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 clinical institutes. Designed for a physician audience, the Outcomes books contain a summary of many of our surgical and medical treatments, with a focus on outcomes data and a review of new technologies and innovations.

The Outcomes books are not a comprehensive analysis of all treatments provided at Cleveland Clinic, and omission of a particular treatment does not necessarily mean we do not offer that treatment. When there are no recognized clinical outcome measures for a specific treatment, we may report process measures associated with improved outcomes. When process measures are unavailable, we may report volume measures; a relationship has been demonstrated between volume and improved outcomes for many treatments, particularly those involving surgical and procedural techniques.

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

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

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

We hope you find these data valuable, and we invite your feedback. Please send your comments and questions via email to:

OutcomesBooksFeedback@ccf.org or scan here.

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

Welcome to this 2015 Cleveland Clinic Outcomes book. Every year, we publish Outcomes books for 14 clinical institutes with multiple specialty services. These publications are unique in healthcare. Each one provides an overview of medical or surgical trends, innovations, and clinical data for a particular specialty over the past year. We are pleased to make this information available.

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

All Cleveland Clinic Outcomes books are available in print and online. Additional data are available through our online Quality Performance 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 books has become increasingly relevant as healthcare transforms from a volume-based to a value-based system. We appreciate your interest and hope you find this information useful and informative.

Sincerely,

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

Chairman’s Letter ........................................ 04
Institute Overview ........................................ 05
Quality and Outcomes Measures
  Critical Care Medicine .......................... 06
  Bronchology ........................................ 10
  Asthma Center ....................................... 14
  Lung and Heart/Lung Transplantation .... 16
  Pulmonary Vascular Program .............. 18
  Chronic Thromboembolic Pulmonary Hypertension 20
  National Hospital Quality Measures .... 22
  Institute Patient Experience ............... 24
  Cleveland Clinic — Implementing Value-Based Care 26
Innovations ............................................. 32
Contact Information .................................... 34
About Cleveland Clinic ............................ 36
Resources ............................................... 38

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.
Dear Colleagues,

The Respiratory Institute is pleased to present the 12th edition of our Outcomes book. This book provides a concise overview of our clinical activities and programs, with a focus on patient outcomes.

At Cleveland Clinic, patients with respiratory diseases and allergic disorders benefit from the expertise of a multidisciplinary team consisting of clinicians who specialize in pulmonary medicine, critical care medicine, and allergy and clinical immunology, all working in close collaboration with thoracic surgeons, thoracic radiologists, and pulmonary pathologists. In 2015, we experienced continued growth in our clinical programs, research funding, and application of innovative technologies. The collaboration between clinicians and researchers helps close the gap between the laboratory discoveries of today and the patient care of tomorrow.

As described in this book, recent innovations that will be enhancing clinical practice include:

- Cone-beam CT scanning to provide 3-dimensional localization of peripheral lung lesions during navigational bronchoscopy
- Laser Doppler flowmetry to measure changes in peripheral microvascular flow in patients with idiopathic pulmonary hypertension

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

Sincerely,

Herbert P. Wiedemann, MD, MBA
Chairman, Respiratory Institute
The Respiratory Institute is regarded as one of the top respiratory centers in the nation, uniting specialists from the departments of Pulmonary Medicine, Critical Care Medicine, and Allergy and Clinical Immunology in the diagnosis and management of the full spectrum of respiratory and allergic disorders. In 2015, *U.S. News & World Report*’s “Best Hospitals” survey ranked Cleveland Clinic No. 3 in the nation for pulmonology services.

At the Respiratory Institute, patients with breathing disorders benefit from the expertise of 110 physicians, 40 fellows, 19 physician assistants, and 14 nurse practitioners. A multidisciplinary team of physicians is available for collaboration, including specialists from Thoracic and Cardiovascular Surgery, Thoracic Imaging, and Pulmonary Pathology.

<table>
<thead>
<tr>
<th></th>
<th>2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total visits</td>
<td>159,458</td>
</tr>
<tr>
<td>Interstitial lung disease visits</td>
<td>1670</td>
</tr>
<tr>
<td>Pulmonary arterial hypertension visits</td>
<td>2232</td>
</tr>
<tr>
<td>Sarcoidosis visits</td>
<td>3550</td>
</tr>
<tr>
<td>Lung cancer visits</td>
<td>1262</td>
</tr>
<tr>
<td>Chronic obstructive pulmonary disease visits</td>
<td>12,225</td>
</tr>
<tr>
<td>Total hospital admissions</td>
<td>2302</td>
</tr>
<tr>
<td>Research funding</td>
<td>$11.2 million</td>
</tr>
<tr>
<td>Research grants/contracts</td>
<td>91</td>
</tr>
<tr>
<td>Lung transplants (includes heart/lung and liver/lung)</td>
<td>93</td>
</tr>
<tr>
<td>Bronchoscopies</td>
<td>3968</td>
</tr>
</tbody>
</table>
The Respiratory Institute manages and staffs the Medical Intensive Care Unit (MICU) on the main campus of the Cleveland Clinic. With a total of 64 beds across 5 nursing units, it is one of the largest ICUs in the US. The unit is staffed by board-certified intensivists, who have been providing in-house coverage 24 hours a day since July 2008.

