Measuring Outcomes Promotes Quality Improvement
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 disease-based institutes. Designed for a physician audience, the Outcomes books contain a summary of many of our surgical and medical treatments, with data on patient volumes and outcomes 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 techniques.

In addition to these institute-based books of 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 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 or scan here.

To view all our Outcomes books, please visit Cleveland Clinic’s Quality and Patient Safety website at clevelandclinic.org/outcomes.
Dear Colleague:

Welcome to this 2012 Cleveland Clinic Outcomes book. We distribute Outcomes books for more than 14 specialties. These publications are unique in healthcare. Each one provides a summary overview of medical or surgical trends, innovations, and clinical data for a Cleveland Clinic specialty over the past year.

Cleveland Clinic uses data to manage outcomes across the full continuum of care. Clinical services are delivered through patient-centered institutes, each based around a single disease or organ system. Institutes combine medical and surgical services, along with research and education, under unified leadership. The individual institute defines quality benchmarks for its specialty services and reports longitudinal progress.

All Cleveland Clinic Outcomes books are available in print and online. Additional data are available through our online Quality Performance Report (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 reports has received favorable notice from colleagues, media, and healthcare observers. We appreciate your interest and hope you find this information useful and informative.

Sincerely,

Delos M. Cosgrove, MD
CEO and President
what’s inside

Chairman’s Letter ........................................ 04
Institute Overview ........................................ 05
Quality and Outcomes Measures

Critical Care Medicine ................................. 08
The Respiratory Special Care Unit (ReSCU) .... 11
Bronchology .................................................. 13
Asthma Center .............................................. 16
Lung and Heart/Lung Transplantation ............. 17
Pulmonary Vascular Program ......................... 19
Pneumonia .................................................... 21
Institute Patient Experience ......................... 22
Cleveland Clinic —
Improving Quality, Safety, and the Patient Experience 24
Innovations ..................................................... 30
Selected Publications ................................. 38
Staff Listing .................................................. 44
Contact Information ..................................... 46
Institute Locations ...................................... 47
About Cleveland Clinic ................................. 48
Resources ..................................................... 50

Prefer an e-version?

Visit clevelandclinic.org/OutcomesOnline, and we’ll remove you from the hard copy mailing list and email you when next year’s books are online.
The Respiratory Institute is pleased to present the ninth edition of our Outcomes book. This book provides a concise overview of our clinical activities and programs, including reports of clinical volumes and patient outcomes. We believe it is important and useful to share this information with our referring physicians, training program alumni, potential patients, and other individuals interested in respiratory diseases.

At Cleveland Clinic, patients with respiratory diseases benefit from the expertise of a multidisciplinary team consisting of clinicians who specialize in pulmonary and critical care medicine, allergy and clinical immunology, and thoracic surgery, all working in close collaboration with thoracic radiologists and pulmonary pathologists.

In 2012, we experienced continued growth in our clinical programs, research funding, and application of innovative technologies. We are proud of these accomplishments and thankful for all those who helped us achieve this level of success. We are firmly committed to providing ever-increasing levels of clinical excellence in the future.

Herbert P. Wiedemann, MD, MBA
Chairman, Respiratory Institute
Institute Overview

At the Respiratory Institute, patients with pulmonary disorders benefit from the expertise of a multidisciplinary team of specialists. Specifically, experts in four departments — Pulmonary, Allergy and Critical Care Medicine; Thoracic and Cardiovascular Surgery; Thoracic Imaging; and Pulmonary Pathology — collaborate to care for these patients.

The institute provides comprehensive care for all patients with respiratory disorders. The staff’s national experts treat patients with the following conditions:

- Acute respiratory distress syndrome
- Allergies (allergic rhinitis, food, drug, latex, etc.)
- Asthma
- Beryllium-induced lung disease
- Chronic obstructive pulmonary disease, including alpha-1 antitrypsin deficiency
- Hereditary hemorrhagic telangiectasia (HHT)
- Idiopathic pulmonary fibrosis
- Interstitial lung disease
- Lung cancer
- Lymphangioleiomyomatosis
- Pulmonary alveolar proteinosis
- Pulmonary vascular diseases (idiopathic pulmonary hypertension, pulmonary embolic disease, etc.)
- Sarcoidosis

<table>
<thead>
<tr>
<th></th>
<th>2012</th>
<th>% Increase 2008–2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Visits</td>
<td>107,670</td>
<td>55%</td>
</tr>
<tr>
<td>Interstitial Lung Disease Visits</td>
<td>2,264</td>
<td>4%</td>
</tr>
<tr>
<td>Pulmonary Arterial Hypertension Visits</td>
<td>2,818</td>
<td>93%</td>
</tr>
<tr>
<td>Sarcoidosis Visits</td>
<td>2,404</td>
<td>79%</td>
</tr>
<tr>
<td>Lung Cancer Visits</td>
<td>1,412</td>
<td>80%</td>
</tr>
<tr>
<td>Chronic Obstructive Pulmonary Disease Visits</td>
<td>6,855</td>
<td>59%</td>
</tr>
<tr>
<td>Total Hospital Admissions</td>
<td>2,083</td>
<td>84%</td>
</tr>
<tr>
<td>Research Funding</td>
<td>$8.9 million</td>
<td>93%</td>
</tr>
<tr>
<td>Research Grants/Contracts</td>
<td>91</td>
<td>21%</td>
</tr>
</tbody>
</table>
In collaboration with thoracic surgery colleagues, institute staff evaluate patients for:

- Invasive diagnostic procedures (lung biopsy, mediastinoscopy, etc.)
- Pulmonary resections (lung cancer, etc.)
- Lung-volume reduction surgery for emphysema
- Pulmonary thromboendarterectomy (for chronic pulmonary hypertension secondary to thromboemboli)
- Lung transplantation

The Respiratory Institute’s six formal sections provide advanced subspecialization care in the fields of allergy and clinical immunology, bronchology, critical care medicine, lung transplantation, respiratory therapy, and sleep medicine. Diagnosing and managing the full spectrum of respiratory and allergic disorders, the Respiratory Institute handles more than 121,000 patient visits annually.

Also within the institute are the following centers: Center for Major Airway Diseases (in conjunction with Thoracic Surgery), Asthma Center, Hereditary Hemorrhagic Telangiectasia (HHT) Center, and Alpha-1 Antitrypsin Deficiency Center of Excellence.

The Cleveland Clinic HHT Center, established in 2012, comprises a multidisciplinary group of specialists who provide comprehensive management and screening for the various organ manifestations of this rare and complex disease. The HHT Center facilitates timely and expedited care for patients by ensuring multiple coordinated appointments and a team approach to care.

