



# The Eighth Annual HealthGrades Hospital Quality and Clinical Excellence Study

January 2010

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HEALTHGRADES®

The Eighth Annual

# HealthGrades Hospital Quality and Clinical Excellence Study

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### Executive Summary

Each year HealthGrades independently assesses the quality of care provided at the nation's 5,000 nonfederal hospitals across 26 procedures and diagnoses. These ratings are available to consumers at [www.HealthGrades.com](http://www.HealthGrades.com) to help make health care decisions based on quality of care. In this eighth annual study, HealthGrades objectively identifies hospitals that are performing among the best in the nation for these 26 diagnoses and procedures. These hospitals are further designated as a HealthGrades Distinguished Hospital for Clinical Excellence™ (DH-CE).

HealthGrades specifically examines the differences in risk-adjusted mortality and complications between top-performing hospitals and the rest of the nation's hospitals. This analysis highlights the vast differences in patient care between top-performing hospitals and the rest.

HealthGrades' analysis is based on approximately 40 million Medicare hospital discharges for the years 2006, 2007, and 2008. HealthGrades identifies the Distinguished Hospitals for Clinical Excellence based on overall performance of risk-adjusted outcomes associated with 26 common Medicare inpatient procedures and diagnoses. This analysis compares in-hospital risk-adjusted mortality rates for 17 inpatient procedures and diagnoses, and in-hospital risk-adjusted major complications rates for nine procedures.

269 hospitals  
were designated  
as HealthGrades'  
Distinguished  
Hospitals for  
Clinical  
Excellence.

Of the nation's 5,000 short-term, nonfederal, non-children's, acute care hospitals, only 269 hospitals (approximately 5%) are designated as HealthGrades Distinguished Hospitals for Clinical Excellence. In this study, these 269 Distinguished Hospitals for Clinical Excellence are compared to all other U.S. hospitals to identify trends in outcomes, relative risk, and improvement for the years 2006, 2007, and 2008.

Overall, the Distinguished Hospitals for Clinical Excellence outperformed all other hospitals from 2006 through 2008. They had lower risk-adjusted mortality overall and improved at a faster rate than all other hospitals nationwide. All hospitals experienced an increase in risk-adjusted complications from 2006 through 2008 but Distinguished Hospitals for Clinical Excellence still had overall lower risk-adjusted complications. If all hospitals performed at the level of Distinguished Hospitals, **150,132 Medicare lives could potentially have been saved and 13,104 Medicare in-hospital complications could potentially have been avoided.** Patients who choose to receive their care at a Distinguished Hospital for Clinical Excellence certainly will have a lower risk for an adverse clinical outcome relative to all other hospitals.

## Summary of Findings

HealthGrades' Distinguished Hospitals for Clinical Excellence have lower risk-adjusted mortality and lower in-hospital complications compared to all other hospitals. During 2006 through 2008, they had:

Patients have on average a 28.60% lower chance of dying at the nation's Distinguished Hospitals compared to all other hospitals across 17 procedures and conditions.

- Overall **28.60% lower risk-adjusted mortality** across 17 procedures and diagnoses where in-hospital mortality was the end point of study.

Risk-adjusted mortality was lower at Distinguished Hospitals for Clinical Excellence for all 17 procedures and diagnoses. In fact, risk-adjusted mortality at Distinguished Hospitals for Clinical Excellence was 15.31% to 41.89% lower than all other hospitals (see *Appendix B*).

- Overall **8.66% lower risk-adjusted complications** across nine procedures where in-hospital complications were the end point of study.

Risk-adjusted complications were lower at Distinguished Hospitals for Clinical Excellence for all nine complication-based procedures studied. In fact, risk-adjusted complications at Distinguished Hospitals for Clinical Excellence were 3.82% to 13.80% lower than all other hospitals (see *Appendix C*).

If all hospitals performed at the level of Distinguished Hospitals, 150,132 Medicare lives could potentially have been saved and 13,104 Medicare in-hospital complications may have been avoided.

From 2006 through 2008, if all hospitals performed at the level of Distinguished Hospitals for Clinical Excellence:

- 150,132 Medicare deaths may have been prevented.
- 13,104 Medicare in-hospital complications may have been avoided.

Distinguished Hospitals for Clinical Excellence showed greater overall improvement in risk-adjusted mortality from 2006 through 2008 with an average:

- Reduction in risk-adjusted mortality of 13.91%, compared to 10.41% for all other hospitals.

Thirty-six states have one or more Distinguished Hospitals for Clinical Excellence (compared to 35 last year).

- Delaware has the highest percentage of Distinguished Hospitals for Clinical Excellence at 50.00% of eligible hospitals, followed by Maryland (48.30%), Minnesota (41.18%), Florida (40.20%), and Connecticut (40.00%) (see *Table 4*).

## Introduction

HealthGrades, the nation's leading independent health care ratings organization, has been studying the quality of care at the nation's hospitals for over ten years and making that information available to consumers at [www.HealthGrades.com](http://www.HealthGrades.com). Since the release of the first ratings, HealthGrades' Web traffic has grown to 7.5 million unique visitors per month and the federal government has deployed a Website to share hospital quality information with Medicare beneficiaries. Clearly, health care is considered an important topic by many Americans and the government, as reflected in the major legislative issue of the current administration.

In October of 2009, HealthGrades released its *Twelfth Annual HealthGrades Hospital Quality in America Study* evaluating hospital quality in 26 of the most common Medicare diagnoses and procedures and assessing differences between the best-performing and worst-performing hospitals by each procedure and diagnosis. The current study builds upon those results by evaluating hospitals on their overall performance across all 26 diagnoses and procedures.

This study identifies the best-performing hospitals overall by identifying the group with the lowest overall risk-adjusted mortality and in-hospital major complications when compared with the nation's 5,000 short-term, nonfederal, non-children's, acute care hospitals. These 269 hospitals have been designated as Distinguished Hospitals for Clinical Excellence and are ranked in the top 5% nationally.

