Respiratory Institute

2010 Outcomes

Cleveland Clinic
To promote quality improvement, Cleveland Clinic has created a series of Outcomes books similar to this one for many of its institutes. Designed for a physician audience, the Outcomes books contain a summary of our surgical and medical trends and approaches, data on patient volumes and outcomes, and a review of new technologies and innovations.

Although we are unable to report all outcomes for all treatments provided at Cleveland Clinic — omission of outcomes for a particular treatment does not necessarily mean we do not offer that treatment — our goal is to increase outcomes reporting each year. When outcomes for a specific treatment are unavailable, we often report process measures associated with improved outcomes. When process measures are unavailable, we may report volume measures; a volume/outcome relationship has been demonstrated for many treatments, particularly those involving surgical techniques.

In addition to our internal efforts to measure clinical quality, 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 (CMS) Hospital Compare (hospitalcompare.hhs.gov)
- Ohio Department of Health (ohiohospitalcompare.ohio.gov)
- Cleveland Clinic Quality Performance Report (clevelandclinic.org/QPR)

Our commitment to providing accurate, timely information about patient care also will help patients and referring physicians make informed healthcare decisions.

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

It is my great pleasure to present Cleveland Clinic’s annual Outcomes books. The current edition includes outcomes and volumes along with recent innovations and publications for Cleveland Clinic’s clinical services through calendar year 2010.

Cleveland Clinic is celebrating its 90th Anniversary in 2011. Our founders were innovators. They created a unique model of medicine based on patient care, enhanced by research and education. We honor this legacy, measuring quality, reporting outcomes and continuously improving the value of medical services.

Cleveland Clinic Outcomes books are offered in print and online. Additional data is available through our online Quality Performance Report (clevelandclinic.org/QPR). The site offers data in advance of national and state public reporting sites, in key areas including heart attack, heart failure, stroke and infection prevention.

Thank you for your interest in Cleveland Clinic Outcomes books. We hope you will find them useful and informative.

Sincerely,

Delos M. Cosgrove, MD
CEO and President
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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 its seventh edition of Respiratory Diseases Outcomes. This booklet provides a condensed 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 2010, we experienced continued growth in our clinical programs, research funding and application of innovative technologies. We are proud of these accomplishments and thankful to 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
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.

We provide comprehensive care for all patients with respiratory disorders. Our national experts treat patients with the following conditions:

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

<table>
<thead>
<tr>
<th></th>
<th>2010</th>
<th>% Increase 2007 – 2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Visits</td>
<td>95,755</td>
<td>62%</td>
</tr>
<tr>
<td>Interstitial Lung Disease Visits</td>
<td>2,478</td>
<td>35%</td>
</tr>
<tr>
<td>Pulmonary Arterial Hypertension Visits</td>
<td>2,003</td>
<td>61%</td>
</tr>
<tr>
<td>Sarcoidosis Visits</td>
<td>1,965</td>
<td>74%</td>
</tr>
<tr>
<td>Lung Cancer Visits</td>
<td>1,140</td>
<td>61%</td>
</tr>
<tr>
<td>COPD Visits</td>
<td>9,387</td>
<td>20%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>2010</th>
<th>% Increase 2007 – 2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>Research Funding</td>
<td>$6.2 million</td>
<td>32%</td>
</tr>
<tr>
<td>Research Grants/Contracts</td>
<td>73</td>
<td>3%</td>
</tr>
</tbody>
</table>
In collaboration with our thoracic surgery colleagues, we evaluate patients for:

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

The Respiratory Institute’s six formal sections provide advanced subspecialized 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 serves more than 95,000 patients annually.

Also within our institute are the following centers: Center for Major Airway Diseases (in conjunction with thoracic surgeries), Asthma Center and Alpha-1 Antitrypsin Deficiency Center of Excellence.

Our institute also brings care into the community, providing outpatient services at the Beachwood Family Health and Surgery Center (Pulmonary), Brunswick Family Health Center (Pulmonary), Chagrin Falls Family Health Center (Pulmonary), Independence Family Health Center (Pulmonary and Allergy), Strongsville Family Health and Surgery Center (Pulmonary and Allergy), Westlake Family Health Center (Allergy) and Willoughby Hills Family Health Center (Allergy). Respiratory Institute staff also provides comprehensive (ICU, inpatient, outpatient) pulmonary care at Hillcrest Hospital and Euclid Hospital.