The institute also brings care into the community, providing outpatient services at the Avon Richard E. Jacobs Health Center (Pulmonary & Allergy), Beachwood Family Health and Surgery Center (Pulmonary), Brunswick Family Health Center (Pulmonary), Chagrin Falls Family Health Center (Pulmonary & Allergy), Independence Family Health Center (Pulmonary & Allergy), Medina Medical Office Building (Allergy), Mentor Medical Office Building (Pulmonary), Strongsville Family Health and Surgery Center (Pulmonary & Allergy), Twinsburg Family Health and Surgery Center (Pulmonary & Allergy), Willoughby Hills Family Health Center (Pulmonary & Allergy), and Wooster Family Health Center (Pulmonary & Allergy). Respiratory Institute staff also provide comprehensive (ICU, inpatient, outpatient) pulmonary care at Hillcrest Hospital, Euclid Hospital, Fairview Hospital, and South Pointe Hospital.

This past year, the institute has seen continued growth in clinical programs and research activities, which are primarily conducted at Cleveland Clinic’s main campus facilities (clinics, hospital, and research laboratories). The collaboration between clinicians and researchers helps close the gap between the laboratory discoveries of today and the patient care of tomorrow.
Outpatient Visits

2008 – 2012

Outpatient Visits (in thousands)

Pulmonary and Critical Care

Allergy

2008 78,062
2009 88,970
2010 95,755
2011 107,670
2012 121,383

N = 121,383

Lung Transplants (Includes Heart/Lung and Liver/Lung)

2008 – 2012

Procedures

2008 57
2009 157
2010 122
2011 108
2012 104

N = 104

Bronchoscopies

2008 – 2012

Procedures

2008 2,365
2009 2,572
2010 2,771
2011 3,109
2012 3,546

N = 3,546
The Respiratory Institute manages and staffs the Medical Intensive Care Unit (MICU) at Cleveland Clinic. The unit has seen a steady increase in patient volume over the past six years, with the unit now consisting of 64 dedicated beds.

The unit is staffed by board-certified intensivists, who have been providing in-house coverage 24 hours a day since July 2008. Patient outcomes continue to be excellent, as exhibited by mortality rates below the risk-adjusted predicted values, improving infection rates, and low readmission rates within 48 hours of discharge.

**Mean APACHE IV Score and Standardized Mortality Ratio (Observed to Expected)**

### MICU APACHE IV* Acuity Score

<table>
<thead>
<tr>
<th>Year</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011</td>
<td>71.0</td>
</tr>
<tr>
<td>2012</td>
<td>72.0</td>
</tr>
</tbody>
</table>

**2011 – 2012**

<table>
<thead>
<tr>
<th>2011</th>
<th>N = 2,881</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012</td>
<td>N = 3,515</td>
</tr>
</tbody>
</table>

### MICU Standardized Mortality Ratio

<table>
<thead>
<tr>
<th>Year</th>
<th>Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011</td>
<td>1.00</td>
</tr>
<tr>
<td>2012</td>
<td>0.98</td>
</tr>
</tbody>
</table>

**2011 – 2012**

<table>
<thead>
<tr>
<th>2011</th>
<th>N = 2,881</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012</td>
<td>N = 3,515</td>
</tr>
</tbody>
</table>

*The Acute Physiology, Age, and Chronic Health Evaluation system (APACHE IV) is used to risk-adjust the Respiratory Institute’s population of critical care patients.

Cleveland Clinic’s APACHE IV mean score of 72 for 2012 is well above the benchmark of 54 from a large adult population that reflects the current practice of critical care in the United States.¹

**Reference**

Admissions to the MICU grew 10% compared with 2011, reaching 4,544 patients in 2012. Direct interhospital transfers account for 38% of total MICU admissions. Occupancy has remained above 92% throughout the year. MICU length of stay remained stable and was less than predicted by more than a day. Readmission rates within 48 hours of MICU discharge have remained well below 2%.
Infection rates at Cleveland Clinic, including in the MICU, continue to decrease despite increased patient volumes and acuity.

**MICU Central Line-Associated Bloodstream Infections**

2008 – 2012

Rate (per 1,000 Line Days)

![Bar chart showing the rates of central line-associated bloodstream infections from 2008 to 2012, with the CDC/NHSN 25th to 75th percentile indicated.]

Centers for Disease Control and Prevention’s National Healthcare Safety Network (CDC/NHSN).

**MICU Nosocomial Ventilator-Associated Pneumonia**

2008 – 2012

Rate (per 1,000 Vent Days)

![Bar chart showing the rates of ventilator-associated pneumonia from 2008 to 2012, with the CDC/NHSN 25th to 75th percentile indicated.]

Centers for Disease Control and Prevention’s National Healthcare Safety Network (CDC/NHSN).

**MICU C. difficile Infections**

2008 – 2012

Rate (per 1,000 Patient Days)

![Bar chart showing the rates of C. difficile infections from 2008 to 2012.]

No accepted benchmark exists for unit-acquired *C. difficile*.
The Respiratory Special Care Unit (ReSCU) was created for patients who depend on mechanical ventilation, but who are otherwise healthy enough to leave the intensive care unit. The primary goals of the ReSCU are to:

- Help patients breathe without a ventilator
- Teach patients self-care
- Teach family members how to care for the patient and manage the ventilator at home
- Prepare the patient and family for the patient’s discharge to another facility

When appropriate, patients on partial or complete ventilator support are discharged to long-term acute care facilities before being completely weaned from the mechanical ventilator.

**Status at ReSCU Discharge**

**2008 – 2012**

**Patients (%)**

<table>
<thead>
<tr>
<th>Year</th>
<th>Completely Weaned</th>
<th>Full Ventilator Support</th>
<th>Partial Ventilator Support</th>
<th>Died in ReSCU</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008</td>
<td>54</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2009</td>
<td>55</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2010</td>
<td>57</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2011</td>
<td>81</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2012</td>
<td>91</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

N = 54 55 57 81 91
## ReSCU Statistics 2012

<table>
<thead>
<tr>
<th>Category</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of patients successfully weaned</td>
<td>58 (63.7%)</td>
</tr>
<tr>
<td>Number of patients on partial ventilator support</td>
<td>5 (5.5%)</td>
</tr>
<tr>
<td>Number of patients on full ventilator support</td>
<td>25 (27.5%)</td>
</tr>
<tr>
<td>Number of deaths</td>
<td>3 (3.3%)</td>
</tr>
<tr>
<td>Average length of stay (days) before successful weaning</td>
<td>8.7</td>
</tr>
<tr>
<td>Average length of stay (days) overall</td>
<td>25.9</td>
</tr>
</tbody>
</table>

Based on data from January 1 to December 31, 2012.
Cleveland Clinic's Respiratory Institute provides a full range of advanced diagnostic and interventional bronchoscopy techniques. The institute has some of the world's most extensive experience with:

- Electromagnetic navigation
- Lung transplant-related airway disease
- Airway stenting
- Management of airway complications due to histoplasmosis
- Benign airway diseases
- Metallic stent removal

Staff physicians performed 3,546 bronchoscopies during 2012, a 67% increase in five years. Most important, the institute's complication rates remain low.