As outlined in the following graphs, patient outcomes continue to be excellent, including decreasing mortality rates that are below the risk-adjusted predicted values, improving infection rates, and low readmission rates.

The acuity and complexity of the patient population remain high as demonstrated by the overall APACHE IV acuity score. Cleveland Clinic’s APACHE IV mean score of 67 is well above the benchmark of 54 from a large adult population that reflects the current practice of critical care in the United States. The APACHE IV is used to risk-adjust the Respiratory Institute’s population of critical care patients.

**Reference**

The Respiratory Institute manages and staffs the Medical Intensive Care Unit (MICU) on the Main Campus of the Cleveland Clinic. With a total of 64 beds across 5 nursing units, it is one of the largest ICUs in the US. The unit is staffed by board-certified intensivists, who have been providing in-house coverage 24 hours a day since July 2008.

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Reference

Total admissions to the MICU at Cleveland Clinic main campus did not change significantly from 2014 to 2015. During this past year, the institute has continued to develop and strengthen the capabilities of ICUs within Cleveland Clinic's network of regional hospitals in Northeast Ohio, whose admission rates have increased. Overall, this change has resulted in a noticeable increase in ICU admissions. Direct interhospital transfers account for 34% of total MICU admissions. The percent of direct emergency department admissions reduced slightly, decreasing from 44% in 2014 to 38% in 2015, while outside hospital transfers increased to 28%. Occupancy has remained above 93% throughout the year. MICU length of stay has remained stable and was less than predicted. Readmission rates within 48 hours of ICU discharge have remained below 2%.
The MICU central line-associated bloodstream infection (CLABSI) rate increased to 2.45 in 2015 compared with 1.03 in 2014. In 2015, the reporting criteria for this hospital-acquired infection were changed, and some of the increase can be attributed to this adjustment in the metric. The spectrum of pathogens now associated with the reported CLABSI rate has changed significantly with the addition of several pathogens not typically associated with line infections. The institute has further analyzed and refined care processes to minimize total line days, line position, and line maintenance.

The change is likely not related to high patient volumes and high acuity, because there have not been similar increases in other hospital-acquired infections. As shown in the graphs below, rates of both catheter-associated urinary tract infection (CAUTI) and *Clostridium difficile* infections improved in 2015 compared with 2014. The percentiles shown in the graphs are taken from the National Healthcare Safety Network report data summary for 2013.¹

**MICU Central Line-Associated Bloodstream Infections (N = 4519)**  
**2010 – 2015**

<table>
<thead>
<tr>
<th>Year</th>
<th>Rate (per 1000 Line Days)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>2.3</td>
</tr>
<tr>
<td>2011</td>
<td>2.3</td>
</tr>
<tr>
<td>2012</td>
<td>2.3</td>
</tr>
<tr>
<td>2013</td>
<td>2.3</td>
</tr>
<tr>
<td>2014</td>
<td>2.3</td>
</tr>
<tr>
<td>2015</td>
<td>2.3</td>
</tr>
</tbody>
</table>

CDC/NHSN = Centers for Disease Control and Prevention’s National Healthcare Safety Network  
A national benchmark for 2015 using the new CLABSI definition is not yet available.

**Reference**

No accepted benchmark exists for unit-acquired *C. difficile*.

**MICU Catheter-Associated Urinary Tract Infection**  
*2013 – 2015*  
*Rate (per 1000 Catheter Days)*

**MICU Nosocomial *C. difficile* Infections**  
*2010 – 2015*  
*Rate (per 1000 Patient Days)*

CDC/NHSN = Centers for Disease Control and Prevention’s National Healthcare Safety Network
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
- Endobronchial ultrasound (EBUS)
- Lung transplant-related airway disease
- Airway stenting
- Management of airway complications due to histoplasmosis
- Benign airway diseases
- Metallic stent removal

Staff physicians performed 3968 bronchoscopies during 2015, a 4.6% increase over 2014. Notably, complication rates remain low.

### Selected Procedure Volumes 2015

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Volume</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transbronchial lung biopsy</td>
<td>1248</td>
</tr>
<tr>
<td>Transbronchial needle aspiration</td>
<td>1108(^a)</td>
</tr>
<tr>
<td>EBUS — linear and peripheral</td>
<td>974</td>
</tr>
<tr>
<td>Electrocautery/laser/cryoablation</td>
<td>379</td>
</tr>
<tr>
<td>Electromagnetic navigation</td>
<td>186</td>
</tr>
<tr>
<td>Balloon/rigid airway dilation</td>
<td>322</td>
</tr>
<tr>
<td>Bronchial/tracheal stenting/T-tube</td>
<td>185</td>
</tr>
<tr>
<td>Bronchial thermoplasty</td>
<td>17</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>4419(^b)</strong></td>
</tr>
</tbody>
</table>

\(^a\)Includes transbronchial needle aspiration with or without EBUS.

\(^b\)Total includes multiple advanced procedures per case.
The aggregate postbronchoscopy complication rate in 2015 was lower than expected compared with published data.\(^1,^2\) With respect to 2 of the most commonly reported complications, the institute’s pneumothorax and significant bleeding rates were either below or on par with published data.

