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The Section of General Thoracic Surgery, Department of Thoracic and Cardiovascular Surgery at Cleveland Clinic, is pleased to present our 7th edition of *Outcomes*.

Every year, additional therapeutic approaches for thoracic disease become available, and we have presented some windows into the future of new technologies.

The outcomes reported here are the result of the collaborative efforts of general thoracic surgeons, pulmonologists, gastroenterologists, thoracic anesthesiologists, and medical and radiation oncologists. In the future, treating patients with aerodigestive disease will become ever more complex and exciting as new surgical and medical technologies emerge. Maintaining a high level of care for our patients will require maintaining a high level of collaboration both within the Clinic and with our colleagues throughout the country and the world.

We hope that you will find this information helpful and thought provoking.

Bruce W. Lytle, M.D.
Chairman, Department of Thoracic and Cardiovascular Surgery

Opening Fall 2008

THE NEW HEART OF CLEVELAND CLINIC

Construction of the new, one million square foot Heart and Vascular Institute is expected to be completed in 2008. The 10-story hospital tower and technology center will feature:

The Sydell and Arnold Miller Family Pavilion: The new gateway and main entrance to Cleveland Clinic, the Sydell and Arnold Miller Family Pavilion will feature outpatient diagnostic facilities, including 115 examination rooms and 170 physician offices. There also will be laboratories and other clinical facilities to support our many specialty areas.

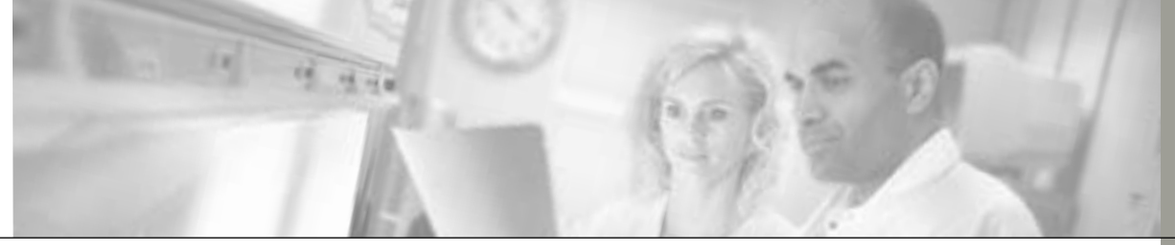
Technology Building: Surgeons and cardiologists will carry out complex and highly technical procedures, and patients will receive around-the-clock intensive care. The Technology Building will feature:

- 16 cardiothoracic operating rooms
- 12 cardiac catheterization labs
- 8 electrophysiology labs
- combined catheterization, electrophysiology, surgery preparation, and recovery area
- a hospital unit for patients to recover from same-day procedures
- 4 specialized intensive care units, including a coronary intensive care unit, a heart failure intensive care unit, and two surgical intensive care units
- cardiac radiology and nuclear medicine facilities

Hospital Tower: Inpatient facilities will feature 288 hospital beds (most in private rooms), with a focus on amenities that promote our "healing hospitality" concept of patient care.

Fully Equipped Conference Center: Telemedicine, satellite video, and digital imaging capabilities will enable doctors from around the world to meet, confer, and share knowledge.

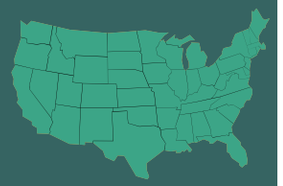
Overview



Cleveland Clinic thoracic surgeons specialize in the diagnois and surgical treatment of diseases of the lung and esophagus, including lung cancer, lung failure, swallowing disorders, airway disease, and esophageal cancer. Our staff offers a broad range of services, from cutting-edge screening techniques to the latest advances in minimally invasive surgical procedures.

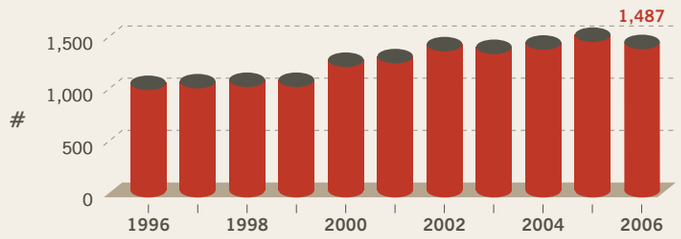
33 States

In 2006, patients from 33 different states in the country came to Cleveland Clinic for their thoracic surgery.



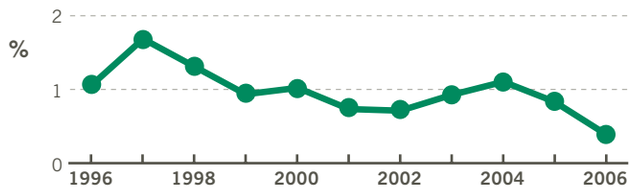
GENERAL THORACIC SURGERY

General Thoracic Surgery at Cleveland Clinic had an outstanding year, with 1,487 procedures performed in 2006.



MORTALITY

Overall mortality decreased significantly to 0.4%, despite the increasing complexity of procedures and comorbid patient illnesses.

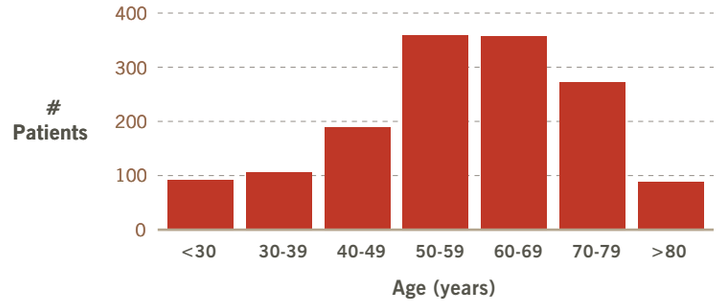


7 Countries

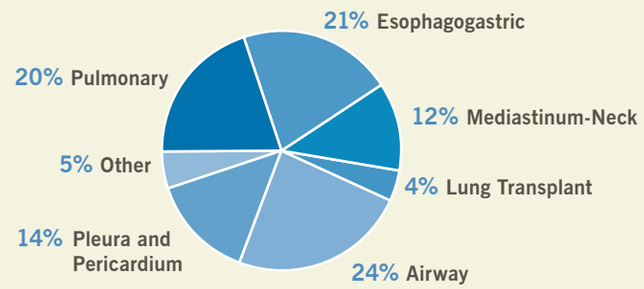
In 2006, patients from 7 different countries traveled to Cleveland Clinic for their thoracic surgery.

AGE DISTRIBUTION

Older age is a known risk factor that adversely affects hospital mortality.