### Selected Procedure Volumes 2012

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Volumes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transbronchial lung biopsy</td>
<td>1,354</td>
</tr>
<tr>
<td>Transbronchial needle aspiration</td>
<td>889</td>
</tr>
<tr>
<td>Endobronchial ultrasound (EBUS)</td>
<td>746</td>
</tr>
<tr>
<td>Electrocautery/laser/cryoablation</td>
<td>234</td>
</tr>
<tr>
<td>Electromagnetic navigation</td>
<td>106</td>
</tr>
<tr>
<td>Balloon/rigid airway dilation</td>
<td>373</td>
</tr>
<tr>
<td>Bronchial/tracheal stenting/T-tube</td>
<td>148</td>
</tr>
<tr>
<td>Bronchial thermoplasty</td>
<td>42</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>3,892</strong></td>
</tr>
</tbody>
</table>

Total includes multiple advanced procedures per case.
The post-bronchoscopy complication rate is far lower than expected, based on published averages.

References

**AQuIRE Bronchoscopy Registry Indicator Analysis**  
**November 2011 – June 2012**

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Respiratory Institute</th>
<th>Overall Multi-Institution Registry</th>
</tr>
</thead>
<tbody>
<tr>
<td>Success rate of interventional procedures in patients with nonmalignant disease</td>
<td>98.77% (N = 81)</td>
<td>97.65% (N = 213)</td>
</tr>
<tr>
<td>Complication rate of interventional procedures in patients with nonmalignant disease</td>
<td>1.23% (N = 81)</td>
<td>3.29% (N = 213)</td>
</tr>
<tr>
<td>Success rate of interventional procedures in patients with malignant disease</td>
<td>89.29% (N = 28)</td>
<td>96.43% (N = 168)</td>
</tr>
<tr>
<td>Complication rate of interventional procedures in patients with malignant disease</td>
<td>3.57% (N = 28)</td>
<td>1.19% (N = 168)</td>
</tr>
<tr>
<td>30-day mortality of interventional procedures in patients with nonmalignant disease</td>
<td>1.23% (N = 81)</td>
<td>5.16% (N = 213)</td>
</tr>
<tr>
<td>30-day mortality of interventional procedures in patients with malignant disease</td>
<td>9.8% (N = 28)</td>
<td>12.5% (N = 168)</td>
</tr>
</tbody>
</table>

For more information, see [chestnet.org/accp/quality-improvement/aquire](https://chestnet.org/accp/quality-improvement/aquire).

The Respiratory Institute is a member of the American College of Chest Physicians (ACCP) Quality Improvement Registry, Evaluation, and Education (AQuIRE) Bronchoscopy Module for Interventional/Therapeutic Registry. This is a web-based, IRB-approved data collection tool that Cleveland Clinic has been using to collect data from all therapeutic bronchoscopy cases. The goals are to understand resource utilization, look for evidence of performance/complications, seek opportunities for research and publication, and foster quality improvement. In the future, the registry might be used for assessing professional competencies and fellows/trainees. Because the registry is still a work in progress, additional centers and individuals are being added to it.
Asthma Control Test Scores During Visits in 2012

Asthma control can be assessed by use of validated instruments, including the Asthma Control Test™ (ACT). The ACT includes five questions that assess daytime symptoms, nighttime symptoms, reliance on as-needed “rescue” medication, the effect of asthma on everyday functioning, and patient assessment of control, with each of these five responses scored on a 1 to 5 scale.

A major objective of asthma management is to achieve well-controlled (ACT = 20 to 25) asthma. If asthma is not well-controlled (ACT = 16 to 19) or is poorly controlled (ACT ≤ 15), evidence indicates such patients are at elevated risk for exacerbation of asthma over time.

The ACT is routinely used in evaluation and management of patients in the Asthma Center. All asthma patients complete the ACT when seen at initial and follow-up visits. Shown below are ACT scores categorized as well-controlled, not well-controlled, or poorly controlled for patients seen in the Asthma Center at Cleveland Clinic main campus during 2012.

Asthma Control Test Score Categories (N = 107)

<table>
<thead>
<tr>
<th>2012</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Initial</td>
</tr>
<tr>
<td>Poorly Controlled (≤ 15)</td>
<td>62%</td>
</tr>
<tr>
<td>Not Well-Controlled (16–19)</td>
<td>23%</td>
</tr>
<tr>
<td>Well-Controlled (20–25)</td>
<td>15%</td>
</tr>
</tbody>
</table>

The lower ACT scores at initial visits reflect the poor control of asthma and unmet needs typically seen in patients referred to the Asthma Center, but patients achieve better control of their asthma by the time of their first return visit. Improvement in asthma control is associated with improved quality of life and reduced health services utilization. These data provide indirect evidence demonstrating that care at Cleveland Clinic’s Asthma Center leads to reduced overall costs of asthma care and provides value.

References


Cleveland Clinic’s Lung Transplant and Heart/Lung Transplant Center is recognized as an international and national leader in lung and heart/lung transplantation, offering hope to patients with end-stage pulmonary and/or vascular disease. Cleveland Clinic’s program continues to be one of the nation’s largest and most active programs of its kind. In 2012, the center performed 104 heart/lung and lung transplants (single, double, and four combined heart/lung transplants) and completed its 1,174th transplant since the program’s inception in 1990.

Cleveland Clinic’s Lung Transplant Program offers special areas of expertise, including multiorgan transplants that include heart/lung and liver/lung transplantation, as well as retransplantation for chronic rejection or bronchiolitis obliterans syndrome. In addition, Cleveland Clinic was one of the first centers in the United States to employ ambulatory extracorporeal membrane oxygenation in patients with respiratory failure to allow for reconditioning and successful transplantation in this critically ill population.

Once a patient is referred for lung transplant evaluation, he or she is assigned a dedicated multidisciplinary team. This team includes a physician who is an expert in end-stage lung disease and transplantation, a pretransplant coordinator, a transplant pharmacist, a transplant social worker, and a financial team. This multidisciplinary team is responsible for creating an individual care plan for each patient that includes determining the timing of transplant listing, testing, and addressing individual patient needs. Once the patient is listed, a transplant educational program is initiated to prepare each patient for transplant, with a separate program for caregivers to help provide emotional support for families and caregivers during this waiting period.

The average waiting time for a transplant at Cleveland Clinic is about 188 days. The waiting time for patients with idiopathic pulmonary fibrosis is 28 days, one of the shortest in the country. A continuing emphasis on quality assurance and quality improvement remains central to the program, reflected in the median post-transplant length of stay of 15 days for patients transplanted in 2012.

