2013
CARDIOTHORACIC SURGERY
OUTCOMES
Measuring and understanding outcomes of medical treatments promotes quality improvement. Created by Cleveland Clinic, this Outcomes book is designed for the physician audience and contains a summary of surgical and medical treatments, with data on patient volumes and outcomes and a review of new technologies and innovations.
CLEVELAND CLINIC’S
HEART & VASCULAR CHAIRMAN’S LETTER

We are proud to present Cleveland Clinic Florida cardiothoracic surgical program’s 2013 Outcomes book. This overview of outcomes, volumes and quality metrics reflects the collaboration of Cleveland Clinic Heart & Vascular staff and the physicians, administration and support personnel of Cleveland Clinic Florida. It refers to national benchmarks established by the Society of Thoracic Surgeons and records our earnest efforts to give every patient the best outcome and experience. We believe that this kind of transparency is essential to improving quality and efficiency as we transition to the era of value-based medicine.

We are gratified by the success of our collaborations. Our goal is to develop relationships with providers nationwide to enhance the value of healthcare in our communities. Your comments and feedback are most welcome. Thank you for your interest.

Bruce W. Lytle, MD
Chairman, Miller Family Heart & Vascular Institute
As Chairman, I am pleased to present our 2013 Outcomes book. Our department continues to grow and strive to provide Cleveland Clinic’s standard of care for our patients in South Florida. While this book provides statistics, I am compelled to emphasize our approach to patient care. We function as a well-integrated care team, guided by Cleveland Clinic’s leading principle of “Patients First.” From your first phone call to our support staff, Barbara or Melanie, to inquire about our services through your hospitalization and personal care by the physician assistants and nurses; we aim to make your care as personalized and seamless as possible. This team approach is reflected in some of the highest patient satisfaction scores in the Cleveland Clinic enterprise.

Cleveland Clinic Florida offers Cleveland Clinic’s model of medical care delivery. This includes a common centralized electronic medical record and close collaboration with other physicians to ensure the best care for the patient.

In addition to patient-centered care, we strive to offer residents of South Florida access to complex cardiac and thoracic surgical procedures. Our familiarity with specialized procedures, such as septal myectomy, complex valve surgery and valve repair, along with offering minimally invasive and robotic surgery, demonstrate the high level of expertise we offer our patients.

Edward B. Savage, MD
Chairman, Tomsich Department of Cardiothoracic Surgery
Heart & Vascular Center
Cleveland Clinic Florida
WHAT’S INSIDE

Surgical Overview .................................................................................................................. 6
Isolated Coronary Artery Bypass Graft Outcomes ............................................................ 8
Patient Experience .............................................................................................................. 12
Valve and Thoracic Surgery Outcomes ............................................................................. 14
Innovations ......................................................................................................................... 16
Staff Biographies ............................................................................................................... 22
Contact Information ......................................................................................................... 24
2013 SURGICAL OVERVIEW

2013
Total Cases = 413
Total Cardiac Cases = 241
Source: Administrative case volumes

Cleveland Clinic Florida and the Cleveland Clinic Department of Thoracic and Cardiovascular Surgery have enjoyed a successful affiliation since 2001. Our program continues to thrive each year, performing over 2,200 cardiac procedures to date. This program allows patients of southern Florida to receive Cleveland Clinic cardiothoracic surgical care in their community and close to home.

Surgical Volume 2009 - 2013

Source: Administrative case volumes
Case Distribution

- 58% Cardiac
- 42% Thoracic

Source: Administrative case volumes

Cardiac Case Distribution

- 36% CABG
- 21% Valve
- 10% CABG & Valve
- 33% Other*

Source: Society of Thoracic Surgeons (STS) National Cardiac Surgery Database, 2013
*Other includes complex procedures such as aortic aneurysms, double valve procedures, etc.
Cardiac Volume

Since the inception of the program, Cleveland Clinic Florida has performed over 2,200 cardiac procedures.