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

2006 – 2010

Procedures

<table>
<thead>
<tr>
<th>Year</th>
<th>Procedures</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006</td>
<td>65</td>
</tr>
<tr>
<td>2007</td>
<td>72</td>
</tr>
<tr>
<td>2008</td>
<td>57</td>
</tr>
<tr>
<td>2009</td>
<td>157</td>
</tr>
<tr>
<td>2010</td>
<td>122</td>
</tr>
</tbody>
</table>

N = 756

* Includes 13 heart/lung and 4 liver/lung transplants

Bronchoscopies

2006 – 2010

Procedures

<table>
<thead>
<tr>
<th>Year</th>
<th>Procedures</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006</td>
<td>2,228</td>
</tr>
<tr>
<td>2007</td>
<td>2,391</td>
</tr>
<tr>
<td>2008</td>
<td>2,365</td>
</tr>
<tr>
<td>2009</td>
<td>2,572</td>
</tr>
<tr>
<td>2010</td>
<td>2,771</td>
</tr>
</tbody>
</table>

N = 756
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 five years, with the unit now consisting of 43 dedicated beds.

The unit is staffed by board-certified intensivists, now providing in-house coverage 24 hours per day (since July 2008). In 2010, there were 3,233 admissions to the MICU.

In view of our high transfer population (39 percent of our MICU admissions come directly from other hospitals), patient outcomes continue to be excellent, as exhibited by mortality rates below the risk-adjusted predicted values and improving infection rates.

### Overall MICU Scores (N = 810)

<table>
<thead>
<tr>
<th>1st Quarter 2010</th>
<th>Mean APACHE IV* on Admission</th>
<th>Standardized Mortality Ratio (SMR)</th>
<th>Observed ICU Length of Stay (Days)</th>
<th>Predicted ICU Length of Stay (Days)</th>
<th>National ICU Length of Stay (Days)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>76.4</td>
<td>1.0</td>
<td>5.7</td>
<td>5.3</td>
<td>5.2</td>
</tr>
</tbody>
</table>

### MICU APACHE Scores and Death Rates by Quartiles of Severity

<table>
<thead>
<tr>
<th>1st Quarter 2010</th>
<th>APACHE IV* Risk Quartile</th>
<th>MICU Admissions (%)</th>
<th>Mean APACHE IV Score on Admission</th>
<th>Observed Hospital Death (%)</th>
<th>Predicted Hospital Death (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>151-200 Highest Risk</td>
<td>12</td>
<td>139</td>
<td>86</td>
<td>87</td>
</tr>
<tr>
<td></td>
<td>101-150 Third Quartile</td>
<td>12</td>
<td>102</td>
<td>48</td>
<td>61</td>
</tr>
<tr>
<td></td>
<td>51-100 Second Quartile</td>
<td>22</td>
<td>83</td>
<td>34</td>
<td>36</td>
</tr>
<tr>
<td></td>
<td>0-50 Lowest Quartile</td>
<td>54</td>
<td>55</td>
<td>15</td>
<td>11</td>
</tr>
</tbody>
</table>

* The Acute Physiology and Chronic Health Evaluation system is used to risk-adjust our population of critical care patients.
**MICU Infection Rates**

**Cleveland Clinic MICU Central Line Associated Bloodstream Infections (CLABSI)**

2008 – 2010

Cleveland Clinic's most recent quarterly performance is between the CDC National Healthcare Safety Network (NHSN) surveillance system's 50th and 75th percentiles for central line associated BSI (NHSN rate = 3.7).

**Cleveland Clinic MICU Nosocomial Ventilator-Associated Pneumonia (VAP)**

2008 – 2010

Cleveland Clinic's most recent quarterly performance is better than the NHSN 25th percentile for VAP (NHSN rate = 1.0).

**Cleveland Clinic MICU Nosocomial C. difficile**

2008 – 2010

Cleveland Clinic’s most recent quarterly performance is 1.1 per 1,000 patient days (4 cases/3,547 patient days).
The Respiratory Special Care Unit (ReSCU) was created for persons who depend on mechanical ventilation to breathe 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 patient and family for patient's discharge to another facility

**Status at ReSCU Discharge**  
2008 – 2010

<table>
<thead>
<tr>
<th>Patients</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expired in ReSCU</td>
<td>54</td>
<td>55</td>
<td>57</td>
</tr>
<tr>
<td>Complete Ventilator Support</td>
<td>54</td>
<td>55</td>
<td>57</td>
</tr>
<tr>
<td>Partial Ventilator Support</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Completely Weaned</td>
<td>54</td>
<td>55</td>
<td>57</td>
</tr>
</tbody>
</table>

**ReSCU Statistics 2010**

<table>
<thead>
<tr>
<th>Category</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Discharges</td>
<td>57</td>
</tr>
<tr>
<td>Total ReSCU Days</td>
<td>1,757</td>
</tr>
<tr>
<td>Number of Patients Completely Weaned from Ventilation</td>
<td>32</td>
</tr>
<tr>
<td>Number of Deaths</td>
<td>0</td>
</tr>
<tr>
<td>Average Length of Stay (days)</td>
<td>30.8</td>
</tr>
</tbody>
</table>

The Section of Respiratory Therapy is dedicated to providing state-of-the-art clinical care, advancing the science and profession of respiratory care, and promoting educational advancement for practitioners and their patients. These services include, but are not limited to, patients in the Respiratory Special Care Unit (ReSCU), Medical Intensive Care Unit (MICU), Neurological Intensive Care Unit (NICU) and Surgical Intensive Care Unit (SICU).