Although the waiting time for transplant is one of the shortest in the country, Cleveland Clinic’s transplant program always allows patients to live at home while awaiting transplant and accepts patients who live within 1,000 miles of Cleveland Clinic, meaning they do not have to relocate to Cleveland. Transplant program physicians follow patients for the duration of their transplant to ensure continuity of care and regularly collaborate with patients’ local physicians by providing frequent updates through letters and through the DrConnect program, which enables referring physicians to view their patients’ reports and images online.

Cleveland Clinic’s Lung Transplant Team is involved in a series of innovative clinical and research programs. Team surgeons have pioneered certain transplant surgical techniques, including bronchial artery revascularization, which may improve outcomes further by reducing ischemic injury. In addition, the surgical team is currently leading the international INSPIRE study, investigating preservation techniques and early transplant graft function. Cleveland Clinic’s Ex Vivo Lung Perfusion Program has been actively working with various ex vivo perfusion systems with the ultimate goal of expanding the pool of donor lungs available and extending this lifesaving therapy to more patients awaiting transplant. The Lung Transplant Team continues to participate in various studies focused on antibody-mediated rejection, gastroesophageal reflux and rejection, and the factors that lead to early graft failure.
Primary Lung Transplant Survival Outcomes

The 30-Day and 1-Year benchmarks are for patients receiving their first transplant of this type between January 1, 2009, and June 30, 2011; the 3-Year benchmark is for patients receiving their first transplant between July 1, 2006, and December 31, 2008. Data are from SRTR/OPTN for patients receiving single organ transplants only; retransplants are excluded.

<table>
<thead>
<tr>
<th>Adult Patient Survival</th>
<th>30-Day</th>
<th>1-Year</th>
<th>3-Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient Survival (Cleveland Clinic)</td>
<td>96%</td>
<td>86%</td>
<td>64%</td>
</tr>
<tr>
<td>Patient Survival (SRTR/OPTN)</td>
<td>96%</td>
<td>85%</td>
<td>66%</td>
</tr>
</tbody>
</table>

SRTR/OPTN = Scientific Registry of Transplant Recipients/Organ Procurement and Transplantation Network
Source: Scientific Registry of Transplant Recipients, July 2012 release, available at srtr.org
The Pulmonary Vascular Program in the Department of Pulmonary, Allergy, and Critical Care Medicine in the Respiratory Institute at Cleveland Clinic consists of a team of six Pulmonary and Critical Care physicians, two advanced practice nurses, two research nurse coordinators, and research fellows who collaborate closely with Cardiology, Cardiothoracic Surgery, and Lung Transplant providers. As part of Cleveland Clinic, the Pulmonary Vascular Program is able to draw on expertise in hepatology, liver transplantation, sleep medicine, and rheumatology. Cleveland Clinic has active clinical and research programs for all types of pulmonary hypertension, including idiopathic pulmonary arterial hypertension (previously known as primary pulmonary hypertension), chronic thromboembolic pulmonary hypertension, portopulmonary hypertension, and pulmonary hypertension associated with scleroderma spectrum of diseases and other connective tissue diseases.

Physicians and nurses in the Pulmonary Vascular Program have special expertise and interest in pulmonary hypertension and are dedicated to the evaluation and care of pulmonary hypertension patients. All new and difficult cases are discussed in weekly multidisciplinary group meetings. Patients are treated with various intravenous, oral, or inhaled therapies, including epoprostenol, treprostinil, bosentan, sildenafil, tadalafil, ambrisentan, and calcium channel blockers. Many patients receive combination therapy.

Clinicians in the program have several ongoing investigator-initiated research projects aimed at understanding the pathophysiology of pulmonary hypertension. Cleveland Clinic is also participating in several multicenter clinical trials evaluating new therapies.
The graph shows survival for 493 Cleveland Clinic patients with category 1 pulmonary arterial hypertension, compared with their predicted survival based on the NIH registry equation from the 1980s\textsuperscript{1} and a contemporary French registry.\textsuperscript{2} For both comparisons, Cleveland Clinic patients had better than expected survival. For example, actual three-year survival for Cleveland Clinic patients was 66%, compared with 52.2% predicted by the NIH formula and 56.2% predicted by the French formula.

**References**


Pneumonia

Pneumonia Appropriateness of Care
2011 – 2012

This composite metric, based on four pneumonia hospital quality process measures developed by The Centers for Medicare & Medicaid Services (CMS), shows the percentage of patients who received all the recommended care for which they were eligible. Cleveland Clinic has set and exceeded a target of UHC’s 90th percentile.

CMS calculates two pneumonia outcome measures: all-cause mortality and all-cause readmission rates, each based on Medicare claims and enrollment information. Cleveland Clinic’s performance appears below.

Pneumonia All-Cause 30-Day Mortality (N = 280)
July 2009 – June 2012

There is no significant difference between Cleveland Clinic’s pneumonia patient mortality rate and the national average; Cleveland Clinic’s readmission rate is significantly higher than the national average. To further reduce avoidable readmissions, a multidisciplinary team is tasked with improving transitions from hospital to home or post-acute facility. Specific initiatives have been implemented in each of these focus areas: communication, education, and follow-up.
Cleveland Clinic is dedicated to delivering excellent clinical outcomes and the best possible experience for our patients and their families. Patient feedback is critical in driving priorities and assessing results. Based on this feedback, Cleveland Clinic’s Office of Patient Experience implements training programs to improve service and communication as well as educational initiatives to help patients understand what to expect when they are in our care.

Outpatient Office Survey — Respiratory Institute

2011 – 2012

Percent Best Response*

*Response options: Very Good, Good, Fair, Poor, Very Poor
Each bar represents a composite score based on responses to multiple survey questions.

Source: Press Ganey, a national hospital survey vendor
**Inpatient Survey — Respiratory Institute**

**HCAHPS Overall Assessment**

2011 – 2012

The Centers for Medicare & Medicaid Services requires United States hospitals that treat Medicare patients to participate in the national Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) survey, a standardized tool that measures patients’ perspectives of hospital care. Results collected for public reporting are available at medicare.gov/hospitalcompare.

The guiding principle of Cleveland Clinic is “Patients First,” and improving the patient experience is a major strategic organizational goal. The Office of Patient Experience collaborates with physician and nursing leadership to establish best practices and implement standardized protocols that ensure delivery of patient-centered care.

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**HCAHPS Domains of Care**

2011 – 2012

The Centers for Medicare & Medicaid Services requires United States hospitals that treat Medicare patients to participate in the national Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) survey, a standardized tool that measures patients’ perspectives of hospital care. Results collected for public reporting are available at medicare.gov/hospitalcompare.

The guiding principle of Cleveland Clinic is “Patients First,” and improving the patient experience is a major strategic organizational goal. The Office of Patient Experience collaborates with physician and nursing leadership to establish best practices and implement standardized protocols that ensure delivery of patient-centered care.