This study details the differences in outcomes between these elite hospitals and all other hospitals. It demonstrates what it could mean if all hospitals performed at the level that the best hospitals have been able to achieve. As a group, these best-performing hospitals have 28.60% lower risk-adjusted mortality across 17 diagnoses and procedures and 8.66% lower risk-adjusted in-hospital complications across nine commonly performed procedures. This translates into potentially saving 150,132 Medicare lives and potentially preventing 13,104 Medicare in-hospital complications between 2006 and 2008 if all hospitals performed at the very highest levels.

These Distinguished Hospitals for Clinical Excellence for 2010 are listed in *Appendix A* and online at [www.HealthGrades.com](http://www.HealthGrades.com).

This study highlights the variation in patient outcomes between the Distinguished Hospitals for Clinical Excellence and all other U.S. hospitals by assessing, comparing, and studying the quality outcomes and trends for each group across the 26 procedures and diagnoses rated by HealthGrades for the years 2006 through 2008.

## Methodology

In order to evaluate overall hospital performance and to identify the best-performing hospitals in clinical excellence across the U.S., HealthGrades uses a two-step methodology:

1. Assign star ratings for 26 procedures and diagnoses using the *HealthGrades Hospital Report Cards™ Mortality and Complication Based Outcomes Methodology*. These star ratings are published in October of each year.
2. Identify the overall best-performing hospitals through additional analysis using the *Distinguished Hospital Award for Clinical Excellence™ Methodology*.

Distinguished Hospitals have 28.60% lower risk-adjusted mortality and 8.66% lower risk-adjusted complications compared to all other hospitals.

The 26 procedures and diagnoses in this study are as follows.

#### Mortality-Based Procedures and Diagnoses

- Bowel Obstruction
- Chronic Obstructive Pulmonary Disease
- Coronary Bypass Surgery
- Coronary Interventional Procedures (Angioplasty/Stent)
- Diabetic Acidosis and Coma
- Gastrointestinal Bleed
- Gastrointestinal Surgeries and Procedures
- Heart Attack (Acute Myocardial Infarction)
- Heart Failure
- Pancreatitis
- Pneumonia
- Pulmonary Embolism
- Resection/Replacement of Abdominal Aorta
- Respiratory Failure
- Sepsis
- Stroke
- Valve Replacement Surgery

#### Complication-Based Procedures

- Back and Neck Surgery (Spinal Fusion)
- Back and Neck Surgery (except Spinal Fusion)
- Carotid Surgery
- Cholecystectomy
- Hip Fracture Repair
- Peripheral Vascular Bypass
- Prostatectomy
- Total Hip Replacement
- Total Knee Replacement

### Mortality and Complication Based Outcomes 2010 Methodology

To help consumers evaluate and compare hospital performance, HealthGrades analyzes patient outcome data for virtually every hospital in the country. HealthGrades purchased the initial data from the Centers for Medicare and Medicaid Services (CMS). The Medicare data (MedPAR file) from CMS contains approximately 40 million inpatient records for Medicare hospitalizations from 2006 through 2008.

Risk-adjustment methodology allows for fair statistical comparison between hospitals with different populations.

Using a logistic-regression based risk-adjustment model to compare performance among hospitals, hospitals are assigned one of three star ratings: 1-star (poor), 3-star (as expected), or 5-star (best) for each of the above patient groups. The purpose of risk adjustment is to obtain fair statistical comparisons among disparate populations or groups. Significant differences in demographic and clinical risk factors are found among patients treated in different hospitals and therefore, risk adjustment of the data is needed to make accurate and valid comparisons of clinical outcomes at different hospitals. To be eligible to receive a star rating, a hospital must have a minimum of 30 cases over the three years of study and at least five cases in the most recent year analyzed (2008).

More information regarding the risk-adjustment methodology for the 26 procedures and diagnoses above can be found in *Appendix D*. Visit [www.HealthGrades.com](http://www.HealthGrades.com) to view hospital ratings and to read the complete methodology white paper *Hospital Report Cards™ Mortality and Complication Based Outcomes 2010 Methodology*.



### **Distinguished Hospital Award for Clinical Excellence™ 2010 Methodology**

The Distinguished Hospital Award for Clinical Excellence recognizes the best 5% of hospitals in the country for clinical excellence. These hospitals had lower risk-adjusted mortality and lower in-hospital complications than all other hospitals in a broad range of medical services.

To be considered for the Distinguished Hospital Award for Clinical Excellence, a hospital had to have received star ratings in at least **19** of the 26 procedures and diagnoses using MedPAR data.

After creating a list of hospitals that met the above criteria, HealthGrades took the following steps to determine the Distinguished Hospital Award for Clinical Excellence recipients.

1. Calculated the average star rating and average z-score for each hospital by averaging all of their MedPAR-based ratings and the corresponding z-scores.
2. Ranked hospitals in descending order by their average star rating, with ties broken by average z-score.
3. Selected the top 269 hospitals on the list (which represents the top 5% of all hospitals).
4. Designated the hospitals as recipients of the 2010 Distinguished Hospital Award for Clinical Excellence.

### **Comparison of Distinguished Hospitals for Clinical Excellence to All Other Hospitals**

To identify differences in performance between Distinguished Hospitals for Clinical Excellence hospitals and all other hospitals, HealthGrades calculated the actual (observed) and predicted (expected) mortality rates for each of the 17 mortality-based procedures and diagnoses and the actual (observed) and predicted (expected) complication rates for the nine complication-based procedures for each hospital. Hospitals are divided into two groups, Distinguished Hospitals for Clinical Excellence and all other hospitals (non-DH-CE), and then overall observed and expected rates are calculated for both groups in each of the 26 procedures and diagnoses.