To advance care and optimize outcomes, Respiratory Therapy uses specialized electronic databases and reporting to analyze clinical practices.

**Tidal Volume Ranges by Service (N = 10,182)**

<table>
<thead>
<tr>
<th>Service</th>
<th>&lt;4 ml/kg</th>
<th>4-6 ml/kg</th>
<th>6-8 ml/kg</th>
<th>8-10 ml/kg</th>
<th>10-12 ml/kg</th>
<th>&gt;12 ml/kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>ReSCU</td>
<td>756</td>
<td>524</td>
<td>18</td>
<td>22</td>
<td>124</td>
<td>18</td>
</tr>
<tr>
<td>MICU</td>
<td>796</td>
<td>548</td>
<td>24</td>
<td>16</td>
<td>143</td>
<td>23</td>
</tr>
<tr>
<td>SICU</td>
<td>56</td>
<td>312</td>
<td>11</td>
<td>7</td>
<td>56</td>
<td>7</td>
</tr>
</tbody>
</table>

Excessive tidal volumes during mechanical ventilation have been associated with poor outcomes. Our data indicate that during mechanical ventilation, most patients have tidal volumes in the range of 4 to 8 ml/kg (ideal body weight).
Cleveland Clinic's Respiratory Institute provides the full range of advanced diagnostic and interventional bronchoscopy techniques. We have some of the world's most extensive experience with:

- Electromagnetic navigation
- Lung transplant-related airway disease
- Self-expanding metallic stents
- Management of airway complications due to histoplasmosis
- Benign airway diseases
- Metallic stent removal

We performed 2,771 bronchoscopies during 2010, a 37 percent increase in five years. Importantly, our complication rates remain low.

**Post-Bronchoscopy Complication rate (N = 2,162)**

<table>
<thead>
<tr>
<th>Procedure</th>
<th>2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pneumothorax</td>
<td>13</td>
</tr>
<tr>
<td>Reversal of Sedation Required</td>
<td>10</td>
</tr>
<tr>
<td>ICU Admissions</td>
<td>5</td>
</tr>
<tr>
<td>Clinically Significant Bleeding</td>
<td>4</td>
</tr>
</tbody>
</table>

**Flexible Bronchoscopies and Other Procedures 2010**

<table>
<thead>
<tr>
<th>Procedure</th>
<th>2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transbronchial Lung Biopsy</td>
<td>1,341</td>
</tr>
<tr>
<td>Airway Examination</td>
<td>358</td>
</tr>
<tr>
<td>Endobronchial Ultrasound</td>
<td>364</td>
</tr>
<tr>
<td>Electrocautery/Laser Ablation</td>
<td>217</td>
</tr>
<tr>
<td>Electornavigation</td>
<td>122</td>
</tr>
<tr>
<td>Endobronchial Biopsy</td>
<td>120</td>
</tr>
<tr>
<td>Bronchial/Tracheal Dilation and Stenting</td>
<td>70</td>
</tr>
<tr>
<td>Thoracentesis</td>
<td>137</td>
</tr>
<tr>
<td>Fluoroscopic Sniff</td>
<td>45</td>
</tr>
<tr>
<td>Transtracheal Oxygen Catheter Placement</td>
<td>10</td>
</tr>
<tr>
<td>Laryngoscopy</td>
<td>1</td>
</tr>
<tr>
<td>Bronchial Thermoplasty</td>
<td>3</td>
</tr>
<tr>
<td>Pleural Catheter Placement</td>
<td>6</td>
</tr>
</tbody>
</table>
In 2009, the Respiratory Institute joined the ACCP Quality Improvement Registry, Evaluation, and Education (AQuIRE) Bronchoscopy Module for Interventional/Therapeutic Registry. Cleveland Clinic has since contributed 549 cases to the 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. It is possible that, in the future, the registry may be used for assessing professional competencies, as well as fellow/trainee assessment. Because the registry is still a work in progress, additional centers and individuals are being added to it. The data table below displays outcomes data from the registry.

<table>
<thead>
<tr>
<th>AQuIRE Bronchoscopy Registry Indicator Analysis</th>
<th>Respiratory Institute</th>
<th>Overall Registry</th>
</tr>
</thead>
<tbody>
<tr>
<td>February 2009 – December 2010</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Success rate of interventional procedures in patients with malignant disease</td>
<td>92.4% N=115</td>
<td>92.3%</td>
</tr>
<tr>
<td>Complication rate of interventional procedures with malignant disease</td>
<td>2.3% N=115</td>
<td>5.7%</td>
</tr>
<tr>
<td>Success rate of interventional procedures in patients with nonmalignant disease</td>
<td>97.7% N=412</td>
<td>93.5%</td>
</tr>
<tr>
<td>Complication rate of interventional procedures in patients with nonmalignant disease</td>
<td>1.3% N=412</td>
<td>8.0%</td>
</tr>
<tr>
<td>Thirty-day mortality of interventional patients with malignant disease</td>
<td>16.0% N=119</td>
<td>11.2%</td>
</tr>
<tr>
<td>Thirty-day mortality of interventional patients with nonmalignant disease</td>
<td>1.9% N=412</td>
<td>2.8%</td>
</tr>
</tbody>
</table>

For more information, see chestnet.org/accp/quality-improvement/aquire.
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 PRN “rescue” medication, the effect of asthma on everyday functioning and patient assessment of control, with each of these five responses scored on a 1-5 scale.