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**Percent Best Response**

![Graph showing percent best response for various domains of care.]

*Except for “Room Clean” and “Quiet at Night,” each bar represents a composite score based on responses to multiple survey questions.

Source: Press Ganey, a national hospital survey vendor
Overview

Cleveland Clinic health system uses a scorecard approach to measure and monitor quality, safety, and patient experience. Real-time dashboard data are leveraged in each location to drive performance improvement. Although not an exact match to publicly reported data, more timely internal data create transparency at all organizational levels and support improved care in all clinical locations. The following measures are examples of health system 2012 quality and safety focus areas. Throughout this section, “Cleveland Clinic” refers to the academic medical center or “main campus,” and those results are shown.

Cleveland Clinic Core Measures

Appropriateness of Care

2011 – 2012

Cleveland Clinic monitors 30-day readmission rates for any reason to any of its system hospitals. Unplanned readmissions are actively reviewed for improvement opportunities. Strategies associated with communication, education, and follow-up have been implemented for several high-risk conditions, including heart failure and pneumonia. These practices are being expanded and enhanced to reduce overall avoidable readmissions.

All-Cause 30-Day Readmission Rate to Any Cleveland Clinic Hospital

2011 – 2012

Cleveland Clinic's goal is for all patients to receive all the recommended care for their condition. An aggregated “all or nothing” measurement approach to monitoring multiple publicly reported process-of-care measures for heart failure, acute myocardial infarction, pneumonia, and surgery patients yields results consistently above 94%.
Cleveland Clinic Overall In-Hospital Mortality Observed/Expected Ratio

2011 – 2012

Cleveland Clinic’s observed/expected (O/E) mortality ratio outperformed the University HealthSystem Consortium (UHC) academic medical center 50th percentile throughout 2012 based on the UHC 2012 risk model. Ratios less than 1.0 indicate mortality performance “better than” expected in UHC’s risk adjustment model.

The Agency for Healthcare Research and Quality’s Patient Safety Indicator 4 (AHRQ PSI 4) reports deaths among patients with serious treatable complications. Cleveland Clinic performs in the top third of UHC’s academic medical centers for this measure.

*These data are prepared using the University HealthSystem Consortium (UHC) Clinical Database. uhc.edu
Cleveland Clinic — Improving Quality, Safety, and the Patient Experience

Cleveland Clinic continues to improve its performance with respect to postoperative blood clots (AHRQ Patient Safety Indicator 12). Improved screening and prevention strategies have led to a 45% reduction in these events over the past two years.

Cleveland Clinic has implemented several strategies to reduce central line-associated bloodstream infections (CLABSI), including a central-line bundle of insertion, maintenance, and removal best practices. In 2012, Cleveland Clinic initiated focused reviews of every CLABSI occurrence and is introducing equipment and technology to support reductions in CLABSI rates in its high-risk critical care population.

*These data are prepared using the University HealthSystem Consortium (UHC) Clinical Database. [uhc.edu](http://uhc.edu)
A pressure ulcer is an injury to the skin that can be caused by pressure, moisture, or friction. These sometimes occur when patients have difficulty changing positions on their own. Cleveland Clinic caregivers have been trained to provide appropriate skin care and regular repositioning help while taking advantage of special devices and mattresses to reduce pressure for high-risk patients. In addition, they actively look for hospital-acquired pressure ulcers and treat them quickly if they occur.

*Nationally, falls are a leading cause of hospital patient injury. Cleveland Clinic fall prevention efforts include identifying patients who are at risk for falls, checking on them frequently, assisting them to the bathroom, and providing nonskid footwear. Caregivers make sure patients have all necessary items, including a call light, within easy reach.

*The National Database of Nursing Quality Indicators® (NDNQI®) is owned by the American Nurses Association. The database collects and evaluates unit-specific nurse-sensitive data from hospitals domestically and globally, with > 1900 hospitals participating. The comparison data represented here are based on a third of all hospitals in the U.S. participating. © 2012, American Nurses Association, All Rights Reserved. www.nursingquality.org
Patient Experience

The Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) survey is a standardized national tool used to measure patients’ perspectives of hospital care. Results collected for public reporting are available at medicare.gov/hospitalcompare.

Cleveland Clinic HCAHPS Overall Assessment
2011 – 2012

Percent Best Response*

<table>
<thead>
<tr>
<th>Recommend Hospital (% Definitely Yes)*</th>
<th>Hospital Rating (% 9 or 10)</th>
</tr>
</thead>
<tbody>
<tr>
<td>84.0</td>
<td>80.0</td>
</tr>
<tr>
<td>84.9</td>
<td>80.8</td>
</tr>
</tbody>
</table>

2011 (N = 10,378)
2012 (N = 11,190)
National Average
July 1, 2011 – June 30, 2012

*Response options: Definitely Yes, Probably Yes, Probably No, Definitely No
Source: Centers for Medicare & Medicaid Services and Press Ganey, a national hospital survey vendor
The guiding principle of Cleveland Clinic is “Patients First,” and improving the patient experience is a major strategic organizational goal. The Office of Patient Experience collaborates with physician and nursing leadership to establish best practices and implement standardized protocols that ensure delivery of patient-centered care.
Lung Cancer Screening Program

Over the past 12 months, multiple societies have issued guidelines recommending screening for lung cancer with low-dose chest CT in a group at high risk for developing lung cancer. The enrollment criteria of the National Lung Screening Trial was as follows: age 55 to 74 years, smoked 30+ pack-years, and a smoker within the past 15 years. In that trial, the benefit identified was a 20% reduction in lung cancer mortality in this high-risk population. As in other screening studies, many potential risks of screening have also been identified. Such risks include a high percentage of subjects being identified as having small lung nodules. Though only a small percentage of these nodules are lung cancer, all nodules require additional imaging follow-up, some lead to avoidable biopsies, and many patients found to have lung nodules develop anxiety related to the news. In addition, the low-dose radiation received carries a small potential risk of contributing to future cancer development, and the cost-effectiveness of lung cancer screening is not yet determined. Balancing the benefits and concerns for patients requires a complete approach to lung cancer program development and quality control.