The purpose of comparing the predicted to actual is to make a fair comparison between hospitals with different populations. Sicker patients have higher associated observed mortality/complications, so using the observed (O) to expected (E) ratio takes into consideration how sick the patient population is at a given hospital. Observed-to-expected ratios were calculated by procedure or diagnosis by year, for both groups of hospitals. The ratios were then evaluated for differences.

- An O/E ratio of less than 1 means that the procedure or diagnosis measured had fewer deaths/in-hospital complications than expected given the patient population.
- An O/E ratio of greater than 1 means that the procedure or diagnosis measured had more deaths/in-hospital complications than expected given the patient population.

## Results

Distinguished Hospitals improved at a faster rate in 13 procedures and diagnoses compared to all other hospitals.

Distinguished Hospitals for Clinical Excellence consistently outperformed all other hospitals during the years 2006, 2007, and 2008. Distinguished Hospitals had:

- Lower risk-adjusted in-hospital mortality across all 17 mortality-based procedures and diagnoses in almost every year studied.
- Lower risk-adjusted in-hospital complications across the nine complication-based procedures.

In addition, not only did Distinguished Hospitals for Clinical Excellence have better clinical quality outcomes, but their risk-adjusted mortality rates improved at a faster rate from 2006 through 2008 than all other hospitals across 13 of the 17 mortality-based cohorts studied.

### On Average, Distinguished Hospitals had 28.60% Lower Risk-Adjusted In-hospital Mortality.

When compared to all other hospitals, Distinguished Hospitals for Clinical Excellence had lower risk-adjusted in-hospital mortality across all 17 procedures and diagnoses studied. The differences ranged from 15.31% in resection/replacement of abdominal aorta to 41.89% in the treatment of diabetic acidosis and coma (see *Appendix B*).

When comparing Distinguished Hospitals for Clinical Excellence to all other hospitals, the largest differences in risk-adjusted in-hospital mortality were noted in the following areas (see *Table 1*).

**Table 1. Relative Reduction in Risk-Adjusted Mortality Associated with Distinguished Hospitals Compared to All Other Hospitals**

| Procedure / Diagnosis                     | Relative Reduction in Risk-Adjusted Mortality Associated with Distinguished Hospitals Compared to All Other Hospitals |
|---|---|
| Diabetic Acidosis and Coma                | 41.89%  |
| Chronic Obstructive Pulmonary Disease     | 38.32%  |
| Pneumonia                                 | 38.22%  |
| Pulmonary Embolism                        | 35.24%  |
| Heart Failure                             | 34.95%  |
| Bowel Obstruction                         | 34.67%  |
| Pancreatitis                              | 34.20%  |
| Gastrointestinal Bleed                    | 33.88%  |
| Stroke                                    | 30.43%  |
| Gastrointestinal Surgeries and Procedures | 24.49%  |

### On Average, Distinguished Hospitals Performed 8.66% Better in In-hospital Complications.

Distinguished Hospitals for Clinical Excellence demonstrated lower overall risk-adjusted in-hospital complications across all nine common Medicare procedures studied. During the three years studied, Distinguished Hospitals for Clinical Excellence performed, on average, 8.66% better than all other hospitals in in-hospital complications associated with orthopedic surgery, neurosurgery, vascular surgery, prostate surgery, and cholecystectomy.

Distinguished Hospitals have lower risk-adjusted in-hospital complications in all nine complication-based procedures studied.



The relative risk as it pertains to emergent conditions, such as a hip fracture in elderly patients, was lower at Distinguished Hospitals for Clinical Excellence. The differences ranged from 3.82% in carotid surgery to 13.80% in total hip replacement. The largest differences in risk-adjusted in-hospital complication rates were with orthopedic surgery, prostate surgery, and peripheral vascular bypass surgery (see *Table 2* and *Appendix C*).

**Table 2. Relative Reduction in Risk-Adjusted Complications Associated with Distinguished Hospitals Compared to All Other Hospitals**

| Procedure / Diagnosis                        | Relative Reduction in Risk-Adjusted Complications Associated with Distinguished Hospitals Compared to All Other Hospitals |
|--|---|
| Total Hip Replacement                        | 13.80%  |
| Prostatectomy                                | 13.58%  |
| Peripheral Vascular Bypass                   | 9.69%   |
| Back and Neck Surgery (Except Spinal Fusion) | 8.55%   |
| Hip Fracture Repair                          | 8.41%   |

#### **Distinguished Hospitals Improved at a Greater Rate for Risk-Adjusted Mortality.**

Over the three years of study, in-hospital risk-adjusted mortality improved at both Distinguished Hospitals for Clinical Excellence and all other hospitals. However, Distinguished Hospitals for Clinical Excellence improved at a greater rate overall (see *Table 3*). Comparing 2008 data with 2006 data, Distinguished Hospitals for Clinical Excellence had an average reduction in risk-adjusted in-hospital mortality of 13.91% versus 10.41% for all other hospitals.

The evaluation of in-hospital complications showed an increase in the average rate of complications from 2006 through 2008 for both Distinguished Hospitals for Clinical Excellence and all other hospitals. Overall, risk-adjusted in-hospital complication improvement rates were -5.02% for Distinguished Hospitals for Clinical Excellence and -3.18% for all other hospitals. However, Distinguished Hospitals for Clinical Excellence still had a lower three-year average rate of in-hospital complications.

**Table 3. Overall Improvement Distinguished Hospitals Compared to All Other Hospitals**

|                         | % Improvement Mortality-Based Procedures and Diagnoses | % Improvement Complication-Based Procedures |
|-------------------------|--|---|
| Distinguished Hospitals | 13.91%   | -5.02%                                      |
| All Other Hospitals     | 10.41%   | -3.18%                                      |

Distinguished Hospitals for Clinical Excellence improved more than all other hospitals in 13 of the 17 mortality-based cohorts. The exceptions were coronary interventional procedures, gastrointestinal surgeries and procedures, pulmonary embolism, and valve replacement surgery (see *Appendix B*). However, the overall relative risk for these four cohorts is still lower at Distinguished Hospitals.