**References**


EBUS procedures allow the capability not only to sample enlarged nodes for diagnostic purposes but also to systematically stage the mediastinum of patients with known or suspected lung cancer. EBUS is routinely used for the concomitant diagnosis and staging of lung cancer in a single session, obviating the need for a second bronchoscopy or a mediastinoscopy.\(^1\) Sampling adequacy during staging and diagnostic procedures adequacy (defined as a final cytologic diagnosis of lymphoid or malignant cells, or granulomas) is better at the Respiratory Institute when compared to benchmarks from published literature.\(^2,3\) The number of evaluated lymph node stations also exceeds the evaluation of 2 to 3 nodal stations documented in published EBUS studies\(^2,3\) and approaches benchmarks recommended for surgical mediastinoscopy.

### Endobronchial Ultrasound: Lymph Node Stations Evaluated During Staging Procedure and Sample Adequacy (N = 905)

<table>
<thead>
<tr>
<th>Nodal stations evaluated (average)</th>
<th>Cleveland Clinic</th>
<th>National Studies(^2,3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample adequacy</td>
<td>&gt; 94%</td>
<td>83-87%</td>
</tr>
</tbody>
</table>

The average lymph node size biopsied during staging procedures was 8.8 mm; 75% of biopsied nodes were < 10 mm in size. Again, this outperforms standards published in the medical literature on EBUS staging. The ability to routinely and accurately access lymph nodes of < 10 mm is extremely important given that PET scanning is less sensitive for nodes < 7 to 10 mm. In addition, published guidelines call for invasive sampling of normal sized nodes in instances where risk of nodal involvement is high.\(^4\)

### References

Asthma control can be assessed by using validated instruments, including the Asthma Control Test™ (ACT). The ACT includes 5 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 5 responses scored on a 1 to 5 scale. Higher scores reflect improved asthma control, a major objective of asthma management.

The ACT has been routinely used at Cleveland Clinic’s Asthma Center for more than a decade. All asthma patients complete the ACT when seen at initial and follow-up visits.

The 2015 data are being reported in the context of a quality measure. The American Academy of Allergy, Asthma, and Immunology Qualified Clinical Data Registry (QCDR), developed in collaboration with CECity,1,2 was approved by the Centers for Medicare and Medicaid Services in 2014. The QCDR qualifies as a reporting tool for the Physician Quality Reporting System for 2015.2 The measure addresses the proportion of asthma patients whose asthma was either poorly or not well controlled, as indicated by an ACT score < 20 at baseline, who achieve an improvement of ≥ 3 at a subsequent visit during a 12-month period. An increase of 3 has been shown to be the minimal important difference for the ACT.3
Of 451 asthma patients who completed the ACT at initial and follow-up visits in 2015, 358 (74%) were poorly or not well controlled at their initial visit. An improvement in asthma control, as reflected in mean ACT scores, was observed at follow-up visits for these patients, 245 (68.4%) of whom demonstrated an improvement in ACT scores of ≥ 3.

These data offer evidence that care at the Asthma Center provides value and leads to improved asthma outcomes.4

References
Primary Disease of Lung Transplant Recipients
July 2014 – June 2015

62% Idiopathic pulmonary fibrosis (N = 65)
20% Emphysema/chronic obstructive pulmonary disease (N = 21)
18% Other (N = 18)

Idiopathic pulmonary fibrosis was the most common primary disease among patients who had lung transplant procedures at Cleveland Clinic in 2015.

Source: Scientific Registry of Transplant Recipients, December 2015. srtr.org
### Lung Transplant Survival

#### 1-Month and 1-Year Survival (N = 244)

**July 2014 – June 2015**

- **Observed**
- **SRTR expected**

Patients who undergo lung transplantation at Cleveland Clinic have survival rates as expected and not statistically different from national rates. The expected survival rate is based on risk adjustment.

**Source:** Scientific Registry of Transplant Recipients, December 2015. [srtr.org](http://srtr.org)

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### Waiting Time for Lung Transplant

**July 2014 – June 2015**

- **Observed**
- **Expected US**
- **Expected region** (Indiana, Michigan, Ohio)

The median wait time for lung transplantation at Cleveland Clinic is shorter than in the region and about the same as the national average.

**Source:** Scientific Registry of Transplant Recipients, December 2015. [srtr.org](http://srtr.org)

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### Wait-List Mortality

**July 2014 – June 2015**

- **Observed**
- **Expected**

The mortality rate among Cleveland Clinic patients on the wait-list for lung transplant is not statistically different from the national rate. The expected mortality rate is based on risk adjustment.

**Source:** Scientific Registry of Transplant Recipients, December 2015. [srtr.org](http://srtr.org)

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### Ex Vivo Lung Perfusion

The majority (about 80%) of lungs donated for transplant are not usable due to infection, damage, or excess fluid. However, ex vivo lung perfusion allows many of these lungs to be converted to lungs that are transplantable, allowing more lives to be saved. Ex vivo perfusion involves attaching the lungs outside the body to a machine that perfuses them with a solution that helps remove excess water while they are being ventilated. If lung function improves, the lungs can be transplanted. Cleveland Clinic has experimented with this technique for 4 years and is now in the phase where these reconditioned lungs are being transplanted.