In 2012, Cleveland Clinic developed a lung cancer screening program designed to optimize the potential benefits while minimizing the potential risks. The program was designed with the following elements:

- Screening participants who match current guidelines
- A standardized low-dose CT with tracking of the radiation dose administered
- Chest CT interpretation by radiologists with expertise in chest imaging
- An available lung nodule evaluation clinic
- Connection to a tobacco treatment program
- Connection to experts in all areas of lung cancer evaluation and management
- Availability of guided bronchoscopy and minimally invasive surgical procedures
- Review of any screened patient planned for biopsy at a multidisciplinary tumor board
- An education program for primary and specialty physicians within Cleveland Clinic health system (grand rounds, review article in Cleveland Clinic Journal of Medicine, follow-up messages to referring providers, educational letters, educational bookmarks)
- Educational material written for patients
- Standardized electronic order sets
- A central call-in number
- An electronic registry to collect information on the patients enrolled and their scan results
- Research in imaging and biomarker development aimed at optimizing the benefits and minimizing the risks of lung cancer screening
Cleveland Clinic uses a registry that automatically downloads patient demographics, comorbidities, and scan results from the electronic medical records system to monitor the program, provide individual education, and ensure that appropriate nodule follow-up occurs. Through this registry, the following information was obtained on screened subjects through January 31, 2013:

<table>
<thead>
<tr>
<th>Total Screened</th>
<th>78</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean age</td>
<td>62.8 years</td>
</tr>
<tr>
<td>Age &lt; 55</td>
<td>6</td>
</tr>
<tr>
<td>Age &lt; 50</td>
<td>1</td>
</tr>
<tr>
<td>Age &gt; 74</td>
<td>0</td>
</tr>
<tr>
<td>Female:Male</td>
<td>25:53</td>
</tr>
<tr>
<td>COPD</td>
<td>22 (28%)</td>
</tr>
<tr>
<td>CAD</td>
<td>18 (23%)</td>
</tr>
<tr>
<td>&lt; 30 pack-years</td>
<td>3</td>
</tr>
<tr>
<td>Patients with nodules found</td>
<td>57 (73%)</td>
</tr>
<tr>
<td>Patients with nodules 5 mm or greater</td>
<td>18 (23%)</td>
</tr>
<tr>
<td>Lung cancers diagnosed</td>
<td>0</td>
</tr>
</tbody>
</table>

The success of this program will be contingent on efforts to educate providers and patients about the risks and benefits of lung cancer screening while managing the quality of care provided when abnormal imaging findings are identified. The lung cancer screening registry has helped Cleveland Clinic direct these issues to the benefit of patients.
Innovation in Respiratory Care: Inhaled Aerosolized Prostacyclin for Refractory Hypoxemia and Severe Pulmonary Hypertension

Refractory hypoxemia in severe acute respiratory distress syndrome (ARDS) continues to present a challenge with few options for treatment. Inhaled nitric oxide (iNO) has been used in patients who have pulmonary hypertension as well as refractory hypoxemia due to ARDS. In pulmonary hypertension, inhaled vasodilators offer selective pulmonary vasodilatation with fewer systemic side effects. In ARDS, iNO and, more recently, inhaled aerosolized prostacyclin (iAP) have been shown to improve oxygenation and reduce pulmonary vascular pressures. Because iAP is less expensive and more portable, Respiratory Institute clinicians instituted a novel protocol for iAP as an alternative to iNO. After studying various delivery techniques, the BodyGuard® 575 continuous infusion pump (CMEAmerica, Golden, Colo.) and the Aeroneb Solo (Aerogen, Galway, Ireland) were chosen to deliver the iAP.

The Respiratory Institute’s experience with iAP in patients who have refractory hypoxemia or severe pulmonary hypertension has been extremely positive. The drug was considered efficacious in 84% of patients with severe hypoxemia based on improved arterial oxygen tension. Among patients with severe pulmonary hypertension, 33% had an adequate reduction in pulmonary artery pressure and/or increase in cardiac index based on pulmonary artery catheter readings. There were no adverse effects, and rescue iNO was not instituted in any patient. The protocol also resulted in an 88% cost reduction per patient for 2,386 hours of iAP vs. comparable use of iNO.
Reduced “Good” Cholesterol Is a Novel Marker of Risk in Pulmonary Arterial Hypertension

Pulmonary arterial hypertension (PAH) is a disorder characterized by remodeling of the pulmonary vasculature and increased pulmonary vascular resistance that ultimately lead to right heart failure and premature death. Recently available PAH-targeted therapies were developed to focus on the imbalance between vasoconstrictors and vasodilators in the pulmonary vasculature. However, the pathobiology of PAH is more complicated and includes dysregulated vascular cell proliferation, cellular metabolic abnormalities, and inflammation. Not surprisingly, even with modern PAH therapies, current outcomes remain poor, with estimated three-year survival rates of only 55%. Thus, there is a clear need for new and more-effective therapies that target the intrinsic mechanisms in PAH with a focus on better understanding the pathobiology of the disease.

High-density lipoprotein cholesterol (HDL-C) is associated with a lower risk of coronary artery disease, and hence it is commonly referred to as the “good” cholesterol. Among other effects, HDL-C promotes healthy vascular function via its anti-inflammatory properties, attenuation of endothelial dysfunction, and anticoagulant effects, which are relevant mechanisms in pulmonary vascular disease. Indeed, Respiratory Institute researchers have found and reported\(^1\,^2\) significantly reduced plasma levels of HDL-C in a cohort of PAH patients. Strikingly, HDL-C was lower in PAH patients even when compared to individuals who had features that commonly lead to low HDL-C levels, such as older age, male gender, coronary artery disease, systemic hypertension, and diabetes.

Lower plasma HDL-C levels in 69 PAH patients (median, interquartile range [IQR]: 36, 29 to 40 mg/dL) compared to 229 controls with several cardiovascular risk factors (median, IQR: 49, 40 to 60 mg/dL) \((P < 0.001\) from a linear regression model adjusting for age, gender, smoking status, coronary artery disease, hypertension, diabetes, and statin use).
Increased inflammatory markers were also seen in patients with low HDL-C levels. Thus, HDL-C may serve as a novel and easily measured marker of disease progression to aid in the management of PAH patients. It is also tempting to hypothesize that pharmacologic manipulation of HDL-C may improve outcomes in this deadly disease. Based on these novel findings, the Respiratory Institute has become interested in the potential role of metabolic abnormalities in PAH. A common reason for low circulating HDL-C levels is the clustering of risk factors for cardiovascular disease and diabetes mellitus, also called metabolic syndrome. These risk factors include high blood pressure, glucose intolerance, central obesity, low HDL-C, and elevated triglycerides. The purported underlying pathogenic mechanism is insulin resistance. An emerging body of evidence suggests that metabolic syndrome and insulin resistance may predispose to pulmonary vascular disease, but clinical data are still preliminary. The Respiratory Institute is conducting a study to elucidate the role of insulin resistance in PAH patients and the mechanistic link between insulin resistance and PAH. To this end, PAH patients in the study receive detailed metabolic evaluations, including oral glucose tolerance tests, body composition analyses, and lipid profiles. Also measured are markers of inflammation and a cellular sensor for glucose levels called O-linked N-acetylglucosamine (O-GlcNAc). Researchers have developed a model linking central obesity, insulin resistance, low HDL-C levels, and PAH through inflammation and abnormal metabolic flux of glucose at the cellular level leading to decreased nitric oxide levels. The Respiratory Institute is currently testing this model in PAH patients.

