutic strategies for management of cerebrovascular diseases, claudication and limb salvage, and treatment of aortic aneurysms. Her Specialties include endovascular treat-

ment of abdominal and thoracic aortic aneurysms, percutaneous carotid interventions, management of complex aortic

pathologies, percutaneous interventions for peripheral vascular disease, and percutaneous venous interventions.



Cardiovascular Outreach Clinics



Stanford Hospital and Clinics has developed relationships with community hospitals that allow us to extend our world-renowned cardiovascular care to other areas within California. Each outreach clinic has a team of Stanford specialists able to perform complex procedures for patients while allowing them to stay closer to their home and community. Our doctors work closely with you to insure the best personalized care for your patients.

El Camino Hospital **Cardiothoracic Surgery**

Services:

Cardiac surgeon on-site; CT Services

Physicians:

Ramin Beygui, MD, FACS

Michael Fischbein, MD, PhD

Hari L. Mallidi, MD, FRCSC

Bruce Reitz, MD

Robert C. Robbins, MD, FRCA

2490 Hospital Drive #303,
Mountain View, CA 94040

Phone: (650) 988-7500

Fax: (650) 988-7536

Vascular Surgery

Services:

Vascular surgeon on-site

Physician:

Christopher Zarins, MD

2490 Hospital Drive #303,
Mountain View, CA 94040

Phone: (650) 988-7500

Fax: (650) 988-7536

Regional Medical Center of San Jose

Cardiothoracic Surgery

Services:

Cardiac surgeons on-site; CT
Services

Physicians:

Michael Fischbein, MD, PhD

Kai Ihnken, MD, FACS

Hari L. Mallidi, MD, FRCSC

175 N. Jackson Ave. #204,
San Jose, CA 95116

Phone: (408) 259-0200

Fax: (408) 259-0223

World-renowned care, closer to home

Santa Clara Valley Medical Center

Cardiothoracic Surgery

Services:

Cardiac surgeon on-site; CT Services

Physician:

Kai Ihnken, MD, FACS

75 South Bascom Ave. # 5c031

San Jose, CA 95128

Phone: (408) 885-6191

Fax: (408) 885-6195

Saint Agnes Medical Center

Cardiothoracic Surgery

Services:

Cardiac surgeons on-site; CT Services

Physicians:

J.W. Randolph Bolton, MD, PhD

Douglas C. Wallace, MD, FACS

1381 E. Herndon Ave. #101,

Fresno, CA 93720

Phone: (559) 436-6165

Fax: (559) 436-6341



Each outreach clinic has a team of Stanford specialists able to perform complex procedures for patients while allowing them to stay closer to their home and community.

Transfer Center and LifeFlight



The Communications Center is open seven days a week, twenty-four hours a day to take calls related to patient transfers.

The Stanford Transfer Center serves as a gateway for transfers from other facilities. Staffed by registered nurses and communication specialists, the Transfer Center triages requests made by physicians wishing to transfer a patient to Stanford. The Communications Center is open seven days a week, twenty-four hours a day to take calls related to patient transfers.

The goals of the Stanford Transfer Center are:

- To provide “one stop shopping” for physicians wishing to access Stanford’s services
- To ensure appropriate utilization of resources
- To use a multidisciplinary approach, coordinating with physicians, Transfer Center staff, case managers and financial counselors
- To explore the benefits of bringing a patient in to Stanford from an outlying facility
- To expedite patient transfers
- To limit potential financial liability on the part of patients and their families

Once a transferred patient has arrived at Stanford Hospital, the Transfer Center RNs follow up to ensure that the appropriate care has been delivered. When the specialty care plan is completed, the patient is either discharged, or the Transfer Center works with Stanford case managers to arrange return transfer to the sending facility.

LIFEFLIGHT

600-700 flights per year are completed, going as far as 250 miles to the northern California coast, to Reno, NV, Bakersfield in the Central Valley, and to the Central Coast at Santa Maria, all from the Bay Area.

Our flight crews meet rigorous standards. Flight nurses have extensive training in caring for critically ill or injured patients in the airborne environment. Using a hospital-developed set of protocols, they provide care consistent with that of Stanford Hospital & Clinics, thereby becoming an extension of the Hospital. There are a number of procedures performed by our flight nurses

that are beyond the normal scope of practice for registered nurses. Recurrent training and clinical review maintain the competency in these skills. The pilots come to the program with several thousand hours of turbine helicopter experience but then have further training and maintain IFR and airline pilot ratings.

REASONS FOR TRANSFER

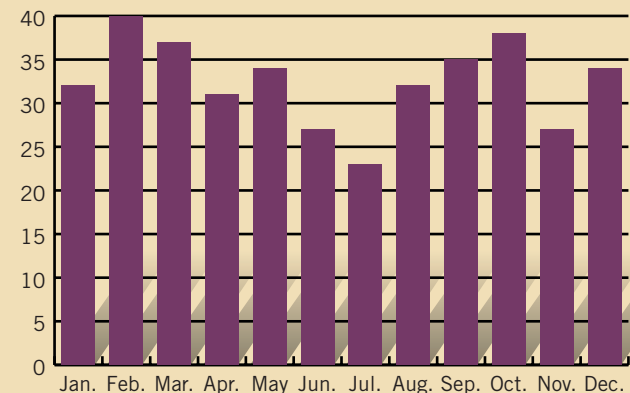
- Decompensated Heart Failure
- Cardiac Transplant Evaluation
- Pulmonary Hypertension
- Acute MI
- Coronary Artery Disease
- Valvular Heart Disease
- Congenital Heart Disease
- Cardiac Arrhythmias
- Aortic Aneurysms and Dissections
- Stroke
- Limb Threatening Ischemia
- Mesenteric and Renal Vascular Disease
- Vascular Injuries
- Venous Thrombotic Disorders

600-700 flights per year are completed, going as far as 250 miles.

For inpatient transfers call: (650) 723-4696



Total Cardiothoracic and Cardiology Transfers 2007





Located 20 miles north of San Jose and 40 miles south of San Francisco, Stanford Hospital & Clinics can be easily reached from anywhere in Northern California.

Stanford Hospital & Clinics

Stanford University Medical Center
 300 Pasteur Drive, Stanford, CA 94305
 650. 723.4000
www.heart.stanfordhospital.com



Stanford University Medical Center