Use of serial ACT scores in asthma management can objectify the degree to which the goals of management as described in asthma guidelines are being achieved and, in so doing, can encourage optimal asthma care outcomes. A major objective of asthma management is to achieve well-controlled (ACT = 20-25) asthma. If asthma is poorly controlled (ACT ≤ 15) or not well controlled (ACT = 16-19), evidence indicates such patients are at elevated risk for exacerbation of asthma over time.

We have used the ACT in Allergy and Clinical Immunology at Cleveland Clinic for more than five years on a routine basis. All asthmatic patients complete the ACT when seen at initial and follow-up visits. Shown below are ACT scores categorized by level of control in patients seen in 2010 who completed the ACT at initial encounter and follow-up visit appointments.

Because ACT scores of 19 or less have been associated with higher rates of health service utilization, our data provide indirect evidence that care in Allergy and Clinical Immunology at Cleveland Clinic can lead to reduced overall costs of asthma care and provides value.

**Asthma Control Test (ACT) Score Categories (N = 255)**

<table>
<thead>
<tr>
<th>Score Range</th>
<th>Initial</th>
<th>Follow-up</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poorly Controlled (≤ 15)</td>
<td>32%</td>
<td>19%</td>
</tr>
<tr>
<td>Not Well Controlled (16-19)</td>
<td>24%</td>
<td>17%</td>
</tr>
<tr>
<td>Well Controlled (20-25)</td>
<td>44%</td>
<td>64%</td>
</tr>
</tbody>
</table>
In collaboration with Cleveland Clinic’s Neurological Institute, the Respiratory Institute operates a neuromuscular disease clinic with a predominant focus on the respiratory management of patients with amyotrophic lateral sclerosis (ALS), multiple sclerosis, muscular dystrophies and other neuromuscular disorders. The Kaplan-Meier curves below show long-term survival in over 300 patients with ALS who were seen in the neuromuscular clinic at the Respiratory Institute over a period of six years. The curves are stratified by use of noninvasive ventilation.

**Amyotrophic Lateral Sclerosis (ALS) Survival for Patients Tolerant/Intolerant of Noninvasive Ventilation**

2005 – 2010

<table>
<thead>
<tr>
<th>Survival (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
</tr>
<tr>
<td>80</td>
</tr>
<tr>
<td>60</td>
</tr>
<tr>
<td>40</td>
</tr>
<tr>
<td>20</td>
</tr>
<tr>
<td>0</td>
</tr>
</tbody>
</table>

Days from Start of Noninvasive Ventilation

Hazard Ratio 1.5 (1.1-2.0)

$P = 0.01$
In 2010, the Lung Transplant Program completed its 962nd transplant since the program's inception in 1990 and performed 122 lung transplants (51 single, 71 double). More than 620 end-stage lung disease patients were evaluated nationally and internationally by the transplant team. The transplant program continues a reputation for accepting and transplanting challenging, complex patients.

Cleveland Clinic's Lung Transplant Team is involved in a series of multicenter trials aimed at therapy for primary graft dysfunction, acute rejection and induction therapy. In addition, our surgeons have pioneered certain transplant surgical techniques, including bronchial artery revascularization, that may improve outcomes further by reducing ischemic injury.

The average waiting time for a graft in our program remains stable. The average waiting list time for patients transplanted in 2010 was 137 days, and the median waiting list time was 60.5 days. A continuing emphasis on quality assurance and quality improvement remains central to the program, reflected in the median post-transplant length of stay of 17 days for patients transplanted in 2010.

Another unique feature of Cleveland Clinic's transplant program is that patients can live within 1,000 miles of the Cleveland area while awaiting an organ, which means they do not have to relocate to Cleveland. We follow our patients for the life of their transplant for continuity of care, and we collaborate with their local physicians. Our transplant physicians are committed to helping transplanted patients receive as much care as possible close to their homes. The goal is to return each transplant patient to his or her primary care physician or referring physician within three to six months after transplant.
The Lung Transplant Program has achieved strong survival rates at or above the national average, with a one-month survival rate of 94 percent, one-year survival rate of 83 percent and three-year survival rate of 71 percent.