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### Reference

The Pulmonary Vascular Program at Cleveland Clinic consists of a team of 5 pulmonologists, 2 cardiologists, an advanced practice nurse, a nurse, a patient care coordinator, 2 research nurse coordinators, and research fellows. Additionally, as part of Cleveland Clinic, the program draws on expertise in cardiothoracic surgery, lung transplantation, hepatology, liver transplantation, sleep medicine, and rheumatology to provide a comprehensive and multidisciplinary approach to patient care. Active clinical and research programs are offered for all types of pulmonary hypertension, including idiopathic pulmonary arterial hypertension, chronic thromboembolic pulmonary hypertension, hereditary hemorrhagic telangiectasia, portopulmonary hypertension, congenital heart disease, and pulmonary hypertension associated with the scleroderma spectrum of diseases and other connective tissue diseases. The surgical thromboendarterectomy program for patients with chronic thromboembolic pulmonary hypertension has emerged as one of the most active in the United States.

The Pulmonary Vascular Program is involved in a wide range of research activities, from NIH-funded basic research and translational research to clinical trials of the latest therapies. Many patients referred to the Pulmonary Vascular Program benefit from enrollment in one or more of these ongoing clinical trials and research studies.
**Actual and Predicted Survival of Patients With Category 1 Pulmonary Arterial Hypertension (N = 854)**

2015

The graph shows the survival curve for patients with category 1 pulmonary arterial hypertension enrolled in the Cleveland Clinic Pulmonary Hypertension Registry, compared with their predicted survival based on the NIH registry equation\(^1\) and with survival in a large French registry.\(^2\) For both comparisons, Cleveland Clinic patients had better than expected survival. For example, actual 3-year survival for Cleveland Clinic patients was 66.8%, compared with 51.3% predicted by the NIH equation and 56.6% in the French registry.

### References


Pulmonary hypertension due to unresolved pulmonary emboli that narrow pulmonary arteries, also known as chronic thromboembolic pulmonary hypertension (CTEPH), is a deadly disease that can be effectively treated with a complex surgical procedure called pulmonary thromboendarterectomy (PTE). Cleveland Clinic has a multidisciplinary team dedicated to the evaluation and treatment of CTEPH patients. The team includes clinicians from Pulmonary Medicine, Cardiothoracic Surgery, Nuclear Medicine, Chest Radiology, Interventional Radiology, Cardiovascular Medicine, Anesthesiology, and Critical Care Medicine.

Over the past 21 years, a total of 168 PTE surgeries have been performed at Cleveland Clinic. Between 1995 and 2010, operative mortality (i.e., in-hospital deaths) was 11.6%. Between 2011 and 2015, volumes doubled and operative mortality decreased to 4.8%, a rate comparable to current published literature.1,2

Pulmonary Thromboendarterectomy Experience (N = 168)
1995 – 2015

For the 81 patients operated on between 2011 and 2015, hemodynamic data show normalization of pulmonary vascular resistance.

References
Not only are hemodynamic results remarkable and operative mortality low, but long-term outcomes are excellent, with a 3-year survival rate of 84.8%, compared to 59.6% for patients treated with medical therapies ($P = 0.07$) between 2009 and 2015.

**PTE vs Medical Therapy (N = 127)**

### Hemodynamics Before and After PTE (N = 65)

**2011 – 2015**

<table>
<thead>
<tr>
<th></th>
<th>Preop Median (25th, 75th percentiles)</th>
<th>Postop Median (25th, 75th percentiles)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean PAP, mm Hg</td>
<td>45 (37, 54)</td>
<td>25 (22, 31)</td>
</tr>
<tr>
<td>CI, L/min/m$^2$</td>
<td>2.2 (1.8, 2.6)</td>
<td>2.8 (2.4, 3.2)</td>
</tr>
<tr>
<td>PVR, Wood units</td>
<td>6.65 (4.9, 10.2)</td>
<td>2.4 (1.9, 3.3)</td>
</tr>
</tbody>
</table>

CI = cardiac index, PAP = pulmonary artery pressure, PTE = pulmonary thromboendarterectomy, PVR = pulmonary vascular resistance

Not only are hemodynamic results remarkable and operative mortality low, but long-term outcomes are excellent, with a 3-year survival rate of 84.8%, compared to 59.6% for patients treated with medical therapies ($P = 0.07$) between 2009 and 2015.
Pneumonia All-Cause 30-Day Mortality and All-Cause 30-Day Readmissions

July 2012 – June 2015

The Centers for Medicare & Medicaid Services (CMS) calculates 2 pneumonia outcomes measures based on Medicare claims and enrollment information. The most recent risk-adjusted data available from CMS are shown. Cleveland Clinic’s pneumonia patient mortality rate is ranked “better than” the US national rate. Cleveland Clinic’s pneumonia readmissions rate is ranked “worse than” the US national rate. To further reduce avoidable readmissions, Cleveland Clinic is focused on optimizing transitions from hospital to home or postacute facility. Specific initiatives have been implemented to ensure effective communication, education, and follow-up.

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Source: medicare.gov/hospitalcompare
CMS calculates 2 COPD outcomes measures based on Medicare claims and enrollment information. The most recent risk-adjusted data available from CMS are shown. Although Cleveland Clinic's COPD patient mortality rate is lower than the US national rate, CMS ranks Cleveland Clinic’s performance as “no different than” the US national rate. Cleveland Clinic’s COPD readmissions rate is slightly higher than the US national rate and also ranked by CMS as “no different than” the US national rate. To further reduce avoidable readmissions, Cleveland Clinic is focused on optimizing transitions from hospital to home or postacute facility. Specific initiatives have been implemented to ensure effective communication, education, and follow-up.