Risk-Adjusted CABG Operative Mortality (Primary Operations only)

[Graph showing CABG outcomes from 2001 to 2013 with a steady increase in procedure numbers]

Source: STS Harvest Report period ending 12/31/2013
Abbreviations: CABG, coronary artery bypass graft
Cardiac Presentation on Admission

CABG Primary and Reoperations

The majority of CABG procedures done at Cleveland Clinic Florida in 2013 were primary operations. A primary operation is the first time a patient has a particular procedure.
2013 ISOLATED CORONARY ARTERY BYPASS GRAFT OUTCOMES

CABG Risk Factors

<table>
<thead>
<tr>
<th>Risk Factor</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dyslipidemia</td>
<td>80%</td>
</tr>
<tr>
<td>Hypertension</td>
<td>85%</td>
</tr>
<tr>
<td>Pulmonary Hypertension</td>
<td>90%</td>
</tr>
<tr>
<td>Diabetes Mellitus</td>
<td>95%</td>
</tr>
<tr>
<td>Congestive Heart Failure</td>
<td>100%</td>
</tr>
<tr>
<td>Left Main Disease (&gt;50 Stenosis)</td>
<td>80%</td>
</tr>
<tr>
<td>Peripheral Arterial Disease</td>
<td>85%</td>
</tr>
<tr>
<td>Family History of CAD</td>
<td>90%</td>
</tr>
<tr>
<td>Cerebrovascular Disease</td>
<td>95%</td>
</tr>
<tr>
<td>Chronic Lung Disease*</td>
<td>100%</td>
</tr>
<tr>
<td>Dialysis-Dependent</td>
<td></td>
</tr>
<tr>
<td>Immunosuppressive Treatment</td>
<td></td>
</tr>
</tbody>
</table>

Source: STS Harvest Report period ending 12/31/2013
*Chronic Lung Disease includes mild, moderate and severe

Perioperative Medications

<table>
<thead>
<tr>
<th>Medication</th>
<th>Florida</th>
<th>STS Expected</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preoperative Beta Blockers</td>
<td>100%</td>
<td></td>
</tr>
<tr>
<td>Aspirin</td>
<td>100%</td>
<td></td>
</tr>
<tr>
<td>Beta Blockers</td>
<td>100%</td>
<td></td>
</tr>
<tr>
<td>Lipid-Lowering Agents</td>
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</tr>
</tbody>
</table>

Discharge

Source: STS Harvest Report period ending 12/31/2013
Internal Mammary Artery Used

Arterial grafts are known for their excellent long-term patency and are the conduits of choice for coronary revascularization. In 2013, 99 percent of patients undergoing primary isolated revascularization procedures at received at least one arterial graft.

Risk-Adjusted Postoperative Complications

Source: STS Harvest Report period ending 12/31/2013

Source: STS Harvest Report period ending 12/31/2013
As the saying goes, much of life is about timing. And this could not be truer for Cleveland Clinic Florida patient Louis Lasky. A man who is accustomed to overcoming health challenges, Louis persevered through kidney transplantation and management of his heart’s abnormal heart rhythm with a permanent pacemaker throughout the last 11 years.

Yet, it was his positive approach to achieve good health that would become critical for Louis when a problem with his aortic valve was added to his challenges eight years ago. Crucial to the heart’s functioning, the aortic valve is responsible for controlling the flow of blood from the heart into a large blood vessel called the aorta. When the aortic valve does not work correctly, it either does not close all the way causing blood to leak back into the heart (aortic regurgitation), or the valve does not open fully reducing blood flow through the heart (aortic stenosis).

Although initially advised to undergo immediate aortic valve replacement surgery, a second opinion from Cleveland Clinic Florida cardiologist Howard Bush, MD, presented Louis with another approach throughout the next six years of care.

“Dr. Bush felt that surgery was not necessary and monitored the situation with annual echocardiograms,” said Louis says. “It should also be noted that through the years, Dr. Bush was hesitant to inject dye for diagnostic through my body into my heart due to restrictions set by my prior kidney transplant. MRIs could not be done either due to a pacemaker.”
As time passed, Louis’ aortic stenosis condition was managed, yet he was primarily asymptomatic, according to Cleveland Clinic Florida cardiothoracic surgeon, Edward Savage, MD. While initial symptoms of aortic valve disease including fatigue and loss of energy can be manageable, as Louis developed more advanced signs of the disease surgery became imminent.

“He started getting achy chest pain with radiation to the neck and back of the head,” said Dr. Savage says. “Louis had really pushed himself and may have minimized some symptoms until it really started to bother him. A cardiac catheterization showed that in addition to his severe aortic stenosis, he had developed severe narrowing of the arteries on the heart.”