Of the nine complication-based cohorts, prostatectomy was the only cohort that showed a decrease in complication rates from 2006 to 2008 for both Distinguished Hospitals for Clinical Excellence and all other hospitals. The increase in complication rates for Distinguished Hospitals for Clinical Excellence was lower in back and neck surgery (except spinal fusion), carotid surgery, and cholecystectomy (see *Appendix C*).

### Prevalence of Distinguished Hospitals Across States

Thirty-six states have at least one hospital designated as a Distinguished Hospital for Clinical Excellence (compared to 35 states last year). This year Alabama, Nebraska, and North Dakota joined the states that have at least one Distinguished Hospital for Clinical Excellence, while Arkansas and Massachusetts no longer have at least one hospital designated as a Distinguished Hospital for Clinical Excellence.

Delaware leads the nation in percentage of Distinguished Hospitals for Clinical Excellence with 50.00% of eligible hospitals qualifying for the distinction; followed by Maryland (48.39%), Minnesota (41.18%), Florida (40.20%), and Connecticut (40.00%) (see *Table 4*).

Distinguished Hospitals for Clinical Excellence by Eligible Hospitals by State

Thirty-six states have at least one Distinguished Hospital for Clinical Excellence.

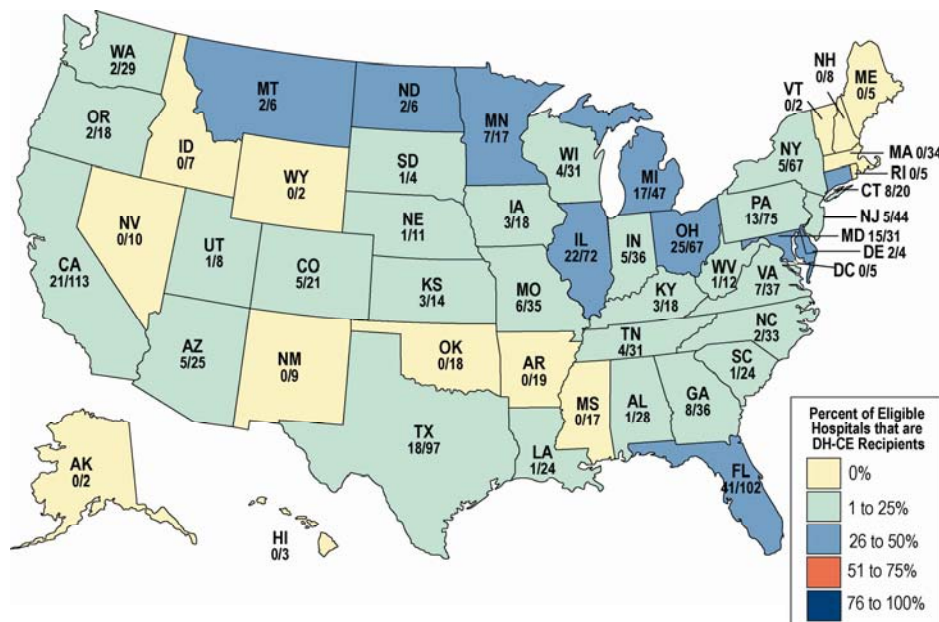


Table 4. Percentage of Distinguished Hospitals for Clinical Excellence by State

| State / Abbreviation | Percent of Eligible | DH-CE Hospitals | Eligible Hospitals | State / Abbreviation | Percent of Eligible | DH-CE Hospitals | Eligible Hospitals |
|----------------------|---------------------|-----------------|--------------------|----------------------|---------------------|-----------------|--------------------|
| Alabama              | 3.57%               | 1               | 28                 | Montana              | 33.33%              | 2               | 6                  |
| Alaska               | .00%                | 0               | 2                  | Nebraska             | 9.09%               | 1               | 11                 |
| Arizona              | 20.00%              | 5               | 25                 | Nevada               | .00%                | 0               | 10                 |
| Arkansas             | .00%                | 0               | 19                 | New Hampshire        | .00%                | 0               | 8                  |
| California           | 18.58%              | 21              | 113                | New Jersey           | 11.36%              | 5               | 44                 |
| Colorado             | 23.81%              | 5               | 21                 | New Mexico           | .00%                | 0               | 9                  |
| Connecticut          | 40.00%              | 8               | 20                 | New York             | 7.46%               | 5               | 67                 |
| Delaware             | 50.00%              | 2               | 4                  | North Carolina       | 6.06%               | 2               | 33                 |
| Dist. of Columbia    | .00%                | 0               | 5                  | North Dakota         | 33.33%              | 2               | 6                  |
| Florida              | 40.20%              | 41              | 102                | Ohio                 | 37.31%              | 25              | 67                 |
| Georgia              | 22.22%              | 8               | 36                 | Oklahoma             | .00%                | 0               | 18                 |
| Hawaii               | .00%                | 0               | 3                  | Oregon               | 11.11%              | 2               | 18                 |
| Idaho                | .00%                | 0               | 7                  | Pennsylvania         | 17.33%              | 13              | 75                 |
| Illinois             | 30.56%              | 22              | 72                 | Rhode Island         | .00%                | 0               | 5                  |
| Indiana              | 13.89%              | 5               | 36                 | South Carolina       | 4.17%               | 1               | 24                 |
| Iowa                 | 16.67%              | 3               | 18                 | South Dakota         | 25.00%              | 1               | 4                  |
| Kansas               | 21.43%              | 3               | 14                 | Tennessee            | 12.90%              | 4               | 31                 |
| Kentucky             | 16.67%              | 3               | 18                 | Texas                | 18.56%              | 18              | 97                 |
| Louisiana            | 4.17%               | 1               | 24                 | Utah                 | 12.50%              | 1               | 8                  |
| Maine                | .00%                | 0               | 5                  | Vermont              | .00%                | 0               | 2                  |
| Maryland             | 48.39%              | 15              | 31                 | Virginia             | 18.92%              | 7               | 37                 |
| Massachusetts        | .00%                | 0               | 34                 | Washington           | 6.90%               | 2               | 29                 |
| Michigan             | 36.17%              | 17              | 47                 | West Virginia        | 8.33%               | 1               | 12                 |
| Minnesota            | 41.18%              | 7               | 17                 | Wisconsin            | 12.90%              | 4               | 31                 |
| Mississippi          | .00%                | 0               | 17                 | Wyoming              | .00%                | 0               | 2                  |
| Missouri             | 17.14%              | 6               | 35                 |                      |                     |                 |                    |