DISTRIBUTION OF THORACIC PROCEDURES



Distal airway tumor treated with resection and reconstruction of the trachea and carina.

CT Scan

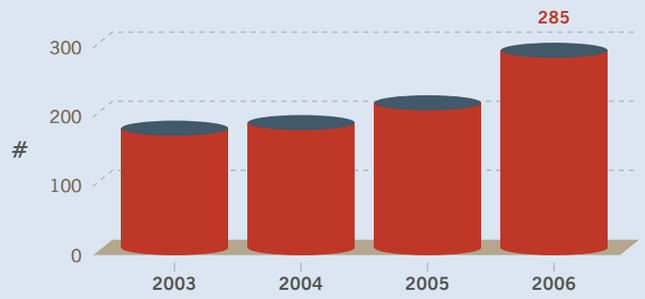
Bronchoscopy

Post-reconstruction

Pulmonary Resection

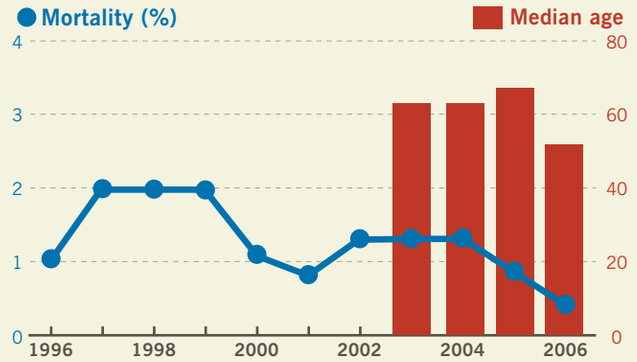
PULMONARY RESECTION

Anatomic pulmonary resection is the removal or resection of lung parenchyma for benign or pulmonary cancer. Pulmonary resections accounted for about 20% of all thoracic operations in 2006.

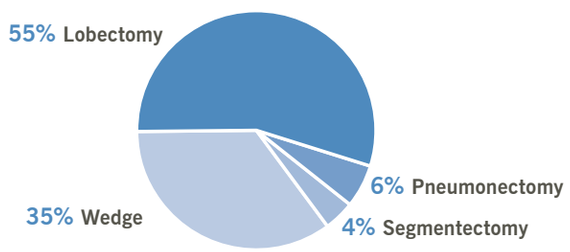


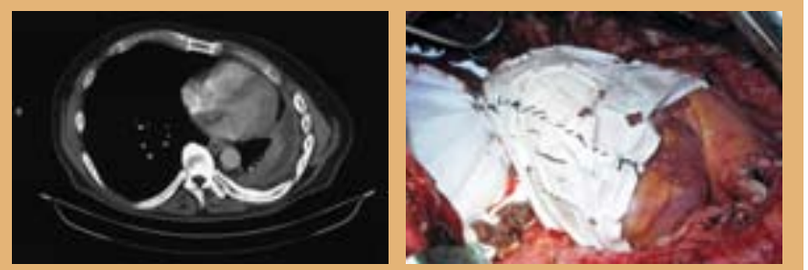
PULMONARY RESECTION MORTALITY

Hospital mortality for all pulmonary resections declined to 0.4% in 2006.



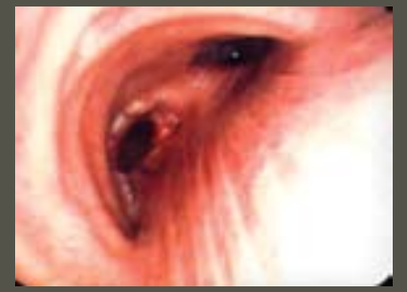
TYPES OF PULMONARY RESECTION





Extended resection and reconstruction of pericardium and diaphragm to treat mesothelioma.

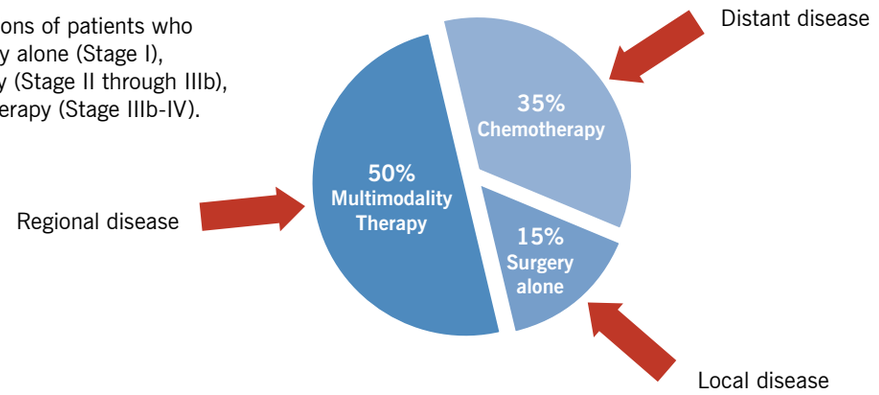
Endobronchial carcinoid tumor arising in the distal bronchus intermedius.



Postoperative result of right lower lobe sleeve resection and reimplantation of right middle lobe.

THERAPEUTIC OPTIONS

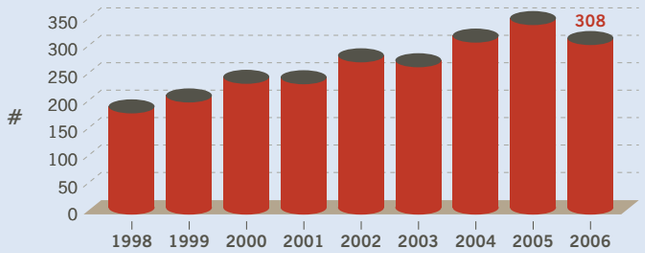
Approximate proportions of patients who are eligible for surgery alone (Stage I), multimodality therapy (Stage II through IIIb), or palliative chemotherapy (Stage IIIb-IV).



Esophageal Surgery

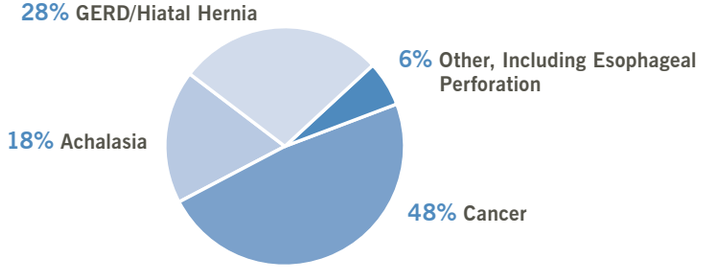
MAJOR ESOPHAGEAL SURGERY VOLUME

Major esophageal surgery includes resections for cancer and reparative surgery for motility and reflux disorders. In 2006, 308 esophageal operations were performed.