<table>
<thead>
<tr>
<th>Adult Patient Survival</th>
<th>1 Month*</th>
<th>1 Year*</th>
<th>3 Years**</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient Survival (CC)</td>
<td>93.75</td>
<td>83.36</td>
<td>70.86</td>
</tr>
<tr>
<td>Patient Survival (SRTR/OPTN)</td>
<td>95.72</td>
<td>83.75</td>
<td>66.16</td>
</tr>
</tbody>
</table>

CC = Cleveland Clinic
SRTR/OPTN = Scientific Registry of Transplant Recipients/Organ Procurement and Transplantation Network

Pneumonia – National Hospital Quality Measures

2010

Pneumonia care performance measures are available online at hospitalcompare.hhs.gov, a consumer-oriented website hosted by the Centers for Medicare & Medicaid Services (CMS).

Process Measures (often referred to as “core” measures)

Hospitals submit pneumonia process-of-care data that show how consistently recommended care was provided to adult patients, irrespective of payer. Cleveland Clinic’s National Hospital Quality Measure pneumonia data are displayed below.

Appropriateness of Care Measure

In addition to process-specific measures, Cleveland Clinic generates “appropriateness of care” data for submission to the Ohio Department of Health. We calculate how often we provided every recommended pneumonia process intervention for which each individual patient was eligible. The results, also shown, are generated on a per-patient, “all or nothing” basis.

Cleveland Clinic data source: hospitalcompare.hhs.gov
Visit clevelandclinic.org/QPR to view Cleveland Clinic’s current Quality Performance Report.

* Benchmarks: Overall appropriateness of care only: Ohio average for discharges, January through December 2009, ohiohospitalcompare.ohio.gov
All other measures: National average for discharges, April 2009 through June 2010, hospitalcompare.hhs.gov
Outcome Measures
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 – National Hospital Quality Measures, continued

Pneumonia - All Cause 30-Day Mortality (N = 288)
Discharges July 2007 – June 2010

Pneumonia - All Cause 30-Day Readmissions (N = 330)
Discharges July 2007 – June 2010

Cleveland Clinic’s pneumonia risk-adjusted 30-day mortality rate is no different than the national average. Our pneumonia risk-adjusted readmission rate is no different than the national average. To further reduce this rate, transition-of-care strategies are being developed and deployed at Cleveland Clinic. These include pre-discharge needs assessment, improved discharge processes (patient education, relay of discharge information to receiving providers), and post-discharge follow-up, including continued clinical management support.
“Patients First” is the guiding principle of Cleveland Clinic. Patient experience is a key component of Cleveland Clinic’s strategic plan to achieve a coordinated delivery model that integrates patient- and family-centered care with clinical outcomes, quality, safety and employee experience.

The Office of Patient Experience’s mission is to ensure consistent, patient-centered care by partnering with caregivers to exceed the expectations of patients and families. Programs and services include:

- Expertise for critical initiatives throughout the organization to ensure the consistent delivery of patient-centered care
- Patient satisfaction data analysis, HCAHPS education and resources
- Identification and sharing of sustainable best practices
- Support of employee experience and recognition initiatives
- Customer service education programs, including the Respond with H.E.A.R.T.® service recovery program, to positively impact the Cleveland Clinic culture and support caregivers in providing outstanding service to patients, families and colleagues
- Personalized, holistic Healing Services for patients, families and employees, including light massage, Reiki, Healing Touch™, reflexology, personal aromatherapy, guided imagery, spiritual support, Code Lavender first-response holistic care service and others
- Health literacy education and solutions
- Voice of the Patient Advisory Councils, an advisory resource that empowers patients and families to take an active role in improving the patient experience by providing real-time feedback and creative solutions to specific challenges
- Ombudsman Office, which serves as a centralized complaint center

### Outpatient – Respiratory Institute

**Overall Rating of Outpatient Care and Services During Outpatient Visit (N = 563)**

2010

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<th>Percent</th>
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</table>

Source: Press Ganey, a national hospital survey vendor
Rating of Outpatient Care Provider (N = 563)  
2010

Source: Press Ganey, a national hospital survey vendor

Likelihood of Recommending Outpatient Care Provider (N = 563)  
2010

Source: Press Ganey, a national hospital survey vendor
Inpatient – Respiratory Institute

With the support of the Centers for Medicare & Medicaid Services (CMS) and its partner organizations, the first national standard patient experience hospital survey (HCAHPS) was implemented in late 2006. Results collected for reporting are available at hospitalcompare.hhs.gov.