## Interpretation of Results

The Distinguished Hospitals for Clinical Excellence outperformed all other hospitals from 2006 through 2008, with a 28.60% lower risk-adjusted mortality rate and an 8.66% lower risk-adjusted in-hospital complication rate among Medicare beneficiaries compared to all other hospitals. If all hospitals performed at this level, **150,132 Medicare lives could potentially have been saved and 13,104 Medicare in-hospital complications could potentially have been avoided.**

When evaluating risk-adjusted mortality, Distinguished Hospitals for Clinical Excellence not only had lower risk-adjusted mortality overall but improved at a faster rate than all other hospitals nationwide.

In this year's study, we saw an increase in complications across all hospitals, both Distinguished Hospitals for Clinical Excellence and all other hospitals from 2006 to 2008. It is not possible to know the contributing factors for this without further study but there are several possible hypotheses. One possibility is that with the release of eight no-pay complications from the Federal government in the fall of 2008, perhaps hospitals are more diligent about identifying complications. Another potential explanation is the aging of the population and the increase in elective procedures performed among more elderly patients with chronic conditions who are more likely to experience a complication. Whatever the reason, hospitals overall experienced an increase in risk-adjusted complications from 2006 through 2008, but Distinguished Hospitals for Clinical Excellence still had overall lower risk-adjusted complication rates.

In conclusion, Distinguished Hospitals for Clinical Excellence outperform all other hospitals across all of the 17 mortality cohorts and all nine complication cohorts studied. These hospitals have high-quality care and have sustained excellent clinical results over time. This may be due to differences in aggressiveness of process improvement, use of protocols, and increased acceptance and support from key hospital stakeholders that quality is a priority. Patients who choose to receive their care at a Distinguished Hospital for Clinical Excellence certainly will have a lower risk for an adverse clinical outcome relative to all other hospitals.

## Acknowledgements

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Health Grades Inc. is the leading independent health care ratings organization, providing quality ratings, profiles and cost information on the nation's hospitals, physicians, nursing homes and prescription drugs.

## Appendix A: Distinguished Hospitals for Clinical Excellence™ 2010 List

\* Distinction cannot be used without a Licensing Agreement from Health Grades, Inc.

| Distinguished Hospitals for Clinical Excellence™ 2010*   | City                         |
|--|------------------------------|
| <b>Alabama</b>   |                              |
| D.C.H. Regional Medical Center   | Tuscaloosa                   |
| <b>Arizona</b>   |                              |
| Banner Boswell Medical Center  | Sun City                     |
| Banner Del E. Webb Medical Center  | Sun City West                |
| Mayo Clinic Hospital   | Phoenix                      |
| Scottsdale Healthcare - Osborn   | Scottsdale                   |
| Scottsdale Healthcare - Shea   | Scottsdale                   |
| <b>California</b>  |                              |
| Beverly Hospital   | Montebello                   |
| Centinela Freeman Regional Medical Center - Centinela<br><i>including:</i> Centinela Freeman Regional Medical Center -<br>Memorial | Inglewood<br><br>Inglewood   |
| El Camino Hospital   | Mountain View                |
| Fountain Valley Regional Hospital and Medical Center   | Fountain Valley              |
| Garfield Medical Center  | Monterey Park                |
| Glendale Memorial Hospital & Health Center   | Glendale                     |
| Good Samaritan Hospital  | Los Angeles                  |
| Hoag Memorial Hospital Presbyterian  | Newport Beach                |
| Huntington Memorial Hospital   | Pasadena                     |
| John Muir Medical Center - Concord   | Concord                      |
| John Muir Medical Center - Walnut Creek  | Walnut Creek                 |
| Mills-Peninsula Health Services<br><i>including:</i> Mills Health Center   | Burlingame<br>San Mateo      |
| Saddleback Memorial Medical Center - Laguna Hills<br><i>including:</i> Saddleback Memorial Medical Center San Clemente             | Laguna Hills<br>San Clemente |
| Saint John's Hospital Health Center  | Santa Monica                 |
| Saint Jude Medical Center  | Fullerton                    |
| Santa Monica - UCLA Medical Center   | Santa Monica                 |
| Scripps Memorial Hospital Encinitas  | Encinitas                    |
| Scripps Memorial Hospital La Jolla   | La Jolla                     |
| Scripps Mercy Hospital<br><i>including:</i> Scripps Mercy Hospital - Chula Vista   | San Diego<br>Chula Vista     |
| Sequoia Hospital   | Redwood City                 |
| St. Vincent Medical Center   | Los Angeles                  |