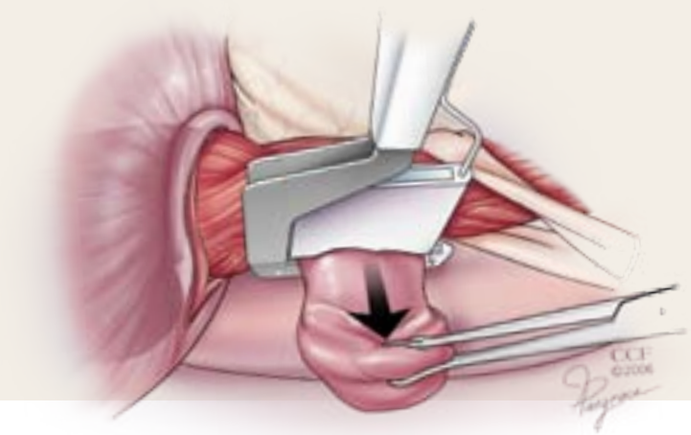


INDICATIONS FOR SURGERY

Resection of esophageal cancer accounted for 48% of esophageal operations in 2006.

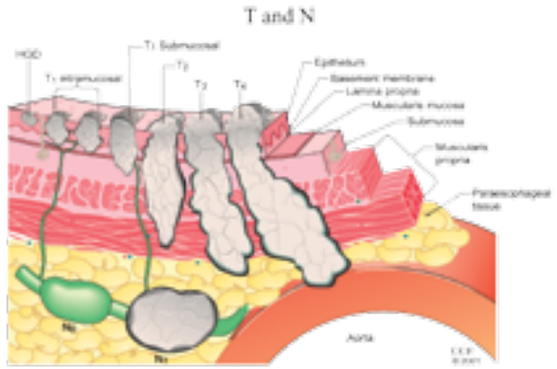


SURGICAL TREATMENT OF ESOPHAGEAL DIVERTICULUM

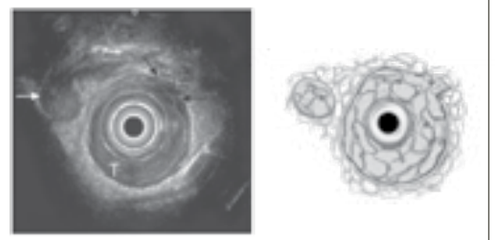


ESOPHAGECTOMY

Esophagectomy remains one of the most challenging of general thoracic operations. In 2006, more than half of resections were for locally advanced malignancy. These procedures were performed as part of a trimodality approach, with surgery following an intensive course of induction chemoradiation therapy.

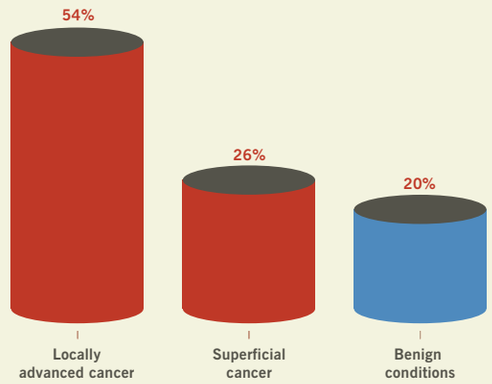


Histopathologic representation of esophageal invasion by cancer.



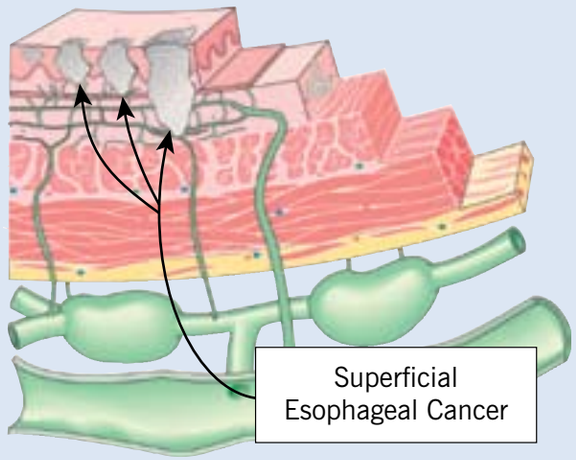
Endoscopic esophageal ultrasound image demonstrating localized lymph node involvement of esophageal wall.

INDICATIONS FOR ESOPHAGECTOMY



ESOPHAGECTOMY FOR SUPERFICIAL CANCER

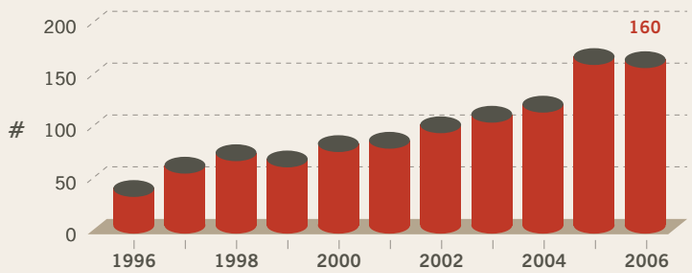
Patients with superficial esophageal cancer generally underwent resection without a chest incision (transhiatal esophagectomy).



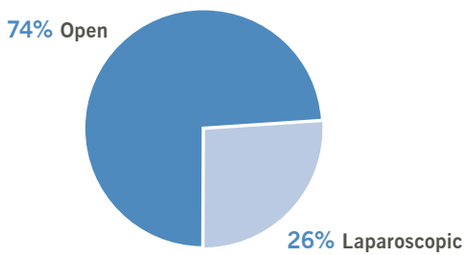
Benign Esophageal Surgery

BENIGN ESOPHAGEAL SURGERY VOLUME

Surgical procedures for gastroesophageal reflux disease (GERD) and paraesophageal hernia remained steady in 2006. Thoracic surgeons work with a multidisciplinary team in the Center for Swallowing and Esophageal Disorders to identify optimal candidates and the appropriate surgical approach.

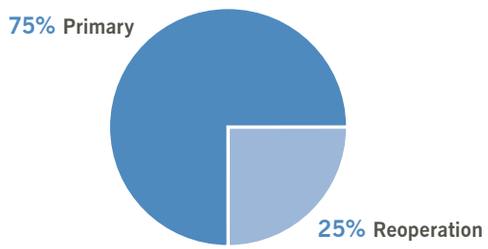


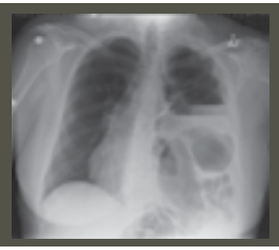
ANTIREFLUX SURGERY: SURGICAL APPROACH



PRIMARY OPERATIONS VERSUS REOPERATIONS

Reoperative surgery is an important part of our esophageal practice. The majority of esophageal reoperations are for failed antireflux procedures or unsuccessful interventions for achalasia.