“My family and friends knew of my situation, but no one, including myself, was anticipating the urgency of surgery once the final two tests were conducted,” Louis explains. “Once I met Dr. Savage, I felt confident that he and his surgical team would do a great job.”

Once again, timing became the operative term for Louis. “I have undergone many previous surgeries, and I knew if I did not have the operation, I would be dead within a few days,” he says.

“The combination of aortic stenosis and the high-grade multi-vessel coronary disease Louis faced can be a fatal combination if ignored,” said Dr. Savage. “He was lucky.”

On December 6, 2013, 76-year-old Louis had surgery to replace his aortic valve in addition to undergoing a quintuple bypass to treat all five of the major vessels to his heart that were diseased.

At Cleveland Clinic Florida, the majority of aortic valves are replaced with a bioprosthetic valve that can be made from pig tissue (porcine) or cow tissue pericardial (bovine). The valves are safe to insert, durable (lasting from 15 to 20 years), and allow patients to avoid lifetime use of anticoagulants (blood thinning medications).

Just seven days after surgery, Louis returned home to resume his daily routine, but he admits that the experience has changed his perspective on life. “When released from the hospital, it was like a whole new life experience had begun. Things just seemed different. For weeks, everything seemed new,” Louis says.

A typical recovery from aortic valve replacement is two to three months, but may take longer in older patients or those with additional comorbid conditions, such as renal disease, said Dr. Savage. “Five months later, Louis is back to all of his normal activities.”

“The most important lesson I’ve learned from surviving heart disease is to always be your own health advocate. Things have occurred that could easily have resulted in life’s termination,” Louis says. “I also possess a strong mental and physical will. To survive and get stronger, you need the latter. Negativity is not an option — ever!”
VALVE AND THORACIC SURGERY OUTCOMES

Valve Volume
2011 - 2013

Source: Society of Thoracic Surgeons (STS) National Cardiac Surgery Database, 2013
Abbreviations: AVR, aortic valve replacement; CABG, coronary artery bypass graft; MVR, mitral valve replacement and mitral valve repair

Valve Case Distribution

Source: Society of Thoracic Surgeons (STS) National Cardiac Surgery Database, 2013
Thoracic Volume
2010 - 2013

Number of Patients

Source: Administrative case volumes

Thoracic Case Distribution

Source: Administrative case volumes
The relationship between Cleveland Clinic’s Department of Thoracic and Cardiovascular Surgery and Cleveland Clinic Florida enhances opportunities to provide new treatments and therapies to patients as well as to accelerate mutual accomplishments in cardiac care. The following pages highlight some of the latest innovations being investigated at the Miller Family Heart & Vascular Institute at Cleveland Clinic’s main campus.
The Global Cardiovascular Innovation Center (GCIC) has awarded a total of more than $18 million to more than 54 companies and projects. The organization has helped create more than 525 jobs in Ohio. The GCIC is part of the Cleveland Clinic Innovations (CCI), which is Cleveland Clinic’s technology commercialization arm. Its mission is to “benefit the sick through the broad and rapid deployment of Cleveland Clinic technology.” CCI facilitates innovation, creates spin-off companies, licenses technology, secures resources and establishes strategic collaborations with corporate partners.
Mini-Cog Test to Help Predict Heart Failure Readmissions and Outcomes

Cognitive impairment in patients with heart failure is known to be related to reduced rates of treatment adherence, ability to perform activities of daily living and adequate self-care. Published heart failure guidelines recommend screening for cognitive impairment, but do not suggest which test to use. Cleveland Clinic researchers were the first to use Mini-Cog, a cognitive impairment screening test previously developed for use in geriatric populations, to assess patients hospitalized for heart failure. In this three-step test, patients were asked to memorize three unrelated words, draw a clock, and then recall the words. Researchers found that nearly a quarter of this population had cognitive impairment, which subsequently correlated with high rates of poor post-discharge outcomes. Patients with cognitive impairment were twice as likely to be readmitted or die within 30 days of hospital discharge. The risk was higher among patients discharged to home rather than a post-acute facility.