| Distinguished Hospitals for Clinical Excellence™ 2010*                                       | City                          |
|--|-------------------------------|
| <b>Colorado</b>  |                               |
| Centura Health - Penrose Saint Francis Health Services                                       | Colorado Springs              |
| North Colorado Medical Center  | Greeley                       |
| Poudre Valley Hospital   | Fort Collins                  |
| Presbyterian/St. Luke's Medical Center   | Denver                        |
| The Medical Center of Aurora   | Aurora                        |
| <b>Connecticut</b>   |                               |
| Danbury Hospital   | Danbury                       |
| Griffin Hospital   | Derby                         |
| Hartford Hospital  | Hartford                      |
| Hospital of Saint Raphael  | New Haven                     |
| Manchester Memorial Hospital   | Manchester                    |
| Middlesex Hospital   | Middletown                    |
| Norwalk Hospital Association   | Norwalk                       |
| Yale - New Haven Hospital  | New Haven                     |
| <b>Delaware</b>  |                               |
| Beebe Medical Center   | Lewes                         |
| Christiana Care Health System - Christiana Hospital<br><i>including: Wilmington Hospital</i> | Newark<br>Wilmington          |
| <b>Florida</b>   |                               |
| Baptist Hospital of Miami  | Miami                         |
| Baptist Medical Center   | Jacksonville                  |
| Bay Medical Center   | Panama City                   |
| Boca Raton Community Hospital  | Boca Raton                    |
| Brandon Regional Hospital  | Brandon                       |
| Broward General Medical Center   | Fort Lauderdale               |
| Central Florida Regional Hospital  | Sanford                       |
| Charlotte Regional Medical Center  | Punta Gorda                   |
| Cleveland Clinic Hospital  | Weston                        |
| Community Hospital   | New Port Richey               |
| Delray Medical Center  | Delray Beach                  |
| Doctors Hospital of Sarasota   | Sarasota                      |
| Fawcett Memorial Hospital  | Port Charlotte                |
| Flagler Hospital   | Saint Augustine               |
| Florida Hospital Fish Memorial   | Orange City                   |
| Florida Hospital Memorial Medical Center<br><i>including: Florida Hospital Oceanside</i>     | Daytona Beach<br>Ormond Beach |



| Distinguished Hospitals for Clinical Excellence™ 2010*           | City               |
|--|--------------------|
| Florida Hospital Orlando   | Orlando            |
| Gulf Coast Medical Center  | Panama City        |
| Halifax Medical Center   | Daytona Beach      |
| <i>including:</i> Atlantic Medical Center                        | Daytona Beach      |
| Holy Cross Hospital  | Fort Lauderdale    |
| JFK Medical Center   | Atlantis           |
| Jupiter Medical Center   | Jupiter            |
| Kendall Regional Medical Center                                  | Miami              |
| Lawnwood Regional Medical Center and Heart Institute             | Fort Pierce        |
| Lee Memorial Hospital  | Fort Myers         |
| Martin Memorial Medical Center                                   | Stuart             |
| Mayo Clinic  | Jacksonville       |
| Memorial Hospital  | Jacksonville       |
| Memorial Hospital Pembroke                                       | Pembroke Pines     |
| Mercy Hospital   | Miami              |
| Munroe Regional Medical Center                                   | Ocala              |
| NCH Healthcare System  | Naples             |
| Oak Hill Hospital  | Brooksville        |
| Ocala Regional Medical Center/West Marion Hospital               | Ocala              |
| Palm Beach Gardens Medical Center                                | Palm Beach Gardens |
| Parrish Medical Center   | Titusville         |
| Physicians Regional Medical Center                               | Naples             |
| Sarasota Memorial Hospital                                       | Sarasota           |
| Sebastian River Medical Center                                   | Sebastian          |
| University Hospital & Medical Center                             | Tamarac            |
| Wuesthoff Medical Center - Rockledge                             | Rockledge          |
| <b>Georgia</b>   |                    |
| Dekalb Medical   | Decatur            |
| Gwinnett Medical Center  | Lawrenceville      |
| Houston Medical Center   | Warner Robins      |
| Memorial University Medical Center                               | Savannah           |
| Northeast Georgia Medical Center                                 | Gainesville        |
| <i>including:</i> Northeast Georgia Medical Center - Lanier Park | Gainesville        |
| Piedmont Fayette Hospital  | Fayetteville       |
| Piedmont Hospital  | Atlanta            |
| Saint Joseph's Hospital of Atlanta                               | Atlanta            |

| Distinguished Hospitals for Clinical Excellence™ 2010* | City              |
|--|-------------------|
| <b>Illinois</b>  |                   |
| Advocate Good Samaritan Hospital                       | Downers Grove     |
| Advocate Lutheran General Hospital                     | Park Ridge        |
| Alexian Brothers Medical Center                        | Elk Grove Village |
| Centegra Memorial Medical Center                       | Woodstock         |
| Central DuPage Hospital                                | Winfield          |
| Evanston Hospital                                      | Evanston          |
| <i>including:</i> Highland Park Hospital               | Highland Park     |
| Ingalls Memorial Hospital                              | Harvey            |
| Little Company of Mary Hospital                        | Evergreen Park    |
| Loyola University Hospital                             | Maywood           |
| Mercy Hospital & Medical Center                        | Chicago           |
| Northwest Community Hospital                           | Arlington Heights |
| Northwestern Memorial Hospital                         | Chicago           |
| Our Lady of the Resurrection Medical Center            | Chicago           |
| Palos Community Hospital                               | Palos Heights     |
| Provena Saint Joseph Medical Center                    | Joliet            |
| Rush University Medical Center                         | Chicago           |
| Saint Mary and Elizabeth Medical Center - Division     | Chicago           |
| St. Alexius Medical Center                             | Hoffman Estates   |
| Saint Joseph Hospital                                  | Chicago           |
| Sherman Hospital                                       | Elgin             |
| Skokie Hospital  | Skokie            |
| Swedish Covenant Hospital                              | Chicago           |
| <b>Indiana</b>   |                   |
| Clarian Health Partners Incorporated                   | Indianapolis      |
| <i>including:</i> Indiana University Medical Center    | Indianapolis      |
| Clark Memorial Hospital                                | Jeffersonville    |
| Community Hospital                                     | Munster           |
| Floyd Memorial Hospital and Health Services            | New Albany        |
| St. Vincent Indianapolis Hospital                      | Indianapolis      |
| <b>Iowa</b>  |                   |
| Mercy Medical Center - Cedar Rapids                    | Cedar Rapids      |
| Mercy Medical Center - Des Moines                      | Des Moines        |
| St. Luke's Hospital                                    | Cedar Rapids      |

