



Measuring and understanding outcomes of medical treatments promotes quality improvement. Cleveland Clinic has created a series of Outcomes books similar to this one for its clinical institutes. Designed for a physician audience, the Outcomes books contain a summary of many of our surgical and medical treatments, with a focus on outcomes data and a review of new technologies and innovations.

The Outcomes books are not a comprehensive analysis of all treatments provided at Cleveland Clinic, and omission of a particular treatment does not necessarily mean we do not offer that treatment. 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 relationship has been demonstrated between volume and improved outcomes for many treatments, particularly those involving surgical and procedural techniques.

In addition to these institute-based books of clinical outcomes, Cleveland Clinic supports transparent public reporting of healthcare quality data. The following reports are available to the public:

- Joint Commission Performance Measurement Initiative (qualitycheck.org)
- Centers for Medicare and Medicaid Services (CMS) Hospital Compare (medicare.gov/hospitalcompare), and Physician Compare (medicare.gov/PhysicianCompare)
- Cleveland Clinic Quality Performance Report (clevelandclinic.org/QPR)

Our commitment to transparent reporting of 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, and we invite your feedback. Please send your comments and questions via email to:

OutcomesBooksFeedback@ccf.org.

To view all of our Outcomes books, please visit clevelandclinic.org/outcomes.



Dear Colleague:

Welcome to this 2016 Cleveland Clinic Outcomes book. Every year, we publish Outcomes books for 14 clinical institutes with multiple specialty services. These publications are unique in healthcare. Each one provides an overview of medical or surgical trends, innovations, and clinical data for a particular specialty over the past year. We are pleased to make this information available.

Cleveland Clinic uses data to manage outcomes across the full continuum of care. Our unique organizational structure contributes to our success. Patient services at Cleveland Clinic are delivered through institutes, and each institute is based on a single disease or organ system. Institutes combine medical and surgical services, along with research and education, under unified leadership. Institutes define quality benchmarks for their specialty services and report on longitudinal progress.

All Cleveland Clinic Outcomes books are available in print and online. Additional data are available through our online Quality Performance Reports (clevelandclinic.org/QPR). The site offers process measure, outcome measure, and patient experience data in advance of national and state public reporting sites.

Our practice of releasing annual Outcomes books has become increasingly relevant as healthcare transforms from a volume-based to a value-based system. We appreciate your interest and hope you find this information useful and informative.

Sincerely,

A handwritten signature in black ink, appearing to read "DMC".

Delos M. Cosgrove, MD
CEO and President

what's inside

Chairman Letter_____	04	Heart Failure and Transplant	59
Introduction_____	05	Lung and Heart-Lung Transplant	62
Institute Overview_____	06	Peripheral Vascular Disease	64
Quality and Outcomes Measures		Cerebrovascular Disease	71
Surgical Overview	08	Thoracic Surgery	72
Ischemic Heart Disease		Preventive Cardiology and Rehabilitation	79
Interventional Treatment	13	Surgical Quality Improvement	86
Surgical Treatment	16	Patient Experience — Heart & Vascular Institute	90
AMI	21	Cleveland Clinic — Implementing	
Cardiac Rhythm Disorders	22	Value-Based Care	92
Valve Disease	32	Innovations_____	100
Aortic Disease	41	Contact Information_____	104
Hypertrophic Obstructive Cardiomyopathy	52	About Cleveland Clinic_____	106
Congenital Heart Disease	54	Resources_____	108
Pericardial Disease	57	Institute Resources_____	110

Chairman Letter



Dear Colleagues,

I am pleased to share this annual summary of outcomes from the Sydell and Arnold Miller Family Heart & Vascular Institute. This publication is a testament to Cleveland Clinic's commitment to tracking and reporting outcomes to help guide clinical decisions and continuously improve patient care.