**Readmission or Death**

- **High-likelihood of cognitive impairment:** 47% at 30 days post-discharge
- **Low-likelihood of cognitive impairment:** 22%

*P-value < .001*
ValveXchange Heart Valve System

In 2011, Cleveland Clinic was first to implant the ValveXchange® heart valve system. This novel approach to valve replacement may eliminate the need for invasive surgery when the need arises for leaflet replacement. The technology may also simplify open procedures. Because the system uses bioprosthetic materials, patients do not need lifelong anticoagulant therapy. Since the initial implant in 2011, the system has been approved for use in Europe and is awaiting FDA trials for approval for use in the United States.

Sutureless Transcatheter Mitral Stent Valve

Researchers at Cleveland Clinic have developed a sutureless transcatheter mitral stent valve delivery system. Although catheter-based devices do exist for aortic valve replacement, this is the first system designed for catheter-based mitral valve replacement. The device may be an appropriate treatment option for patients with severe mitral regurgitation who are not candidates for surgery, which is currently required for mitral valve replacement. The design includes two sets of stent wings that surround the valve and incorporate leaflets against the valve annulus. The wings open with stent self-expansion, so that the stent-valve attaches securely to the valve annulus through radial force. The prosthetic valve is positioned over the native valve.
Identifying Dysfunctional HDL

High-density lipoprotein (HDL) is associated with heart-protective properties. However, recent studies at Cleveland Clinic identified build-up and oxidation of the primary protein in HDL, apolipoprotein A1 (apoA1), in the artery wall during development of coronary artery disease (CAD). The build-up of the oxidized apoA1 in the arteries was shown to be linked to development of inflammation in the artery wall and an increased risk of CAD. Cleveland Clinic researchers have developed an antibody that detects trace levels of the oxidized and “dysfunctional” apoA1 and HDL present in the artery wall, based on the small amount that leaches back out into the bloodstream. This new test may help identify patients at greatest risk of developing atherosclerosis. It may also help identify the need for early and more aggressive preventive treatment efforts in patients who have not been identified by traditional risk factors as being at risk for cardiovascular disease and disease progression.
Nanostim Pacemaker

Cleveland Clinic was one of only three hospitals in the United States to implant the first leadless pacemaker. The Nanostim™ is more than 90 percent smaller than a traditional pacemaker. The device is battery-powered. A sensor electrode receives information about the heart rate, which is processed with miniature software, and a generator sends stimulation to the heart as needed. The Nanostim is implanted directly in the heart using a catheter that is guided through the femoral vein. Traditional pacemakers require a chest incision and creation of a pocket to implant the pacemaker and leads (wires) that carry electrical impulses to the device. Eliminating the incision and leads reduces the risk of complications, such as infection and broken and dislodged leads. The Nanostim is awaiting approval in the United States and is currently being studied only in patients who require single-chamber pacing.

Screening for Retired NFL Players

Cleveland Clinic has partnered with the NFL Player Care Foundation to help retired NFL players improve their quality of life and stay healthy. Players receive free comprehensive cardiovascular screenings in addition to urologic health evaluations and prostate exams. More than 500 former players are expected to participate by the end of 2014.
Edward B. Savage, MD

**Chairman,** Robert and Suzanne Tomsich Department of Cardiothoracic Surgery, Cleveland Clinic Florida

**Specialty Interests:** Mitral valve repair, complex valve surgery, off-pump coronary artery bypass, minimally invasive and robotic surgery; thoracic aortic aneurysm surgery, ventricular remodeling, surgical treatments for congestive heart failure, surgical treatment of atrial fibrillation, lung cancer, chest tumors

**Medical Degree:** Yale University School of Medicine, New Haven, Conn.

**Advanced Training:** Hospital of the University of Pennsylvania, Philadelphia; Brigham & Women's Hospital, Boston

**Board Certifications:** American Medical Board of Surgery and the American Board of Thoracic Surgery

**Clinic Appointment:** 2009

Dr. Savage is an avid fitness enthusiast and enjoys swimming, biking and training with weights. He has earned black belt in Shotokan karate.
Nicolas A. Brozzi, MD

**Staff Surgeon,** Robert and Suzanne Tomsich Department of Cardiothoracic Surgery, Cleveland Clinic Florida

**Specialty Interests:** Heart transplant and mechanical circulatory support, surgery for aortic aneurysms, minimally invasive cardiac surgery, transcatheter surgery for the aorta and cardiac valves, coronary by-pass grafting, cardiac reoperations, surgical treatment of atrial fibrillation, surgical simulation and education