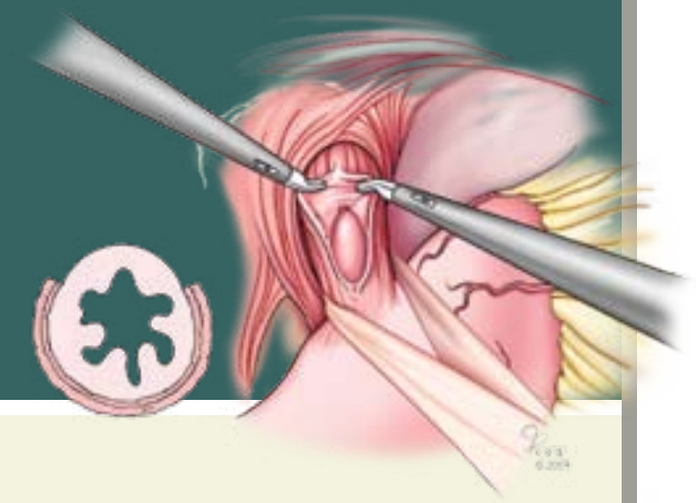




Chest radiogram demonstrating a giant paraesophageal hernia with herniation of abdominal contents into the left chest.

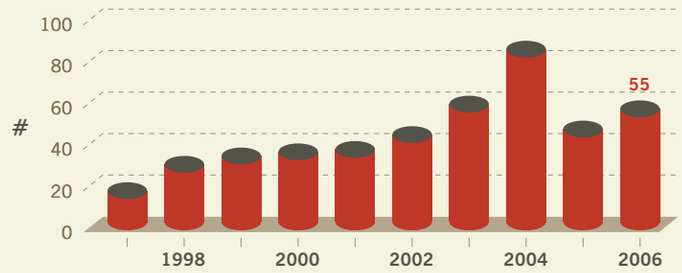
ESOPHAGEAL MYOTOMY

Today, our surgeons routinely perform laparoscopic myotomy as the primary therapy for achalasia. Using video-assisted surgery, the abnormally thickened esophageal muscle is incised to allow for improved swallowing, with reduced postoperative discomfort and decreased length of hospital stay.

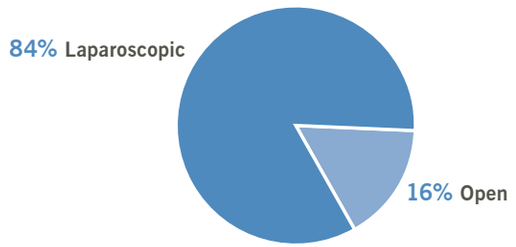


ACHALASIA SURGERY

Patients undergoing surgical myotomy for achalasia have benefited from recent advances in endoscopic surgery. This surgery has proven safe, effective, and durable. In 2006, 55 surgical procedures were performed for achalasia.



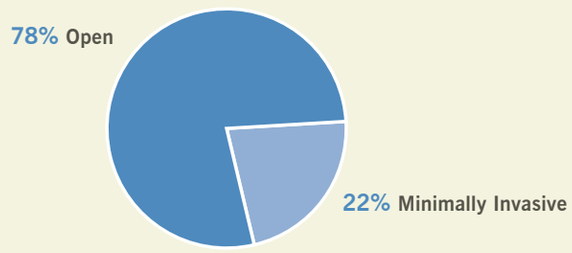
In 2006, 84% of myotomies were performed through a laparoscopic approach versus the standard laparotomy or thoracotomy.



Minimally Invasive

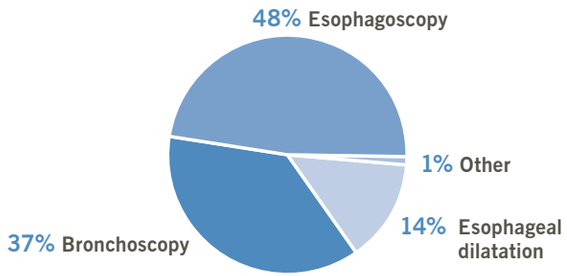
Minimally invasive surgery is used for a variety of chest diseases. Video-assisted lobectomy is preferred for early-stage lung cancer.

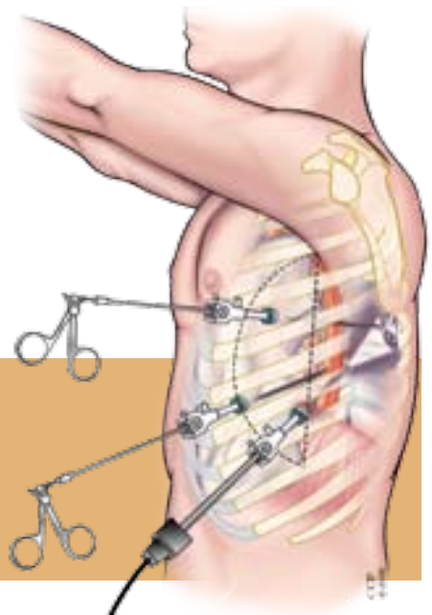
THORACIC PROCEDURES: SURGICAL APPROACH



ENDOSCOPY

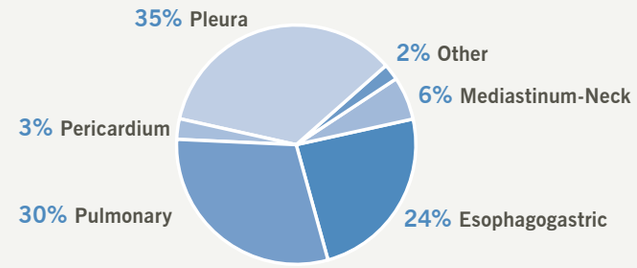
In 2006, 1,494 endoscopic and other minor procedures were performed, most on an outpatient basis.





Video-assisted thorascopic surgery (VATS) has been shown to reduce pain, shorten length of hospital stay, and offer a quicker recovery than traditional "open" surgery. This illustration shows the placement of operating ports for the VATS technique.

DISTRIBUTION OF MINIMALLY INVASIVE PROCEDURES



The Accidental Patient

Charles Braschwitz was diagnosed with lung cancer quite by accident — a mountain biking accident, to be exact. An MRI to assess internal injuries showed a mass in his left lung, lower quadrant. In time, the mass doubled in size. That's when thoracic surgeon David Mason, M.D., diagnosed bronchial alveolar carcinoma and recommended a video-assisted thoracoscopic (VATS) lobectomy.