COPD All-Cause 30-Day Mortality and All-Cause 30-Day Readmissions

July 2012 – June 2015

Percent

COPD = chronic obstructive pulmonary disease

\(^a\)Source: medicare.gov/hospitalcompare
Keeping patients at the center of all that we do is critical. Patients First is the guiding principle at Cleveland Clinic. Patients First is safe care, high-quality care, in the context of patient satisfaction, and high value. Ultimately, our caregivers have the power to impact every touch point of a patient’s journey, including their clinical, physical, and emotional experience.

We know that patient experience goes well beyond patient satisfaction surveys. Nonetheless, by sharing the survey results with our caregivers and the public, we constantly identify opportunities to improve how we deliver exceptional care.

### Outpatient Office Visit Survey — Respiratory Institute

**CG-CAHPS Assessment**

2014 – 2015

**Percent Best Response**

<table>
<thead>
<tr>
<th></th>
<th>2014 (N = 1502)</th>
<th>2015 (N = 3123)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Appointment Access</strong></td>
<td>70</td>
<td>75</td>
</tr>
<tr>
<td><strong>Doctor Communication</strong></td>
<td>80</td>
<td>85</td>
</tr>
<tr>
<td><strong>Doctor Rating</strong></td>
<td>70 (9 or 10)</td>
<td>75 (9 or 10)</td>
</tr>
<tr>
<td><strong>Clerical Staff</strong></td>
<td>70</td>
<td>75</td>
</tr>
<tr>
<td><strong>Test Results Communication</strong></td>
<td>70</td>
<td>75</td>
</tr>
</tbody>
</table>

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*In 2013, Cleveland Clinic began administering the Clinician and Group Practice Consumer Assessment of Healthcare Providers and Systems surveys (CG-CAHPS), standardized instruments developed by the Agency for Healthcare Research and Quality (AHRQ) and supported by the Centers for Medicare & Medicaid Services for use in the physician office setting to measure patients’ perspectives of outpatient care.*

*Based on results submitted to the AHRQ CG-CAHPS database from 3962 practices in 2014.*

*Response options: Always, Usually, Sometimes, Never*  
*Response options: Yes, definitely; Yes, somewhat; No*  
*Response options: Yes, No*  

*Source: Press Ganey, a national hospital survey vendor*
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.

HCAHPS Domains of Care

2014 – 2015

*Based on national survey results of discharged patients, January 2014 – December 2014, from 4172 US hospitals. medicare.gov/hospitalcompare

*Response options: Definitely yes, Probably yes, Probably no, Definitely no

Source: Press Ganey, a national hospital survey vendor, 2015
Overview

Cleveland Clinic health system uses a systematic approach to performance improvement while simultaneously pursuing 3 goals: improving the patient experience of care (including quality and satisfaction), improving population health, and reducing the cost of healthcare. The following measures are examples of 2015 focus areas in pursuit of this 3-part aim. Throughout this section, “Cleveland Clinic” refers to the academic medical center or “main campus,” and those results are shown.

Real-time data are leveraged in each Cleveland Clinic 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.

Improve the Patient Experience of Care

Cleveland Clinic Overall Inpatient Mortality Ratio

2014 – 2015

Cleveland Clinic Central Line-Associated Bloodstream Infection Rate

2015

Cleveland Clinic’s observed/expected (O/E) mortality ratio outperformed its internal target derived from the Vizient 2015 risk model. Ratios less than 1.0 indicate mortality performance “better than expected” in Vizient’s risk adjustment model.

Cleveland Clinic has implemented several strategies to reduce central line-associated bloodstream infections (CLABSIs), including a central-line bundle of insertion, maintenance, and removal best practices. Focused reviews of every CLABSI occurrence support reductions in CLABSI rates.
Improved screening, risk adjustment, and prevention strategies have supported Cleveland Clinic’s continued improvement with respect to perioperative pulmonary embolism and deep vein thrombosis (AHRQ Patient Safety Indicator 12). Embolism/thrombosis prevention remains a safety priority for Cleveland Clinic.

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 position 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.
Keeping patients at the center of all that we do is critical. Patients First is the guiding principle at Cleveland Clinic. Patients First is safe care, high-quality care, in the context of patient satisfaction, and high value. Ultimately, our caregivers have the power to impact every touch point of a patient’s journey, including their clinical, physical, and emotional experience.

We know that patient experience goes well beyond patient satisfaction surveys. Nonetheless, by sharing the survey results with our caregivers and the public, we constantly identify opportunities to improve how we deliver exceptional care.