**Medical Degree:** University of Buenos Aires, Buenos Aires, Argentina

Advanced Training: Hospital Italiano, Buenos Aires, Argentina; Cleveland Clinic Foundation, Cleveland

**Board Certifications:** Ministry of Public Health and Social Welfare of Argentina; College of Cardiovascular Surgeons of Argentina

**Clinic Appointment:** 2012
Dr. Brozzi is an avid skier and fisherman.

Cedric D. Sheffield, MD

**Staff Surgeon,** Robert and Suzanne Tomsich Department of Cardiothoracic Surgery, Cleveland Clinic Florida

**Specialty Interests:** Heart Transplantation and Mechanical Circulatory Support, Mitral valve repair and replacement, aortic valve replacement, coronary bypass surgery, cardiac re-operations, lung surgery, atrial fibrillation surgery, heart failure surgery, surgery research

**Medical Degree:** Duke University School of Medicine, Durham, North Carolina (Honors)

Advanced Training: Baylor College of Medicine, Houston; University of Maryland Hospital, Baltimore; Maryland Shock Trauma Institute, Baltimore; University of Arkansas for Medical Sciences-Arkansas Children’s Hospital, Little Rock; Cleveland Clinic Foundation, Cleveland

**Board Certifications:** American Board of Thoracic Surgery

**Clinic Appointment:** 2014
Dr. Sheffield enjoys numerous outdoor activities including boating and fishing and lives an active rural lifestyle.
Evaluation for Cardiac Surgery  954.659.5320
Office support personnel expedite the request for consult, organize the patient’s schedule and address questions.

Evaluation for Thoracic Surgery  954.659.5320
Office support personnel expedite the request for consult, organize the patient’s schedule and address questions.

Hospital Transfer  954.659.5320
The cardiothoracic surgery office will facilitate the transfer of a patient from any hospital to Cleveland Clinic Florida.

Direct to Surgeon  954.659.5320
This is the cardiothoracic surgery office. Your call will be directed to the stated surgeon.

Emergencies  954.689.5000
A cardiothoracic surgeon is available 24 hours a day. The on-call surgeon can be reached through the hospital operator.

Location
The cardiothoracic surgery office is located at the Cleveland Clinic Florida in Weston.
Cleveland Clinic leads the nation in cardiovascular care and is home to heart, vascular, and thoracic specialists who are among the best in the world. They work with referring physicians to coordinate care and ensure the best possible outcomes and experience for every patient.

The Sydell and Arnold Miller Family Heart & Vascular Institute is located at Cleveland Clinic’s main campus. Here, 189 staff physicians, 117 residents and fellows, and 1,400 nurses devote their time and skills to caring for patients with cardiovascular, thoracic, and vascular disease. Comprehensive care includes collaboration with 54 vascular surgery and cardiovascular intensive care anesthesiologists and 3,000 Cleveland Clinic staff physicians in 120 medical and surgical specialties and subspecialties.

To promote quality improvement, Cleveland Clinic has created a series of Outcomes books similar to this one for many of its programs and affiliate programs. Although we are unable to report all outcomes for all treatments provided – omission of outcomes for a particular treatment does not necessarily mean we do not offer that treatment – our goal is to increase outcomes reporting each year. When there are no recognized clinical outcome measures for a specific treatment, we may report process measures associated with improved outcomes. When process measures are unavailable, we may report volume measures; a volume/outcome relationship has been demonstrated for many treatments, particularly those involving surgical techniques.

In addition to our internal efforts to measure clinical outcomes, Cleveland Clinic supports transparent public reporting of healthcare quality data and participates in the following public reporting initiatives:

- Joint Commission Performance Measurement Initiative (qualitycheck.org)
- Centers for Medicare & Medicaid Services (CMS) Hospital Compare (hospitalcompare.hhs.gov)
- Ohio Department of Health (ohiohospitalcompare.ohio.gov)
- Cleveland Clinic Quality Performance Report (clevelandclinic.org/QPR)

Our commitment to providing accurate, timely information about patient care reflects Cleveland Clinic’s culture of continuous improvement and may help referring physicians make informed decisions.

We hope you find these data valuable. To view all our Outcomes books, please visit Cleveland Clinic’s Quality and Patient Safety website at clevelandclinic.org/outcomes.