Dr. Mason removed the malignant section of Mr. Braschwitz's lung using this minimally invasive procedure. No adjuvant therapy was required.

Three weeks after the surgery, Mr. Braschwitz was walking two hours a day. After a month, he rode his bike 10 miles. He credits Dr. Mason and his team's skill for his pain-free experience and quick recovery. "I feel good," he says. "Better than I have a right to feel!"

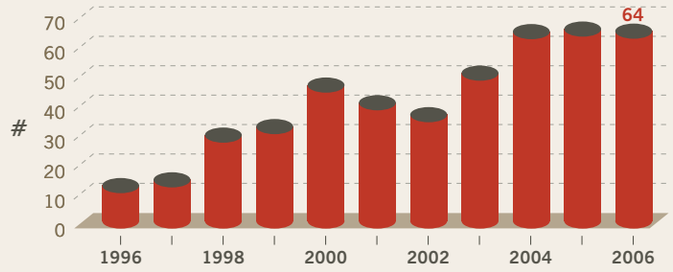
Lung Transplant

64
Number of lung transplants performed at Cleveland Clinic in 2006

12 *days*
Median hospital stay for lung transplant patients at Cleveland Clinic in 2006

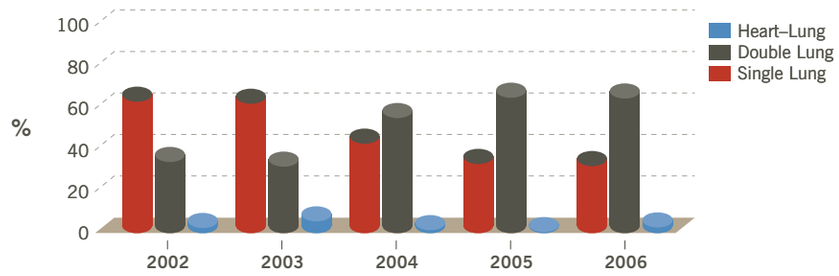
LUNG TRANSPLANT VOLUME

2006 was another successful year for the Lung Transplant Program, with 64 transplants performed at Cleveland Clinic.

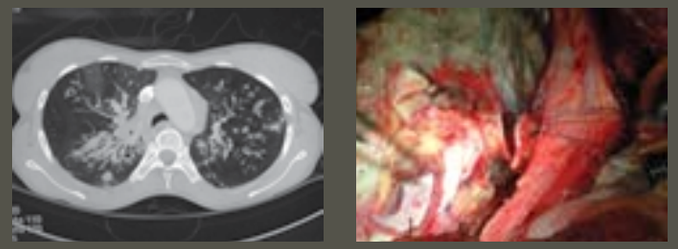


DISTRIBUTION OF LUNG TRANSPLANT PROCEDURES

Double lung transplants at Cleveland Clinic have significantly outpaced single lung transplants in recent years.



CT scan (left) of patient with cystic fibrosis undergoing double lung transplantation (right)

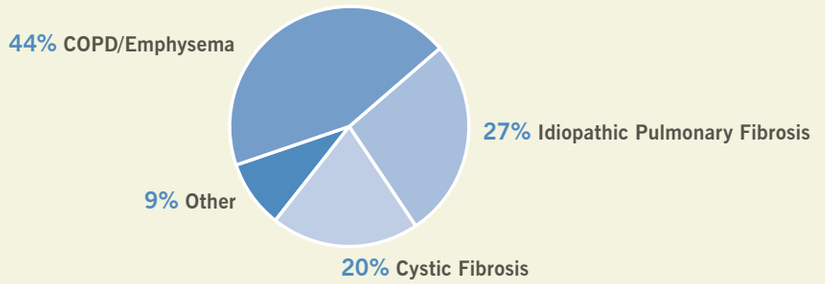


CT Scan

Donor Lung Implantation

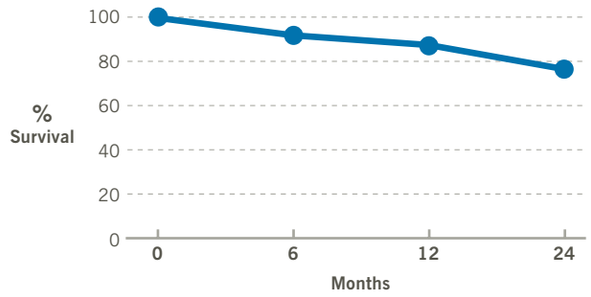
2006 DISTRIBUTION BY STATE, LUNG TRANSPLANTS (N=64)

INDICATIONS FOR LUNG TRANSPLANT



LUNG TRANSPLANT SURVIVAL: 2002 – 2006

From 2002 through 2006, 1-year survival for 269 Cleveland Clinic primary lung transplant patients was 88%.

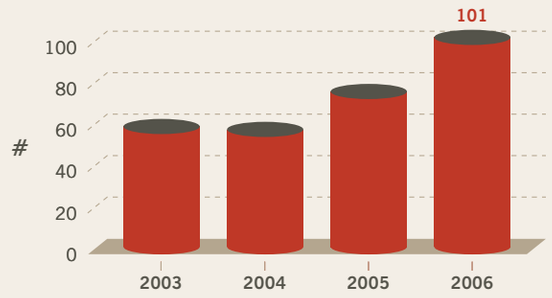


Airway

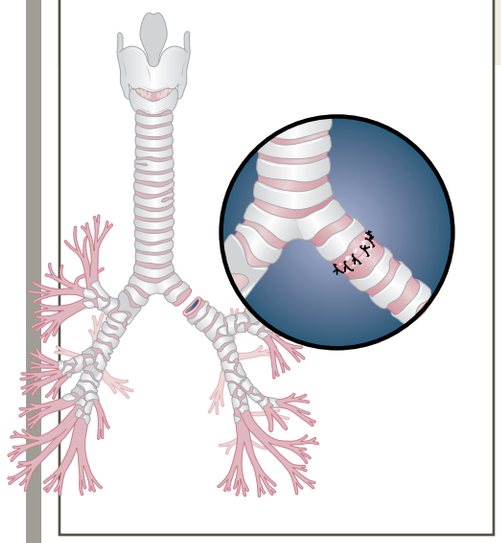
Other Thoracic

The volume of complex airway cases increased significantly in 2006. Tracheal resection and airway reconstruction represent the most challenging surgical procedures.