HCAHPS Overall Assessment
2009 – 2010

HCAHPS Domains of Care
2009 – 2010

Source: Press Ganey, a national hospital survey vendor
Cleveland Clinic Experience — Our Mission, Vision and Values

In 2010, the Office of Patient Experience worked in collaboration with several departments, including the Office of Learning and Performance Development, to introduce “Cleveland Clinic Experience” to every employee across the organization. Cleveland Clinic Experience is an initiative designed to enhance and transform the culture at Cleveland Clinic by integrating exceptional employee and patient experiences. Interactive learning sessions taught caregivers the Cleveland Clinic expected service behaviors, how to positively respond to patient and family concerns, and what it means to live the Cleveland Clinic mission, vision and values on the job every day.
New Bronchoscopy Suites

The Patricia L. and Thomas P. Brundige bronchoscopy suites opened on Aug. 13, 2010. These new suites are designed to provide the full range of services, from standard bronchoscopy through advanced diagnostic and major therapeutic thoracic endoscopy. The suites feature redundant negative pressure isolation, leaded rooms with mobile C-arm fluoroscopy units, general anesthesia systems, bronchoscopy processors and light sources with endobronchial ultrasound units, and five floating monitors. Operating room lights with HD cameras on ceiling-mounted booms, along with system integration and connections to a video recording studio, are features of these new suites. They are also equipped with electromagnetic navigation systems, a mobile laser, electrosurgery and argon plasma coagulation units, cryotherapy units, etc. These suites are the most technologically advanced in the world.

Systematic Mediastinal EBUS Staging

With the availability of general anesthesia, we can perform a minimally invasive assessment of the mediastinal lymph nodes and combine the diagnostic and staging procedures in a single step. In addition to obtaining diagnostic tissue, we assess and sample all visible lymph nodes ≥ 5 mm, even if they do not appear abnormal on CT or PET scans. The ability to diagnose and stage lung cancer in a single, minimally invasive procedure can help patients obtain appropriate treatment sooner and with less risk than that posed by multiple staged procedures.
**Stent Modification**

Both malignant and nonmalignant central airway occlusions present many challenges, in that not all simple tubular silicone and self-expanding metallic stents are designed to fix the problems we face. One of the benefits of having a stock of silicone stents in our suites is that we can modify and shape stents during procedures to meet the unique needs of individual patients.

In lung transplant patients, for example, the airway anastomoses can be at odd angles and very close to the branching airways. When stents are required, we often need to notch out some portion of the stent to keep branching airways open. See Figures 1 and 2. Simple surgical scissors and a Dremel™ tool are used to cut and smooth the edges of stents for placement. When the stent is deployed in the airway, we visually seat it in the appropriate position for best results.
Innovations

**Procedure Benchmarking**

Cleveland Clinic was one of the first 10 medical centers in the world to contribute procedural data to an international registry sponsored by the American College of Chest Physicians. The AQuIRE bronchoscopy registry has been developed to gather a number of anonymous clinical variables related to bronchoscopy procedure types, complications and outcomes, the intent being to better understand the value of bronchoscopy. We have been contributing data from therapeutic procedures since late 2009, and we are now starting to evaluate the data from 2010. As a key initial member of the registry and the executive committee, we have an impact on setting standards for bronchoscopy procedures and can compare them with an international group of similar centers.
Using Short-Cycle Business Intelligence to Drive Change

Beginning in late 2010, the Respiratory Institute began using short-cycle business intelligence (BI) to focus on procedural and protocol compliance for ventilation weaning. In collaboration with various respiratory therapy groups, including personnel from the Medical Intensive Care Unit, the Surgical Intensive Care Unit, the Respiratory Special Care Unit and the Neurological Intensive Care Unit, we use a variety of metrics to evaluate performance, such as: sedation levels at time of screening and spontaneous breathing trial (SBT), time (of day) SBT and screening take place, reasons for failed screening, SBT or extubation. Monitoring these specific metrics allows us to make changes to our procedures and/or protocols on a near-real-time basis, allowing for feedback on compliance and testing outcomes.

Figure 1

Figure 2

Figure 3
How Treating Bone Marrow Might Help Patients with Pulmonary Hypertension

Pulmonary arterial hypertension (PAH) is a proliferative vasculopathy of the pulmonary circulation leading to vascular remodeling and arterial obliteration, which increase pulmonary arterial pressures and lead to right heart failure and death. Currently available vasodilator therapies for PAH, although helpful in improving exercise tolerance and quality of life, are only moderately effective in improving survival.

Researchers at Cleveland Clinic are studying the basic mechanisms by which the blood vessels are remodeled and new vessels form in pulmonary hypertension, a process called angiogenesis. They identified specific subsets of bone marrow progenitor cells that may drive angiogenesis in PAH [Asosingh K, et al. Circulating angiogenic precursors in idiopathic pulmonary arterial hypertension. Am J Pathol. 2008;172:615-627]. The findings showed that bone marrow progenitors are increased in PAH, have a greater proliferative potential and correlate with disease severity. Now, in a recent article, “Hypoxia-inducible factors in human pulmonary arterial hypertension: a link to the intrinsic myeloid abnormalities,” published in the March 31, 2011, Blood, the investigators reveal a close relationship between pulmonary arterial hypertension and fundamental myeloid abnormalities in the bone marrow. This new concept challenges previous notions and opens the door to newer therapies in the field of PAH.