Last year was a dynamic one for our institute. Noteworthy 2016 clinical and research accomplishments by our team included:

- Ranking among the 1.3% of US hospitals to earn a 3-star (highest) score in all 3 categories of the Society of Thoracic Surgeons' (STS) risk-adjusted quality ratings for adult cardiac surgery, as well as maintaining a 3-star STS ranking in lobectomy for lung cancer
- Leadership of several milestone studies published in premier journals, including the PRECISION, GLAGOV, and GAUSS-3 studies and major reports from the COMMENCE, PARTNER, and STAMPEDE trials
- Achievement of 0.3% procedural mortality across 374 transcatheter aortic valve replacement cases
- Implantation of a transcatheter tricuspid valved stent in a patient with severe tricuspid regurgitation, marking the world's first successful transcatheter tricuspid valve replacement
- Validation and publication of a novel sex-specific risk-scoring tool that improves mortality risk prediction in patients undergoing exercise treadmill testing
- Presentation of results from our first 1,000 robotically assisted mitral valve surgery cases, including a mortality rate of 0.1% (1/1,000) and a procedural success rate exceeding 99%
- Achievement of a 0% to 0.5% 30-day mortality outcome for isolated CABG, isolated AVR, isolated MV repair, and MV repair + CABG; this represents less than one-third the risk of death compared with other US Hospitals
- Completion of our busiest year ever for procedures and patient volume

We are deeply grateful for the generosity of our many donors who allow us to continue our research mission to improve the care of our patients.

We continue to pursue our goals of innovating and dealing with changes; preserving practice, education and research; and achieving superb outcomes and safety for our patients.

We welcome your feedback, questions, and ideas for collaboration. Please contact me via email at OutcomesBooksFeedback@ccf.org and reference the Heart & Vascular book in your message.

Sincerely,

A handwritten signature in black ink, appearing to read 'Lars G. Svensson'.

Lars G. Svensson, MD, PhD
Chairman, Miller Family Heart & Vascular Institute
Professor of Surgery, Cleveland Clinic Lerner College of Medicine

Introduction

Cleveland Clinic's Sydell and Arnold Miller Family Heart & Vascular Institute is home to many of the world's finest physicians practicing cardiovascular medicine and surgery. In 2017, Cleveland Clinic was named the No. 1 heart care program in America by *U.S. News & World Report* for the 23rd consecutive year.

More than 200 physicians and 1000 nurses work together in the institute to ensure that every patient receives the best outcome possible and an exceptional patient experience. Many individuals with cardiovascular diseases come to Cleveland Clinic after being told all treatment options have been exhausted and nothing more can be done for them.

The institute addresses a vast spectrum of conditions through its three broad departments — Cardiovascular Medicine, Thoracic and Cardiovascular Surgery, and Vascular Surgery. Patient needs are met through a structure of 12 umbrellas for various conditions under which 45 specialized centers are organized to foster collaborative, innovative approaches to care and advance research initiatives to improve patient outcomes.

By combining the core elements detailed above — a patient-centric, individualized approach to care, multidisciplinary collaboration, and unparalleled staff experience and expertise — the Miller Family Heart & Vascular Institute is able to achieve the extraordinary volumes and outcomes reported in the pages that follow.



Institute Overview

Heart & Vascular Institute Overview

2016

Patient visits	604,055
Admissions	13,525
Beds	421
Coronary intensive care	24
Heart failure intensive care	10
Cardiac, vascular, and thoracic surgery intensive care	76
Private patient rooms	283
Same-day recovery	28

Surgical Procedures

Cardiac Surgery

Cardiac surgeries	4284
Valve surgeries	3039
Coronary artery bypass grafting (isolated and combined)	1561
Aortic repairs	1228
Surgeries for septal myectomy	207
Congenital heart surgeries (adult and pediatric)	343
Robotically assisted cardiac surgeries	119

Transplant Surgery

Heart transplants	54
Lung transplants	110

Thoracic Surgery

General thoracic surgeries	1724
Esophageal surgeries	304

Vascular Surgery

Vascular surgeries (open and endovascular)	2796
Bypass surgeries	174
Arteriovenous access surgeries	421

The data reported in the Institute Overview reflect volumes at Cleveland Clinic's main campus only. Data in other areas of the book may reflect volumes for main campus and other Cleveland Clinic hospitals. For a complete list of Cleveland Clinic hospitals, visit clevelandclinic.org.