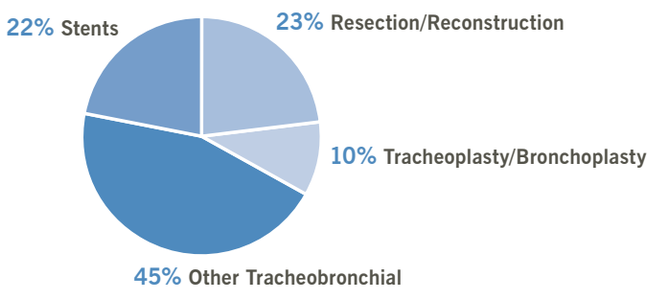
VOLUME OF MAJOR AIRWAY PROCEDURES



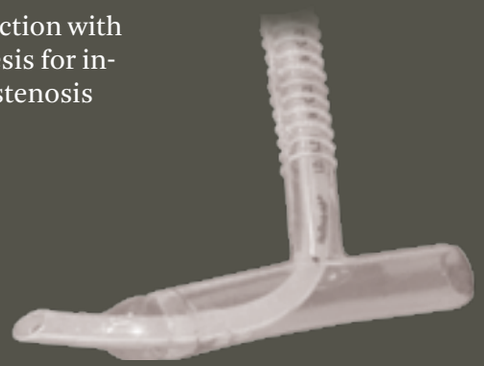
SLEEVE RESECTION
LEFT MAIN BRONCHUS



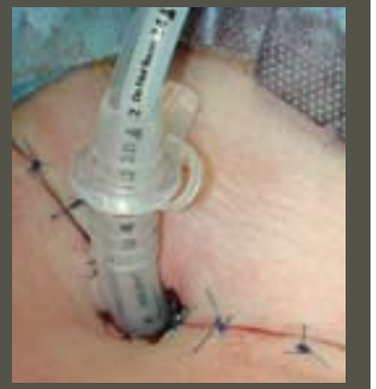
COMPLEX AIRWAY PROCEDURES



Airway reconstruction with Silastic® prosthesis for intractable airway stenosis



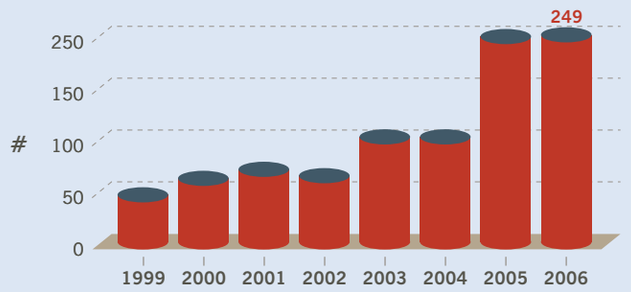
T-tube



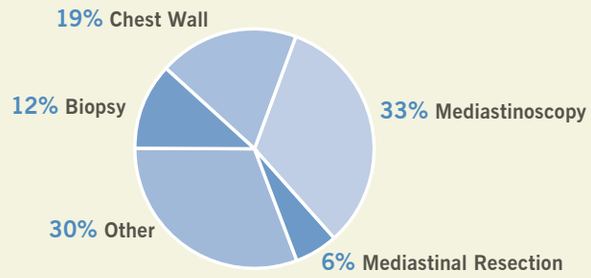
Prosthesis in place

MEDIASTINAL AND CHEST WALL SURGERY VOLUME

Mediastinal and chest wall procedures remained steady in 2006. These include resections for sarcoma, thymoma, breast cancer, and other tumors.

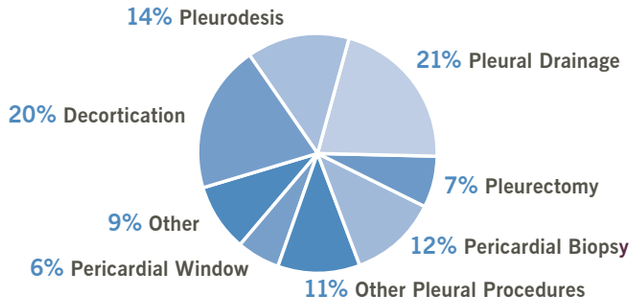


DISTRIBUTION OF MEDIASTINAL & CHEST WALL PROCEDURES



PLEURAL & PERICARDIAL PROCEDURES

In 2006, 205 procedures involving the pleura or pericardium were performed.



249

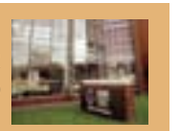
Number of mediastinoscopies performed in 2006

Affiliate Programs

The Cleveland Clinic Thoracic and Cardiovascular Surgery Affiliate Programs experienced another successful year by providing outstanding surgical care close to home and by adding two additional affiliate sites in 2006—Chester County Hospital in West Chester, Pennsylvania, and the Swedish Heart and Vascular Institute in Seattle, Washington. Overall, the affiliates contributed 1,337 thoracic procedures in 2006.

Cleveland Clinic and its affiliates have found that sharing standard clinical protocols, quality management, and efficiencies in administrative practice is mutually beneficial for the clinical staff and patients at each respective hospital.

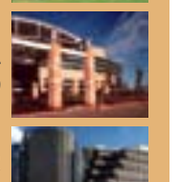
EMH REGIONAL MEDICAL CENTER
ELYRIA, OHIO



FAIRVIEW HOSPITAL
FAIRVIEW, OHIO

HILLCREST HOSPITAL
MAYFIELD HEIGHTS, OHIO

LAKEWEST HOSPITAL
WILLOUGHBY, OHIO



METROHEALTH MEDICAL CENTER
CLEVELAND, OHIO

ROCHESTER GENERAL HOSPITAL
ROCHESTER, NEW YORK

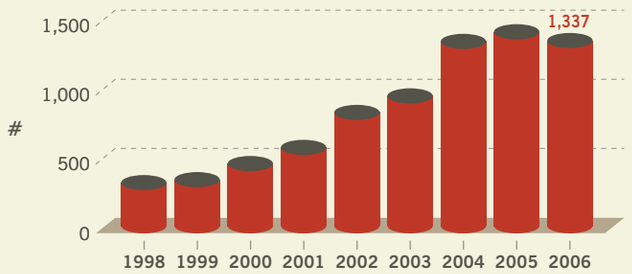
CLEVELAND CLINIC HOSPITAL
WESTON, FLORIDA

2006 — New affiliates

CHESTER COUNTY HOSPITAL
WEST CHESTER, PENNSYLVANIA

SWEDISH HEART AND VASCULAR INSTITUTE
SEATTLE, WASHINGTON

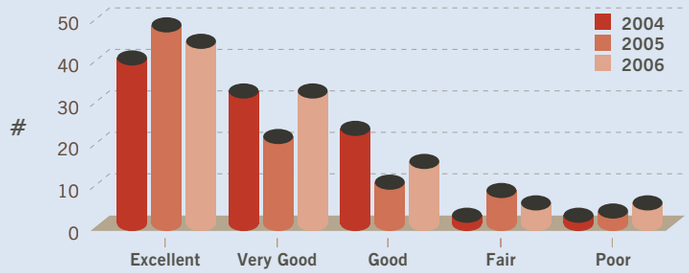
AFFILIATE THORACIC VOLUME



Patient Experience

HOSPITAL SATISFACTION

We ask our patients about their experiences and satisfaction with the services provided by our staff. Although results indicate that we are already providing excellent care, the department is committed to continuous improvement.