**Outpatient Office Visit Survey — Cleveland Clinic**

**CG-CAHPS Assessment**

2014 – 2015

<table>
<thead>
<tr>
<th>Best Response (%)</th>
<th>2014 (N = 167,503)</th>
<th>2015 (N = 227,599)</th>
<th>CG-CAHPS 2014 database average (all practices)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appointment Access (% Always)c</td>
<td>60</td>
<td>65</td>
<td>63</td>
</tr>
<tr>
<td>Specialty Care (% Yes, Definitely)d</td>
<td>85</td>
<td>85</td>
<td>85</td>
</tr>
<tr>
<td>Primary Care (% Always)c</td>
<td>75</td>
<td>75</td>
<td>75</td>
</tr>
<tr>
<td>Doctor Rating (% 9 or 10) 0 – 10 Scale</td>
<td>90</td>
<td>90</td>
<td>90</td>
</tr>
<tr>
<td>Clerical Staff (% Yes, Definitely)d</td>
<td>85</td>
<td>85</td>
<td>85</td>
</tr>
<tr>
<td>Test Results Communication (% Yes)e</td>
<td>60</td>
<td>60</td>
<td>60</td>
</tr>
</tbody>
</table>

**In 2013, Cleveland Clinic began administering the Clinician and Group Practice Consumer Assessment of Healthcare Providers and Systems surveys (CG-CAHPS), standardized instruments developed by the Agency for Healthcare Research and Quality (AHRQ) and supported by the Centers for Medicare & Medicaid Services for use in the physician office setting to measure patients’ perspectives of outpatient care.**

**Based on results submitted to the AHRQ CG-CAHPS database from 3962 practices in 2014**

**Response options:**
- % Always:
  - Always
  - Usually
  - Sometimes
  - Never

- % Yes, Definitely:
  - Yes, definitely
  - Yes, somewhat
  - No

Source: Press Ganey, a national hospital survey vendor
Inpatient Survey — Cleveland Clinic

HCAHPS Overall Assessment
2014 – 2015

Best Response (%)

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.

HCAHPS Domains of Care
2014 – 2015

Best Response (%)

aAt the time of publication, 2015 ratings have not been reported by the Centers for Medicare & Medicaid Services and ratings are not adjusted for patient mix.
bBased on national survey results of discharged patients, January 2014 – December 2014, from 4172 US hospitals. medicare.gov/hospitalcompare

(Options: Always, Usually, Sometimes, Never)

Response options: Definitely yes, Probably yes, Probably no, Definitely no

Source: Centers for Medicare & Medicaid Services, 2014; Press Ganey, a national hospital survey vendor, 2015
Focus on Value

Cleveland Clinic has developed and implemented new models of care that focus on “Patients First” and aim to deliver on the Institute of Medicine goal of Safe, Timely, Effective, Efficient, Equitable, Patient-centered care. Creating new models of Value-Based Care is a strategic priority for Cleveland Clinic. As care delivery shifts from fee-for-service to a population health and bundled payment delivery system, Cleveland Clinic is focused on concurrently improving patient safety, outcomes, and experience.

What does this new model of care look like?

- The Cleveland Clinic Integrated Care Model (CCICM) is a value-based model of care, designed to improve outcomes while reducing cost. It is designed to deliver value in both population health and specialty care.
- The patient remains at the heart of the CCICM.
- The blue band represents the care system, which is a seamless pathway that patients move along as they receive care in different settings. The care system represents integration of care across the continuum.
- Critical competencies are required to build this new care system. Cleveland Clinic is creating disease- and condition-specific care paths for a variety of procedures and chronic diseases. Another facet is implementing comprehensive care coordination for high-risk patients to prevent unnecessary hospitalizations and emergency department visits. Efforts include managing transitions in care, optimizing access and flow for patients through the CCICM, and developing novel tactics to engage patients and caregivers in this work.
- Measuring performance around quality, safety, utilization, cost, appropriateness of care, and patient and caregiver experience is an essential component of this work.
**Improve Population Health**

**Cleveland Clinic Accountable Care Organization Measure Performance**

2015

**National Percentile Ranking**

- **90th**
  - Tobacco Screening
  - Ischemic Vascular Disease
  - Heart Failure
  - Falls Screening

- **80th**
  - Diabetes
  - Hypertension
  - Pneumonia Vaccination
  - Coronary Artery Disease
  - Colorectal Cancer Screening
  - Breast Cancer Screening

- **70th**
  - BMI Screening

- **60th**
  - Influenza Vaccination

- **40th**
  - Depression Screening
  - Blood Pressure Screening

As part of Cleveland Clinic’s commitment to population health and in support of its Accountable Care Organization (ACO), these primary care ACO measures have been prioritized for monitoring and improvement. Cleveland Clinic is improving performance in these measures by enhancing care coordination, optimizing technology and information systems, and engaging primary care physicians and specialists directly in the improvement work. These pursuits are part of Cleveland Clinic’s overall strategy to transform care in order to improve health and make care more affordable.

**Reduce the Cost of Care**

**Cleveland Clinic Health System Orthopaedic Surgery Cost per Case**

2014 – 2015

Development and implementation of care paths has improved outcomes and care coordination while reducing unnecessary variations in clinical practice. These efficiencies have reduced the total cost of care. The Total Joint Arthroplasty care paths that were implemented in 2013 have led to year-over-year reductions in the cost per case for these procedures. Additional cost reductions were experienced in 2015 as these care paths were refined and sustained.