| Distinguished Hospitals for Clinical Excellence™ 2010* | City              |
|--|-------------------|
| <b>Kansas</b>  |                   |
| St. Francis Health Center                              | Topeka            |
| University of Kansas Hospital                          | Kansas City       |
| Via Christi Regional Medical Center                    | Wichita           |
| <b>Kentucky</b>  |                   |
| Baptist Hospital East                                  | Louisville        |
| Owensboro Medical Health System                        | Owensboro         |
| St. Elizabeth Medical Center                           | Edgewood          |
| <b>Louisiana</b>                                       |                   |
| Ochsner Medical Center                                 | New Orleans       |
| <b>Maryland</b>  |                   |
| Baltimore Washington Medical Center                    | Glen Burnie       |
| Doctors Community Hospital                             | Lanham            |
| Franklin Square Hospital Center                        | Baltimore         |
| Frederick Memorial Hospital                            | Frederick         |
| Good Samaritan Hospital                                | Baltimore         |
| Greater Baltimore Medical Center                       | Baltimore         |
| Harbor Hospital  | Baltimore         |
| Holy Cross Hospital                                    | Silver Spring     |
| Howard County General Hospital                         | Columbia          |
| Peninsula Regional Medical Center                      | Salisbury         |
| Sinai Hospital of Baltimore                            | Baltimore         |
| St. Joseph Medical Center                              | Towson            |
| Suburban Hospital                                      | Bethesda          |
| Upper Chesapeake Medical Center                        | Bel Air           |
| Washington Adventist Hospital                          | Takoma Park       |
| <b>Michigan</b>  |                   |
| Allegiance Health                                      | Jackson           |
| Beaumont Hospital - Grosse Pointe                      | Grosse Pointe     |
| Beaumont Hospital - Royal Oak                          | Royal Oak         |
| Bronson Methodist Hospital                             | Kalamazoo         |
| Genesys Regional Medical Center                        | Grand Blanc       |
| Hackley Hospital                                       | Muskegon          |
| Henry Ford Hospital                                    | Detroit           |
| Holland Hospital                                       | Holland           |
| Huron Valley Sinai Hospital                            | Commerce Township |
| McLaren Regional Medical Center                        | Flint             |

| Distinguished Hospitals for Clinical Excellence™ 2010*        | City             |
|---|------------------|
| Munson Medical Center   | Traverse City    |
| Providence Hospital   | Southfield       |
| Sinai - Grace Hospital  | Detroit          |
| St. John Macomb Hospital                                      | Warren           |
| <i>including:</i> St. John Oakland Hospital                   | Madison Heights  |
| St. Mary Mercy Hospital                                       | Livonia          |
| Spectrum Health Butterworth Hospital                          | Grand Rapids     |
| <i>including:</i> Spectrum Health Blodgett Hospital           | Grand Rapids     |
| William Beaumont Hospital - Troy                              | Troy             |
| <b>Minnesota</b>  |                  |
| Fairview Ridges Hospital                                      | Burnsville       |
| Fairview Southdale Hospital                                   | Edina            |
| North Memorial  | Robbinsdale      |
| Park Nicollet Methodist Hospital                              | Minneapolis      |
| St. Cloud Hospital  | Saint Cloud      |
| St. Luke's Hospital   | Duluth           |
| Unity Hospital  | Fridley          |
| <b>Missouri</b>   |                  |
| Boone Hospital Center   | Columbia         |
| Missouri Baptist Medical Center                               | Saint Louis      |
| Skaggs Regional Medical Center                                | Branson          |
| SSM Saint Joseph Health Center                                | Saint Charles    |
| <i>including:</i> SSM Saint Joseph Health Center - Wentzville | Wentzville       |
| SSM Saint Mary's Health Center                                | Richmond Heights |
| St. Luke's Hospital   | Chesterfield     |
| <b>Montana</b>  |                  |
| Benefis Health System   | Great Falls      |
| Kalispell Regional Medical Center                             | Kalispell        |
| <b>Nebraska</b>   |                  |
| BryanLGH Medical Center East                                  | Lincoln          |
| <i>including:</i> BryanLGH Medical Center West                | Lincoln          |
| <b>New Jersey</b>   |                  |
| Clara Maass Medical Center                                    | Belleville       |
| Community Medical Center                                      | Toms River       |
| Hackensack University Medical Center                          | Hackensack       |
| Jersey Shore University Medical Center                        | Neptune          |
| Ocean Medical Center  | Brick            |