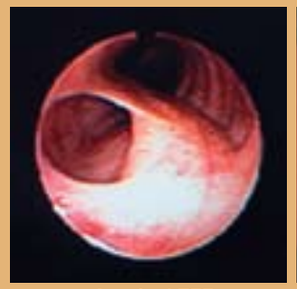
Imagining Tomorrow

Cystic fibrosis had its grip on Allyson Thadeus-Zappe since she was 16 months old. But it wasn't until after she gave birth to her daughter, Olivia, in 2001, that her health began to deteriorate. Her medication stopped working. She developed complications. In 2005, she was listed for a double lung transplant. By the new year, Ms. Thadeus-Zappe was on 10 liters of oxygen a day and IV nutrition around-the-clock. She weighed 95 pounds.

At the end of January 2006, a donor was identified, and Cleveland Clinic thoracic surgeons performed the transplant. One year later, Ms. Thadeus-Zappe is president of her local PTA, works part time at a restaurant and with LifeBanc, and is training for the 2008 U.S. Transplant Games in Pittsburgh. "I want to run the mile," she says.

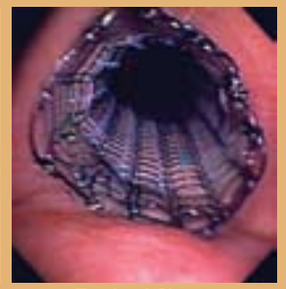
Tracheal and Esophageal Stenting

Cleveland Clinic is a referral center for complex aerodigestive problems, including tracheoesophageal fistula (TEF). Our surgeons have used minimally invasive techniques to treat these diseases.



Acquired TEF

Esophageal Shunt



Tracheal Shunt

Minimally Invasive Assessment of Esophageal Function

The catheter-free Bravo™ pH Monitoring System (Medtronic) represents a major innovation for testing esophageal acid exposure in patients with gastroesophageal reflux disease (GERD). The miniature capsule is placed during endoscopy and permits patients to resume their normal activities and diet. The Bravo probe naturally detaches from the esophagus after a few days and passes harmlessly through the digestive tract. A continuous read-out of acid content (pH) is transmitted to a pager-sized receiver. Cleveland Clinic staff are able to download and analyze this data to tailor an individualized treatment plan for GERD patients.

Endobronchial Valve

A new bronchoscopically placed valve is being developed for treating emphysema. The definitive clinical trial is planned for 2007.

PULMONARY DISEASE

Mason DP, Quader MA, Blackstone EH, Rajeswaran J, DeCamp MM, Murthy SC, Quader AK, Rice TW. Thromboembolism after pneumonectomy for malignancy: an independent marker of poor outcome. Journal of Thoracic and Cardiovascular Surgery 2006 Mar;131(3):711-718.

Venous thromboembolism is surprisingly common (7.4% prevalence) after pneumonectomy for malignancy. Its incidence peaked at 7 days, with most patients having been discharged and prophylaxis discontinued, and it portended poor long-term survival. Improved screening and better prophylaxis might prevent this complication and enhance outcomes.

Murthy SC, Okereke I, Mason DP, Rice TW. A simple solution for complicated pleural effusions. Journal of Thoracic Oncology 2006 Sep;1(7):697-700.

PleurX® catheters are safe, effective, and durable solutions for complicated pleural effusions and seem to provide an attractive alternative for patients who have few other palliative options.

Murthy SC. Air leak and pleural space management. Thoracic Surgery Clinics 2006 Aug;16(3):261-265.

Parenchymal air leakage following lung resection is the rule and not the exception. If there is no sign of improvement in the air leak by 1 week, bronchoscopy is recommended. For larger air leaks, reintervention should be considered if there is no improvement by 1 to 2 weeks.

MAJOR AIRWAY DISEASE

Ranes JL, Budev MM, Murthy S, Mehta AC. Management of tracheomediastinal fistulas using self-expanding metallic stents. Journal of Thoracic and Cardiovascular Surgery 2006 Mar;131(3):748-749.

Self-expanding metallic stents, by promoting formation of granulation tissue, are efficacious in treating complex airway fistulas.

Gildea TR, Murthy SC, Sahoo D, Mason DP, Mehta AC. Performance of a self-expanding silicone stent in palliation of benign airway conditions. Chest 2006 Nov;130(5):1419-1423.

Use of Polyflex® stents for treating benign airway conditions is associated with a high prevalence of complications. We have abandoned its use under such conditions in our practice.

ESOPHAGEAL DISEASE

Rice TW, Khuntia D, Rybicki LA, Adelstein DJ, Vogelbaum MA, Mason DP, Murthy SC, Blackstone EH. Brain metastases from esophageal cancer: a phenomenon of adjuvant therapy? Annals of Thoracic Surgery 2006 Dec;82(6):2042-2049, 2049.e1-e2.

A dose-related increased incidence of brain metastases after adjuvant therapy for esophageal cancer cannot be explained by increased longevity. Adjuvant therapy itself, not just advanced disease, appears to create conditions conducive to developing these rapidly fatal metastases.

Rice TW. Esophagectomy is the treatment of choice for high-grade dysplasia in Barrett's esophagus. American Journal of Gastroenterology 2006 Oct;101(10):2177-2179.

Because the natural history of high-grade dysplasia (HGD) is poorly understood and it is impossible to differentiate HGD from intramucosal cancer, HGD requires aggressive treatment. Esophagectomy safely eliminates HGD. Until a better biomarker for invasive cancer is available, esophagectomy is the treatment of choice for HGD.

Vela MF, Richter JE, Khandwala F, Blackstone EH, Wachsberger D, Baker ME, Rice TW. The long-term efficacy of pneumatic dilatation and Heller myotomy for the treatment of achalasia. Clinical Gastroenterology and Hepatology 2006 May;4(5):580-587.

No treatment cures achalasia. Short- and long-term success is similar for graded pneumatic dilatation and laparoscopic Heller myotomy. Therapeutic success decreases steadily over time. Achalasia patients need careful long-term follow-up evaluation.