Aortic Surgery

Open ascending aorta and aortic arch repairs	709
Open descending aorta and thoracoabdominal repairs	34
Open abdominal aortic aneurysm repairs	102
Endovascular ascending aorta repairs	28
Endovascular descending aorta and thoracoabdominal repairs	265
Endovascular abdominal aortic aneurysm repairs	90

Cardiovascular Medicine Procedures

Interventional Cardiology

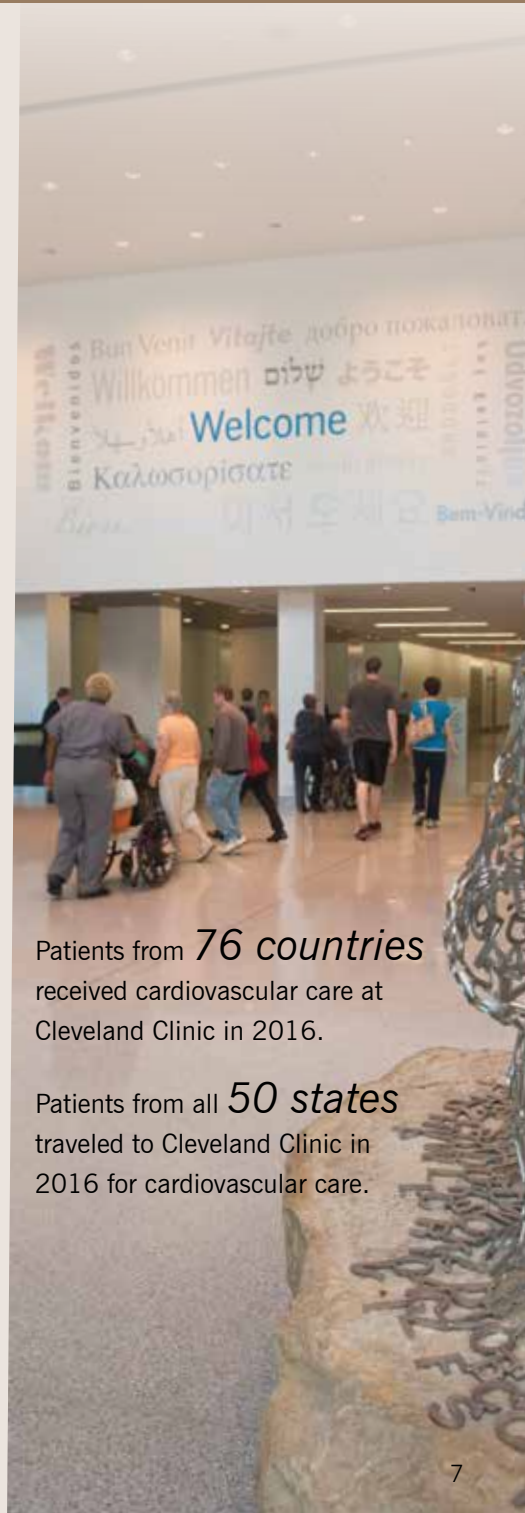
Diagnostic cardiac catheterizations	7831
Interventional cardiac procedures	1707
Percutaneous aortic valvuloplasties	59
Percutaneous mitral valvuloplasties	18
Percutaneous atrial septal defect and patent foramen ovale closures	46

Electrophysiology

Electrophysiology ablations	1583
Ablations for atrial fibrillation	935
Device implants	1457
Leads extracted	175

Diagnostic and Cardiac Imaging

Echocardiograms	79,575
Cardiac CT scans	8081
Cardiac MRI scans	3249
Stress tests	7999
Nuclear cardiology tests	
Tc-Myoview-rest	4271
Tc-Myoview-stress	4142
Rubidium heart (PET)	965
FDG heart (PET)	544
MUGA	58
N-13 ammonia heart	97



Patients from **76 countries** received cardiovascular care at Cleveland Clinic in 2016.

Patients from all **50 states** traveled to Cleveland Clinic in 2016 for cardiovascular care.