**Change in Cost per Case**

**Percent**

![Change in Cost per Case Graph]
In Vivo Testing of the Prostacyclin Pathway in Idiopathic Pulmonary Arterial Hypertension

Respiratory Institute investigators have noted a marked reduction in prostacyclin (PGI₂) synthase and expression of PGI₂ receptors in the lungs of patients with pulmonary arterial hypertension (PAH),¹ a condition characterized by narrowing of the pulmonary vasculature that leads to right heart failure and death. PGI₂ analogues are potent drugs indicated for the treatment of patients with PAH and reduced functional capacity. To test whether patients with idiopathic PAH have systemic microvascular abnormalities of the PGI₂ signaling pathway, investigators in the institute used laser Doppler flowmetry to measure changes in the cutaneous microvascular flow in response to the iontophoresis of treprostinil, a PGI₂ analog.² Patients with idiopathic PAH were shown to have a global vasculopathy with reduced response of the cutaneous microvasculature when challenged with treprostinil iontophoresis. More importantly, this study demonstrates that the PGI₂ pathway can be tested in vivo using a noninvasive approach.

The drug delivery electrode consists of a small sponge for the active drug and a side port for electrical application. Laser Doppler flow is measured in perfusion units at the center of the drug delivery electrode. A computer records the signals for off-line analysis. Inset: The drug delivery electrode receives current from the power supply, and the polarity of this current is set to match the charge of treprostinil (like charges repel each other).

The receiver operating characteristic curve tests the ability of the percentage change in perfusion units during treprostinil iontophoresis to discriminate between idiopathic PAH patients and controls. The area under the curve is 0.87 (95% CI, 0.72-0.96; \( P = 0.0001 \)). This shows that this technique has a good ability to distinguish idiopathic PAH patients from normal individuals.

References


3-Dimensional Localization and Guidance With Cone-Beam CT Scanning and Electromagnetic Navigation Bronchoscopy

Electromagnetic navigation bronchoscopy, which is used for diagnosing small lung lesions in select cancer patients, offers the possibility of doing therapeutic procedures using the same platform; however, the accuracy of the technique must be assured. Both radial ultrasound and 2-dimensional fluoroscopic guidance can help with finding relative location, but both also have drawbacks. The use of cone-beam CT technology and flat panel detectors has the ability to bring new 3-dimensional localization and additional navigational information to direct instruments.

The Respiratory Institute has begun a pilot trial of using cone-beam CT and its navigational tools with electromagnetic navigation bronchoscopy with peripheral radial endobronchial ultrasound. Fusing these technologies has allowed 100% confirmation of instrument location in difficult to reach lesions and provides some real-time feedback to allow instrument adjustments when needed. The aim of this project is to find ways to increase procedure yield similar to or better than the current percutaneous procedure, with less risk, and set the stage for endobronchial ablative techniques to be able to diagnose and perhaps treat cancer in a single session.

A peripheral transbronchial needle is shown inside the target lesion (red arrow). The cone beam CT image can be manipulated to confirm in 3-dimensional space the location of instruments relative to a target lung lesion.
Contact Information

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](http://clevelandclinic.org/pulmonary)

Staff Listing
For a complete listing of Cleveland Clinic’s Respiratory Institute staff, please visit [clevelandclinic.org/staff](http://clevelandclinic.org/staff).

Publications
Respiratory Institute staff authored 213 publications in 2015.
For a complete list, go to [clevelandclinic.org/outcomes](http://clevelandclinic.org/outcomes).

Locations
For a complete listing of Respiratory Institute locations, please visit [clevelandclinic.org/resplocations](http://clevelandclinic.org/resplocations).
Additional Contact Information

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

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
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
About Cleveland Clinic

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 3400 Cleveland Clinic staff physicians and scientists in 140 medical specialties and subspecialties care for more than 6.6 million patients across the system, performing more than 208,000 surgeries and conducting more than 640,000 emergency department visits. Patients come to Cleveland Clinic from all 50 states and more than 180 nations.

Cleveland Clinic is an integrated healthcare delivery system with local, national, and international reach. The main campus in midtown Cleveland, Ohio, has a 1437-bed hospital, outpatient clinic, specialty institutes, labs, classrooms, and research facilities in 42 buildings on 165 acres. Cleveland Clinic’s CMS case-mix index is the second highest in the nation. Cleveland Clinic encompasses more than 150 northern Ohio outpatient locations, including 18 full-service family health centers, 3 health and wellness centers, 9 regional hospitals, an affiliate hospital, and a rehabilitation hospital for children. Cleveland Clinic also includes Cleveland Clinic Florida; Cleveland Clinic Nevada, which includes the Lou Ruvo Center for Brain Health in Las Vegas and urology and nephrology services; 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 (UAE), which began offering services in spring 2015. Cleveland Clinic is the second-largest employer in Ohio, with more than 49,000 employees. It generates $12.6 billion of economic activity a year.

Cleveland Clinic supports physician education, training, consulting, and patient services around the world through representatives and offices in Canada, the Dominican Republic, El Salvador, Guatemala, Honduras, Panama, Peru, Saudi Arabia, Turkey, and the United Arab Emirates.

The Cleveland Clinic Model

Cleveland Clinic was founded in 1921 by 4 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.

Cleveland Clinic established family health centers in surrounding communities beginning in the 1990s. Cleveland Clinic Florida was established in 1987. Marymount Hospital joined Cleveland Clinic in 1995, followed by regional hospitals including Euclid Hospital, Fairview Hospital, Hillcrest Hospital, Lutheran Hospital, Medina Hospital, South Pointe Hospital, and affiliate Ashtabula County Medical Center. In 2015, the Akron General Health System joined the Cleveland Clinic health system.