The study showed that blood progenitor cells are increased in the bone marrow, blood and lungs of patients with PAH. In addition, bone marrow fibrosis was present to a greater degree in PAH subjects. “The combination of bone marrow fibrosis with elevated hematopoietic myeloid progenitor counts suggest a myeloproliferative process is existent in PAH patients,” state Yoder et al. in their editorial, “Bad blood, bad endothelium: ill fate?” in the same issue of the journal.

The researchers homed in on the stem cells to identify factors that might be involved in bone marrow progenitor abnormalities and in progressive pulmonary arterial disease. Several hypoxia-inducible factors (HIF) were measured in patients with PAH and controls. Levels of HIF-regulated factors, erythropoietin (Epo), stem cell factor (SCF) and hepatocyte growth factor (HGF) were all increased in PAH patients. In addition, there was increased production by lung endothelial cells from PAH patients of HGF and stromal derived factor (SDF)-1α. The increased levels of circulating HGF, Epo and SCF in PAH subjects and greater secretion of HGF and SDF-1α by the endothelial cells isolated from PAH patient lungs implicate lung endothelial cells in the recruitment of CD34+CD133+ progenitor cells into the pulmonary vasculature.
To determine whether the bone marrow myeloproliferative disorder may be intrinsic to PAH patients, nonaffected family members of patients with familial PAH were also studied. All family members had increased numbers of circulating progenitors and increased marrow fibrosis compared with normal healthy controls. Taken together, this suggests that a subclinical myeloproliferative process is intrinsic to PAH.

Overall, the findings in this study support a myelopulmonary axis based on the interdependence of hematopoiesis and pulmonary vascular angiogenesis. The findings have significance for new treatment strategies targeting the bone marrow myeloproliferative process to disrupt the progressive, unremitting angioproliferative course of the disease.


Selected Publications


Institute Chairman
Herbert Wiedemann, MD, MBA

Institute Quality Review Officer
Umur Hatipoglu, MD

Pulmonary and Critical Care Medicine
Loutfi Aboussouan, MD
Jafar Abunasser, MD
Muzaffar Ahmad, MD
Olufemi Akindipe, MD
Francisco Almeida, MD, MS
Rendell Ashton, MD
Associate Director, Medical Intensive Care Unit
Marie Budev, DO, MPH
Medical Director, Lung Transplantation
Robert Castele, MD
Jeffrey Chapman, MD
Director, Interstitial Lung Disease Program
Chirag Choudhary, MD
Joseph Cicenia, MD
Daniel Culver, DO
Director, Sarcoidosis Program
Ehab Daoud, MD
Raed Dweik, MD
Director, Pulmonary Vascular Disease Program
Serpil Erzurum, MD
Chair, Department of Pathobiology

Samar Farha, MD
Andrew Garrow, MD
Thomas Gildea, MD, MS
Head, Section of Bronchology
Jorge Guzman, MD
Director, Medical Intensive Care Unit
Tarik Hanane, MD
Gustavo Heresi, MD
David Holden, MD
Manica Isiguzo, MD
Constance Jennings, MD
Sumita Khatri, MD, MS
Co-Director, Asthma Center
Charles Lane, MD
Catherine Lazar, MD
Michael Machuzak, MD
Co-Director, Center for Major Airway Diseases
Peter Mazzone, MD, MPH
Director, Lung Cancer Program
Glenn Meden, MD
Atul Mehta, MD
Chief Medical Officer, Sheikh Khalifa Medical Center, Abu Dhabi
Omar Minai, MD
Kathrin Nicolacakis, MD
Thomas Olbrych, MD
Beverly O’Neill, MD
Vice President for Medical Operations
Euclid Hospital
Joseph Parambil, MD
Bohdan Pichurko, MD
*Director, Pulmonary Function Lab*
Jennifer Ramsey, MD
Deborah Rathz, MD, PhD
Anita Reddy, MD
Hina Sahi, MD
Madhu Sasidhar, MD
*Head, Section of Respiratory Therapy*
James Stoller, MD, MS
*Chair, Education Institute*
Carmen Swaisgood, PhD
Adriano Tonelli, MD

**Allergy and Clinical Immunology**
David Lang, MD
*Head, Section of Allergy and Clinical Immunology*
Susan Abouhassan, MD
Mark Aronica, MD
Sandra Hong, MD
Fred Hsieh, MD
Rachel Koelsch, MD
Lily Pien, MD
Cristine Radojicic, MD

Some physicians may practice in multiple locations. For a detailed list including staff photos, please visit [clevelandclinic.org/staff](http://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

**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**
For help with service issues, information about clinical specialists and services, details about CME opportunities and more
216.448.0900 or 888.637.0568, or email refdr@ccf.org

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

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

**Cleveland Clinic Florida**
Toll-free 866.293.7866

For address corrections or changes, please call 800.890.2467
Institute Locations

Cleveland Clinic Main Campus
9500 Euclid Ave.
Cleveland, OH 44195
216.444.6503

Beachwood Family Health and Surgery Center
26900 Cedar Road
Beachwood, OH 44122
216.839.3820
Pulmonary