Survival in 69 PAH patients according to HDL-C levels. For every 5 mg/dL increase in HDL-C, there was a 36% reduction in the risk.
The results of this research are expected to identify insulin resistance as a novel mediator in PAH and set the stage for interventional trials such as the use of diet and exercise training in patients with PAH, as well as clinical trials with insulin-sensitizing drugs.

Model linking insulin resistance, visceral adiposity, inflammation, and decreased nitric oxide in PAH.

References


Breath Analysis in Lung Cancer

The field of lung cancer biomarkers has been dominated by studies of differences in the genome, transcriptome, and proteome of patients with lung cancer. Differences in the products of cellular metabolism are a less commonly evaluated source of biomarkers. Metabolomics usually refers to the study of nonvolatile metabolic byproducts, such as carbohydrates, free fatty acids, lipids, and nucleic acids. In addition to nonvolatile metabolic signatures, volatile organic compounds (VOCs) are produced or consumed as part of cellular metabolism and in response to cellular stress. These VOCs can travel from their site of origin and be found in the bloodstream, urine, and breath, where their detection and measurement can serve as a source of biomarker development. To date, evidence to support this premise has come from studies of VOC signatures of the headspace gas of cancer cell lines (i.e., the gas present above the cells and culture media) and of the breath. The VOC signatures have been detected using gas chromatography mass spectrometry and other spectrometry systems as well as a variety of cross-responsive chemical sensors.

Recent work in the Respiratory Institute has used a cross-responsive chemical sensor, called a colorimetric sensor array, to distinguish patterns of VOCs in the breath of those with lung cancer from patterns in an at-risk group without lung cancer. In one study, breath samples from 92 subjects with lung cancer and 137 controls with smoking histories or benign lung nodules were analyzed. The system was 75% to 80% accurate in distinguishing the breath of non-small cell carcinoma subjects from the breath of controls, with accuracies increasing to 80% to 85% when more specific questions were evaluated (e.g., adenocarcinoma vs. control, adenocarcinoma vs. squamous cell carcinoma). The results were not validated in an independent cohort.

The Respiratory Institute is performing a multi-institutional study using an advanced version of the colorimetric sensor array. The sensing elements are more abundant, covering a wider spectrum of VOCs, and more sensitive, capable of detecting VOCs with concentrations in the low parts per billion. In addition, the breath collection device is now engineered to expose the sensors to breath from the deepest portion of the lungs where the highest VOC concentrations are thought to exist. Data from well over 300 study subjects were used to make adjustments to the system, optimizing its performance. An analysis recently performed of the first 150 subjects who participated with the adjusted equipment (51 with cancer and 99 without) produced results that suggest an improvement over the performance reported from an earlier study (unpublished data).
More subjects are being recruited for this trial, with the goal of learning enough to enable the engineering of a consumer-ready version of the system, which could be studied in large trials that would be capable of technically and clinically validating this biomarker.

It is an exciting time for lung cancer biomarker development, with much promise and need. Although a great deal of work is required to validate breath biomarkers of lung cancer — both technically and clinically — there is a substantiated hope that this line of investigation will lead to identification of a biomarker that will influence clinical care and patients' lives.


Pichurko BM. Exercising your patient: Which test(s) and when? Respir Care. 2012 Jan;57(1):100-113.

Selected Publications


Stoller JK. Oxygen may reduce dyspnoea in people with COPD who have mild or no hypoxaemia. Evid Based Med. 2012 Apr;17(2):40-41.


Staff Listing

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Sandra Hong, MD
Fred Hsieh, MD
Lily Pien, MD
Cristine Radojicic, MD
Roxana Siles, MD
Rachel Szekely, MD

Some physicians may practice in multiple locations. For a detailed list including staff photos, please visit clevelandclinic.org/staff.
Contact Information

General Patient Referral
24/7 hospital transfers or physician consults
800.553.5056

Pulmonary Appointments/Referrals
216.444.6503 or 800.223.2273, ext. 46503

Allergy Appointments/Referrals
216.444.3386 or 800.223.2273, ext. 43386

On the Web at clevelandclinic.org/pulmonary

Additional Contact Information

General Information
216.444.2200

Hospital Patient Information
216.444.2000

General Patient Appointments
216.444.2273 or 800.223.2273

Referring Physician Center and Hotline
24/7 hotline to streamline access to our array of medical services and schedule patient appointments
855.REFER.123 (855.733.3712)

Or email refdr@ccf.org or visit clevelandclinic.org/refer123

Request for Medical Records
216.444.2640 or 800.223.2273, ext. 42640

Same-Day Appointments
216.444.CARE (2273)

Global Patient Services/International Center
Complimentary assistance for international patients and families
001.216.444.8184 or visit clevelandclinic.org/gps

Medical Concierge
Complimentary assistance for out-of-state patients and families
800.223.2273, ext. 55580, or email medicalconcierge@ccf.org

Cleveland Clinic Abu Dhabi
clevelandclinicabudhabi.ae

Cleveland Clinic Canada
888.507.6885

Cleveland Clinic Florida
866.293.7866

Cleveland Clinic Nevada
702.483.6000

For address corrections or changes, please call 800.890.2467
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216.839.3000
Pulmonary

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330.225.8886
Pulmonary

Chagrin Falls Family Health Center
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Chagrin Falls, OH 44022
440.893.9393
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Euclid Hospital
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99 Northline Circle, Suite 235
Euclid, OH 44119
216.692.7848
Pulmonary

Fairview Hospital
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216.476.7000
Pulmonary

Hillcrest Hospital
Hillcrest Atrium
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440.312.7140
Pulmonary

Independence Family Health Center
Crown Centre II
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Independence, OH 44131
216.986.4000
Pulmonary and Allergy

Lutheran Hospital
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216.696.4300
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Allergy

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Strongsville Family Health and Surgery Center
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Strongsville, OH 44136
440.878.2500
Pulmonary and Allergy

Twinsburg Family Health and Surgery Center
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Twinsburg, OH 44087
330.888.4000
Pulmonary and Allergy

Willoughby Hills Family Health Center
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Willoughby Hills, OH 44094
440.943.2500
Pulmonary and Allergy

Wooster Family Health Center
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Wooster, OH 44691
330.287.4500
800.451.9870
Pulmonary and Allergy
Overview

Cleveland Clinic is an academic medical center offering patient care services supported by research and education in a nonprofit group practice setting. More than 3,000 Cleveland Clinic staff physicians and scientists in 120 medical specialties care for more than 5 million patients across the system, performing more than 200,000 surgeries and conducting 450,000 Emergency Department visits. Patients come to Cleveland Clinic from all 50 states and more than 132 nations around the world.