Staff Biographies

Thomas W. Rice, M.D.

SPECIALTIES: General thoracic surgery, including esophageal, pulmonary, mediastinal, and diaphragm; and minimally invasive surgeries, including laparoscopic and thoracoscopic surgery.

MEDICAL DEGREE: University of Toronto Faculty of Medicine, Toronto, Ontario, Canada

SPECIAL TRAINING: St. Michael's Hospital and University of Toronto Faculty of Medicine, Toronto, Ontario, Canada; University of California, San Francisco, California

Dr. Rice enjoys spending time with his wife, three children, and grandchild and is an avid bridge player.

Sudish C. Murthy, M.D., Ph.D.

SPECIALTIES: Esophageal surgery; minimally invasive bronchoscopic, laparoscopic, and thorascopic surgery; general thoracic surgery; and lung transplantation.

MEDICAL DEGREE: Columbia University College of Physicians and Surgeons, New York, New York

DOCTORAL DEGREE: Pathology, University of British Columbia, Vancouver, British Columbia, Canada

SPECIAL TRAINING: Brigham and Women's Hospital and Harvard University, Boston, Massachusetts; Queen Mary Hospital Medical Center, Hong Kong

Dr. Murthy has competed in numerous team and individual sports. The spectrum encompasses playing football in Canada to running road races in Hong Kong.

David P. Mason, M.D.

SPECIALTIES: General thoracic surgery, minimally invasive thorascopic and laparoscopic surgery, lung cancer, esophageal cancer, malignant mesothelioma, and lung transplantation.

MEDICAL DEGREE: Columbia University College of Physicians and Surgeons, New York, New York

SPECIAL TRAINING: Brigham and Women's Hospital, Boston, Massachusetts

Dr. Mason is a native of Boston and an avid runner who enjoys training with his wife, a triathlete.

Gösta B. Pettersson, M.D., Ph.D.

SPECIALTIES: Adult acquired heart disease (including aneurysms of the thoracic aorta); reconstructive valve surgery; heart and lung transplantation; reoperations; endocarditis; complex coronary artery surgery; aortic and mitral valve repair/replacement (including the Ross procedure); and adult congenital heart surgery.

MEDICAL AND DOCTORAL DEGREES: University of Gothenburg, Gothenburg, Sweden

SPECIAL TRAINING: University of Illinois College of Medicine, Chicago, Illinois; Sahlgrenska University Hospital, Gothenburg, Sweden; University of Copenhagen and State University Hospital Rigshospitalet, Copenhagen, Denmark. Dr. Pettersson is licensed to practice medicine in Sweden, Denmark, Norway, the United Kingdom, and the United States

When time permits, Dr. Pettersson enjoys skiing, hunting, and horseback riding.

Eugene H. Blackstone, M.D.

SPECIALTIES: Adult and congenital cardiac surgery; adult thoracic surgery; novel mathematical models for analysis of time-related and longitudinal clinical outcomes; digital signal processing. Dr. Blackstone's multidisciplinary clinical research team is focused on ischemic and valvular heart diseases, heart rhythm disturbances, heart failure and benign and malignant diseases of the esophagus and lungs.

MEDICAL DEGREE: University of Chicago Division of Biological Sciences, Chicago, Illinois

SPECIAL TRAINING: University of Chicago, Chicago, Illinois; University of Alabama School of Medicine, Birmingham, Alabama

Dr. Blackstone is an organist and pianist, with a 68-rank, 4-manual pipe organ in his home.

R. Thomas Temes, M.D.

SPECIALTIES: Lung, esophageal, mediastinal, pleural, and other thoracic surgeries; minimally invasive surgery (laparoscopic and thorascopic); general thoracic surgery

MEDICAL DEGREE: Johns Hopkins University School of Medicine, Baltimore, Maryland

SPECIAL TRAINING: University of California-Davis Medical Center, Sacramento, California; Washington University School of Medicine/Barnes-Jewish Hospital, St. Louis, Missouri

Dr. Temes enjoys automobile mechanics, sailing, hiking, skiing, and other outdoor activities.

Contact Information

www.clevelandclinic.org/thoracic

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General Thoracic Surgery Scheduler	(216) 445-4585
Direct to Surgeon's Office, Main Campus	
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David P. Mason, M.D.	(216) 444-4053
Sudish C. Murthy, M.D., Ph.D.	(216) 444-5640
Gösta B. Pettersson, M.D., Ph.D.	(216) 444-2035
MetroHealth, Lakewood, Fairview	
R. Thomas Temes, M.D.	(216) 778-5461
Hospital Transfer	
The Appointment Center provides physicians with 24/7 hospital transfer assistance.	(216) 444-8302 (800) 553-5056
Lung Transplant Coordinators	(216) 445-1869
Lung Volume Reduction Coordinators	(216) 445-4215
Airway Center Coordinator	(216) 445-3180
Swallowing Center Evaluation	(216) 444-6536
Taussig Cancer Center	(216) 444-6833
Insurance Counselor	(216) 445-0430

CLEVELAND CLINIC

Founded in 1921, Cleveland Clinic is a not-for-profit academic medical center that integrates clinical and hospital care with research and education. Today, 1,700 Cleveland Clinic physicians and scientists practice in 120 medical specialties and subspecialties. Cleveland Clinic's main campus, with 41 buildings spanning 130 acres, includes a 1,000-bed hospital, an outpatient clinic, subspecialty centers, and supporting laboratories and facilities.

Cleveland Clinic also operates 13 family health centers, 8 community hospitals and 2 affiliate hospitals, and a medical facility in Weston, Florida.

Cleveland Clinic is determined to exceed the expectations of patients, families, and referring physicians. In light of this goal, we are committed to providing accurate and timely information about our patient care. Through participation in national initiatives, Cleveland Clinic supports transparent public reporting of healthcare quality data.

Cleveland Clinic participates in the following public reporting initiatives:

- Joint Commission Performance Measurement Initiative (qualitycheck.org)
- Centers for Medicare and Medicaid Services (CMS) Hospital Compare (hospitalcompare.hhs.gov)
- The Leapfrog Group (leapfroggroup.org)
- Ohio Department of Health Service Reporting (odh.state.oh.us)

In addition, this publication was produced to assist patients and referring physicians in making informed decisions. To that end, information about care and services is provided, with a focus on outcomes of care. For more information, please visit the Cleveland Clinic Quality web site at clevelandclinic.org/quality.

#1
Heart Center in America

For the 12th year in a row, the Cleveland Clinic Heart and Vascular Institute has been ranked America's number one heart program in *U.S. News & World Report's* prestigious "Best Hospitals" survey.