Brunswick Family Health Center
3574 Center Road
Brunswick, OH 44212
330.225.8886
Pulmonary

Chagrin Falls Family Health Center
551 E. Washington St.
Chagrin Falls, OH 44022
440.893.9393
Pulmonary

Euclid Hospital
Medical Office Building
99 Northline Circle, Suite 235
Euclid, OH 44119
216.692.7848
Pulmonary

Hillcrest Hospital
Hillcrest Atrium
6780 Mayfield Road, Suite 323
Mayfield Heights, OH 44124
440.312.7140
Pulmonary

Independence Family Health Center
5001 Rockside Road
Crown Center II
Independence, OH 44131
216.986.4000
Pulmonary and Allergy

Strongsville Family Health and Surgery Center
16761 SouthPark Center
Strongsville, OH 44136
440.878.2500
Pulmonary and Allergy

Westlake Family Health Center
30033 Clemens Road
Westlake, OH 44145
440.899.5555
Allergy

Willoughby Hills Family Health Center
2570 SOM Center Road
Willoughby Hills, OH 44094
440.943.2500
Allergy
Overview

Cleveland Clinic is a nonprofit multispecialty academic medical center that integrates clinical and hospital care with research and education. Today, more than 2,500 Cleveland Clinic physicians and scientists practice in more than 100 medical specialties and subspecialties, annually recording more than 1.5 million physician visits and more than 70,000 surgeries. Cleveland Clinic currently has the highest CMS case-mix index in America. Patients come for treatment from every state and from more than 80 countries annually.

Cleveland Clinic's main campus, with 50 buildings on 180 acres in Cleveland, Ohio, includes a 1,300-bed hospital, outpatient clinic, specialty institutes and supporting labs and facilities. Cleveland Clinic also operates 16 family health centers, nine community hospitals, one affiliate hospital, a rehabilitation hospital for children, Cleveland Clinic Florida, the Lou Ruvo Center for Brain Health in Las Vegas, and Cleveland Clinic Canada. Cleveland Clinic Abu Dhabi (United Arab Emirates), a multispecialty care hospital and clinic, is scheduled to open in 2012. With 41,000 employees, Cleveland Clinic is the second largest employer in Ohio, and is responsible for an estimated $9 billion of economic activity every year.

The Cleveland Clinic Model

Cleveland Clinic was founded in 1921 by four physicians who had served in World War One 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.

In 2007, Cleveland Clinic restructured its practice, bundling all clinical specialties into integrated practice units called institutes. An institute combines all the specialties surrounding a specific organ or disease system under a single roof. Each institute has a single leader and focuses the energies of multiple professionals onto the patient. From access and communication to billing and point-of-care service, institutes are improving the patient experience at Cleveland Clinic.

Cleveland Clinic Lerner Research Institute

At the Cleveland Clinic Lerner Research Institute, hundreds of principal investigators, project scientists, research associates and postdoctoral fellows are involved in laboratory-based, translational and clinical research. Total annual research expenditures exceed $272 million from federal agencies, non-federal societies and associations, endowment funds and other sources.

Cleveland Clinic physicians, scientists, fellows, residents and other employees are involved in more than 3,000 human-subject research activities at any given time.

Cleveland Clinic Lerner College of Medicine

Now in its seventh year of existence, Cleveland Clinic Lerner College of Medicine of Case Western Reserve University offers all students full-tuition scholarships. The program graduated its first 29 students as physician-scientists in 2009.

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 since 1995.

For more information about Cleveland Clinic, please visit clevelandclinic.org.
Referring Physician Center
For help with service-related issues, information about our clinical specialists and services, details about CME opportunities and more, contact the Referring Physician Center at refdr@ccf.org, or 216.448.0900 or 888.637.0568.

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 syndromes, call 877.379.CODE (2633).

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

Request Medical Records
216.444.2640 or 800.223.2273, ext. 42640

Track Your Patient’s 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 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 own personal computer. MyChart offers a secure connection to Google™ Health, where users can securely share personal health information with Cleveland Clinic and record and share details of their Cleveland Clinic treatment with the physicians and healthcare providers of their choice. To establish a MyChart account, visit clevelandclinic.org/mychart.

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 1,000 life-threatening and life-altering diagnoses. For more information, visit clevelandclinic.org/myconsult, email eclevelandclinic@ccf.org or call 800.223.2273, ext. 43223.

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.com) is an educational resource for healthcare providers and the public. Available 24/7, it houses programs that cover topics in 30 areas — if not from A to Z, at least from Allergy to Wellness — with a worldwide reach. Among other resources, the website contains a virtual textbook of medicine (Disease Management Project), a medical newsfeed refreshed daily, 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 under way. In 2010, the center offered 11 simultaneous courses at Arab Health, a major world healthcare forum, in Dubai, United Arab Emirates.