Cleveland Clinic is an integrated healthcare delivery system with local, national, and international reach. The main campus in midtown Cleveland, Ohio, has a 1,450-bed hospital, outpatient clinic, specialty institutes, labs, classrooms, and research facilities in 46 buildings on 167 acres. Cleveland Clinic patients represent the highest CMS case-mix index in the nation. Cleveland Clinic encompasses 75 northern Ohio outpatient locations, including 16 full-service family health centers, eight community hospitals, an affiliate hospital, and a rehabilitation hospital for children. Cleveland Clinic also includes Cleveland Clinic Florida, Cleveland Clinic Lou Ruvo Center for Brain Health in Las Vegas, Cleveland Clinic Canada, and Sheikh Khalifa Medical City (management contract). Cleveland Clinic Abu Dhabi is a full-service hospital and outpatient center in the United Arab Emirates scheduled to begin offering services in 2014. Cleveland Clinic is the second-largest employer in Ohio with nearly 44,000 employees. It generates $10.5 billion of economic activity a year.

The Cleveland Clinic Model

Cleveland Clinic was founded in 1921 by four physicians who had served in World War I and hoped to replicate the organizational efficiency of military medicine. The organization has grown through the years by adhering to the model set forth by the founders. All Cleveland Clinic staff physicians receive a straight salary with no bonuses or other financial incentives. The hospital and physicians share a financial interest in controlling costs, and profits are reinvested in research and education.

The Cleveland Clinic system began to grow in 1987 with the founding of Cleveland Clinic Florida and expanded in the 1990s with the development of 16 family health centers across Northeast Ohio. Fairview Hospital, Hillcrest Hospital, and six other community hospitals joined Cleveland Clinic over the past decade and a half, offering Cleveland Clinic institute services in heart and neurological care, physical rehabilitation, and more. Clinical and support services were reorganized into 27 patient-centered institutes beginning in 2007. Institutes combine medical and surgical specialists around specific diseases or body systems under single leadership and in a shared location to provide optimal team care for every patient. Institutes work with the Office of Patient Experience to give every patient the best outcome and experience.
Cleveland Clinic Lerner Research Institute

At the Lerner Research Institute, hundreds of principal investigators, project scientists, research associates, and postdoctoral fellows are involved in laboratory-based translational and clinical research. Total research expenditures from external and internal sources exceeded $265 million in 2012. Research programs include cardiovascular, oncology, neurology, musculoskeletal, allergy and immunology, ophthalmology, metabolism, and infectious diseases.

Cleveland Clinic Lerner College of Medicine

Lerner College of Medicine of Case Western Reserve University, which celebrated its 10th anniversary in 2012, is known for its small class size, unique curriculum, and full-tuition scholarships for all students. The program is open to 32 students who are preparing to be physician investigators.

Graduate Medical Education

In 2012, nearly 1,800 residents and fellows trained at Cleveland Clinic and Cleveland Clinic Florida, which is part of a continuing upward trend.

U.S. News & World Report Ranking

Cleveland Clinic is consistently ranked among the top hospitals in America by U.S. News & World Report, and our heart and heart surgery program has been ranked No. 1 in the nation since 1995. In 2012, Cleveland Clinic’s urology and nephrology programs were both ranked No. 1 in the nation.

For more information about Cleveland Clinic, please visit clevelandclinic.org.
Referring Physician Center and Hotline

24/7 hotline to streamline access to our array of medical services and schedule patient appointments, call 855.REFER.123 (855.733.3712), email refdr@ccf.org, or visit clevelandclinic.org/refer123

Remote Consults

Online medical second opinions from Cleveland Clinic's MyConsult® are particularly valuable for patients who wish to avoid the time and expense of travel. Cleveland Clinic offers online medical second opinions for more than 1,200 life-threatening and life-altering diagnoses. For more information, visit clevelandclinic.org/myconsult, email eclevelandclinic@ccf.org, or call 800.223.2273, ext. 43223.

Request Medical Records

216.444.2640 or 800.223.2273, ext. 42640

Track Your Patients’ Care Online

DrConnect® offers referring physicians secure access to their patients' treatment progress while at Cleveland Clinic. To establish a DrConnect account, visit clevelandclinic.org/drconnect or email drconnect@ccf.org.

Medical Records Online

Cleveland Clinic continues to expand and improve electronic medical records (EMRs) to provide faster, more efficient, and more accurate care by sharing patient data through a highly secure network. Patients using MyChart® can renew prescriptions and review test results and medications from their personal computers. MyChart provides a link to Microsoft HealthVault, a free online service that helps patients securely gather and store health information. It connects to Cleveland Clinic’s social media and Internet site, currently the most visited hospital website in America. For more information, visit clevelandclinic.org/mychart.

Critical Care Transport Worldwide

Cleveland Clinic’s critical care transport team and fleet of mobile ICU vehicles, helicopters, and fixed-wing aircraft serve critically ill and highly complex patients across the globe.

To arrange a transfer for STEMI (ST elevated myocardial infarction), acute stroke, ICH (intracerebral hemorrhage), SAH (subarachnoid hemorrhage), or aortic syndrome, call 877.379.CODE (2633).

For all other critical care transfers, call 216.444.8302 or 800.553.5056.

CME Opportunities: Live and Online

Cleveland Clinic’s Center for Continuing Education operates one of the largest and most successful CME programs in the country. The center’s website (ccfcme.org) is an educational resource for healthcare providers and the public. Available 24/7, it houses programs that cover topics in 30 areas. Among other resources, the website contains a virtual textbook of medicine (Disease Management Project) and myCME, a system for physicians to manage their CME portfolios. Live courses, however, remain the backbone of the center’s CME operation. Most live courses are held in Cleveland, but outreach plans are underway.
Clinical Trials
Since its establishment in 1921, Cleveland Clinic has been an innovator in medical breakthroughs, with a mission of unlocking basic science and pursuing clinical research. Today, Cleveland Clinic is running more than 2,000 clinical trials of various types. Our researchers are focusing on an array of conditions, including breast and liver cancer, coronary artery disease, heart failure, epilepsy, Parkinson disease, chronic obstructive pulmonary disease, asthma, high blood pressure, diabetes, depression, and eating disorders. To learn more, go to clevelandclinic.org/research.

Healthcare Executive Education
Cleveland Clinic’s dynamic executive education program provides real-world insights into the highly competitive business of healthcare. The Executive Visitors’ Program is an intensive three-day program that provides a behind-the-scenes view of our organization for the busy executive. The Samson Global Leadership Academy is a two-week immersion into the challenges of leadership, management, and innovation. The curriculum includes coaching and a personalized three-year leadership development plan. Learn more at clevelandclinic.org/execed.
This project would not have been possible without the commitment and expertise of a team led by Umur Hatipoglu, MD; Marianne Mitri, MBA; and Sandy Sykes, BSN, MPM, CPHQ.

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