Internally, Cleveland Clinic services are organized into patient-centered integrated practice units called institutes, each institute combining medical and surgical care for a specific disease or body system. Cleveland Clinic was also one of the first academic medical centers to establish an Office of Patient Experience to work with institutes to ensure the best outcome and experience for every patient.

A Clinically Integrated Network

Cleveland Clinic is committed to providing value-based care, and it has grown the Cleveland Clinic Quality Alliance into the nation’s second-largest and northeast Ohio’s largest clinically integrated network. The network comprises more than 5900 physician members, both employees and independent physicians from the community. Led by its physician members, the Quality Alliance strives to improve quality and consistency of care; reduce costs and increase efficiency; and provide access to expertise, data, and experience.
Cleveland Clinic Lerner College of Medicine

Lerner College of Medicine is known for its small class sizes, unique curriculum, and full-tuition scholarships for all students. Each new class accepts 32 students who are preparing to be physician investigators. In 2016, Cleveland Clinic is building a 165,000-square-foot multidisciplinary Health Education Campus as the new home of the Case Western Reserve University (CWRU) School of Medicine and Cleveland Clinic’s Lerner College of Medicine, as well as the CWRU School of Dental Medicine, the Frances Payne Bolton School of Nursing, and physician assistant and allied health training programs.

Graduate Medical Education

In 2015, nearly 1900 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. It has ranked No. 1 in heart care and heart surgery since 1995. In 2015, 4 of its programs were ranked No. 2 in the nation: gastroenterology and GI surgery, nephrology, rheumatology, and urology.

Cleveland Clinic Physician Ratings

Cleveland Clinic believes in transparency and in the positive influence of the physician-patient relationship on healthcare outcomes. To continue to meet the highest standards of patient satisfaction, Cleveland Clinic physician ratings, based on nationally recognized Press Ganey patient satisfaction surveys, are published online at clevelandclinic.org/staff.
Referring Physician Center and Hotline

Call us 24/7 for access to medical services or to schedule patient appointments at 855.REFER.123 (855.733.3712), email refdr@ccf.org, or go to clevelandclinic.org/Refer123. The free Cleveland Clinic Physician Referral App, available for mobile devices, gives you 1-click access. Available at the App Store or Google Play.

Remote Consults

Anybody anywhere can get an online second opinion from a Cleveland Clinic specialist through our MyConsult service. For more information, go to clevelandclinic.org/myconsult, email myconsult@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

Cleveland Clinic offers an array of secure online services that allow referring physicians to monitor their patients’ treatment while under Cleveland Clinic care, as well as access test results, medications, and treatment plans. my.clevelandclinic.org/online-services

DrConnect (online access to patients’ treatment progress while under referred care): 877.224.7367; drconnect@ccf.org or visit clevelandclinic.org/drconnect

MyPractice Community (affordable electronic medical records system for physicians in private practice): 216.448.4617

eRadiology (teleradiology consultation provided nationwide by board-certified radiologists with specialty training, within 24 hours or stat): 216.986.2915; starimaging@ccf.org

Medical Records Online

Patients can view portions of their medical record, receive diagnostic images and test results, make appointments, and renew prescriptions through MyChart, a secure online portal. All new Cleveland Clinic patients are automatically registered for MyChart. clevelandclinic.org/mychart

Critical Care Transport Worldwide

Cleveland Clinic’s fleet of ground and air transport vehicles is ready to transfer patients at any level of acuity anywhere on earth. Specially trained crews provide Cleveland Clinic care protocols from first contact. To arrange a transfer for STEMI (ST-elevation 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 the largest CME program in the country. Live courses are offered in Cleveland and cities around the nation and the world. The center’s website (ccfcme.org) is an educational resource for healthcare providers and the public. It has a calendar of upcoming courses, online programs on topics in 30 areas, and the award-winning virtual textbook of medicine, The Disease Management Project.

Clinical Trials

Cleveland Clinic is running more than 2200 clinical trials at any given time for 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. Cancer Clinical Trials is a mobile app that provides information on the more than 200 active clinical trials available to cancer patients at Cleveland Clinic. clevelandclinic.org/cancertrialapp
Healthcare Executive Education

Cleveland Clinic has programs to teach people from outside the organization how it operates a major medical center. The Executive Visitors’ Program is an intensive, 3-day behind-the-scenes view of the Cleveland Clinic organization for the busy executive. The Samson Global Leadership Academy is a 2-week immersion in challenges of leadership, management, and innovation taught by Cleveland Clinic leaders, administrators, and clinicians. Curriculum includes coaching and a personalized 3-year leadership development plan. clevelandclinic.org/executiveeducation

Consult QD Physician Blog

A blog from Cleveland Clinic for physicians and healthcare professionals. Discover the latest research insights, innovations, treatment trends, and more for all specialties. consultqd.clevelandclinic.org

Social Media

Cleveland Clinic uses social media to help caregivers everywhere provide better patient care. Millions of people currently like, friend, or link to Cleveland Clinic social media — including leaders in medicine.

Facebook for Medical Professionals facebook.com/CMEclevelandclinic

Follow us on Twitter @cleclinicMD

Connect with us on LinkedIn Clevelandclinic.org/MDlinkedin
This project would not have been possible without the commitment and expertise of a team led by Umur Hatipoglu, MD and Marianne Mitri, MBA.

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Every life deserves world class care.