| Distinguished Hospitals for Clinical Excellence™ 2010*    | City                 |
|---|----------------------|
| <b>New York</b>   |                      |
| Albany Medical Center Hospital                            | Albany               |
| Maimonides Medical Center                                 | Brooklyn             |
| New York-Presbyterian/Weill Cornell                       | New York             |
| <i>including:</i> New York Presbyterian - Columbia        | New York             |
| Stony Brook University Medical Center                     | Stony Brook          |
| Winthrop - University Hospital                            | Mineola              |
| <b>North Carolina</b>                                     |                      |
| Gaston Memorial Hospital                                  | Gastonia             |
| Rex Hospital  | Raleigh              |
| <b>North Dakota</b>                                       |                      |
| Altru Hospital  | Grand Forks          |
| Saint Alexius Medical Center                              | Bismarck             |
| <b>Ohio</b>   |                      |
| Akron General Medical Center                              | Akron                |
| Aultman Hospital  | Canton               |
| Bethesda North Hospital                                   | Cincinnati           |
| Christ Hospital   | Cincinnati           |
| Community Health Partners of Ohio - West                  | Lorain               |
| EMH Regional Medical Center                               | Elyria               |
| Good Samaritan Hospital                                   | Dayton               |
| <i>including:</i> Dayton Heart and Vascular Hospital      | Dayton               |
| Good Samaritan Hospital                                   | Cincinnati           |
| Grandview Medical Center                                  | Dayton               |
| Hillcrest Hospital  | Mayfield Heights     |
| Kettering Medical Center                                  | Kettering            |
| Marymount Hospital  | Garfield Heights     |
| Mercy Franciscan Hospital - Mount Airy                    | Cincinnati           |
| Miami Valley Hospital                                     | Dayton               |
| Mount Carmel Health                                       | Columbus             |
| Northside Medical Center                                  | Youngstown           |
| Ohio State University Hospitals                           | Columbus             |
| <i>including:</i> The Ohio State University Hospital East | Columbus             |
| Parma Community General Hospital                          | Parma                |
| South Pointe Hospital                                     | Warrensville Heights |
| Southwest General Health Center                           | Middleburg Heights   |
| St. Elizabeth Health Center                               | Youngstown           |

| Distinguished Hospitals for Clinical Excellence™ 2010*   | City             |
|--|------------------|
| St. John West Shore Hospital                             | Westlake         |
| St. Vincent Charity Hospital                             | Cleveland        |
| Summa Health Systems Hospitals                           | Akron            |
| The Toledo Hospital                                      | Toledo           |
| <b>Oregon</b>  |                  |
| Mercy Medical Center                                     | Roseburg         |
| Saint Charles Medical Center - Bend                      | Bend             |
| <b>Pennsylvania</b>                                      |                  |
| Alle Kiski Medical Center                                | Natrona Heights  |
| Allegheny General Hospital                               | Pittsburgh       |
| <i>including:</i> Allegheny General Hospital - Suburban  | Pittsburgh       |
| Easton Hospital  | Easton           |
| Hamot Medical Center                                     | Erie             |
| Lancaster General Hospital                               | Lancaster        |
| Lehigh Valley Hospital                                   | Allentown        |
| Main Line Hospitals - Lankenau                           | Wynnewood        |
| Mercy Hospital - Scranton                                | Scranton         |
| Pocono Medical Center                                    | East Stroudsburg |
| St. Luke's Hospital                                      | Bethlehem        |
| <i>including:</i> St. Luke's Hospital - Allentown        | Allentown        |
| The Reading Hospital and Medical Center                  | Reading          |
| The Western Pennsylvania Hospital Forbes Regional Campus | Monroeville      |
| University of Pittsburgh Medical Center – St. Margaret   | Pittsburgh       |
| <b>South Carolina</b>                                    |                  |
| AnMed Health   | Anderson         |
| <b>South Dakota</b>                                      |                  |
| Sanford USD Medical Center                               | Sioux Falls      |
| <b>Tennessee</b>   |                  |
| Baptist Memorial Hospital                                | Memphis          |
| Memorial Healthcare System                               | Chattanooga      |
| Methodist Medical Center of Oak Ridge                    | Oak Ridge        |
| Saint Thomas Hospital                                    | Nashville        |
| <b>Texas</b>   |                  |
| CHRISTUS Santa Rosa Healthcare – San Antonio             | San Antonio      |
| Doctors Hospital at Renaissance                          | Edinburg         |
| Harlingen Medical Center                                 | Harlingen        |



| Distinguished Hospitals for Clinical Excellence™ 2010*                         | City           |
|--|----------------|
| Memorial Hermann Healthcare System   | Houston        |
| <i>including:</i> Memorial Hermann Northwest Hospital                          | Houston        |
| Memorial Hermann Southeast Hospital  | Houston        |
| Memorial Hermann Southwest Hospital  | Houston        |
| Memorial Hermann The Woodlands Hospital  | The Woodlands  |
| Memorial Hermann Memorial City Hospital  | Houston        |
| Methodist Hospital   | San Antonio    |
| <i>including:</i> Methodist Specialty and Transplant Hospital                  | San Antonio    |
| Metropolitan Methodist Hospital  | San Antonio    |
| Northeast Methodist Hospital   | San Antonio    |
| Methodist Willowbrook Hospital   | Houston        |
| Mother Frances Hospital - Tyler  | Tyler          |
| Providence Healthcare Network  | Waco           |
| Rio Grande Regional Hospital   | McAllen        |
| San Jacinto Methodist Hospital   | Baytown        |
| South Texas Health - Edinburg Regional Medical Center                          | Edinburg       |
| <i>including:</i> South Texas Health - McAllen Medical Center / Heart Hospital | McAllen        |
| St. Luke's Episcopal Hospital  | Houston        |
| Texas Health Harris Methodist Hospital Fort Worth                              | Fort Worth     |
| The Methodist Hospital   | Houston        |
| <i>including:</i> Diagnostic Center Hospital                                   | Houston        |
| Tomball Regional Hospital  | Tomball        |
| Valley Regional Medical Center   | Brownsville    |
| Woodland Heights Medical Center  | Lufkin         |
| <b>Utah</b>  |                |
| Intermountain Medical Center   | Murray         |
| <b>Virginia</b>  |                |
| Augusta Health   | Fishersville   |
| Bon Secours Memorial Regional Medical Center                                   | Mechanicsville |
| Henrico Doctors' Hospital - Forest   | Richmond       |
| <i>including:</i> Henrico Doctors' Hospital - Parham                           | Richmond       |
| Inova Alexandria Hospital  | Alexandria     |
| Inova Fair Oaks Hospital   | Fairfax        |
| Inova Fairfax Hospital   | Falls Church   |
| Inova Loudoun Hospital   | Leesburg       |

| Distinguished Hospitals for Clinical Excellence™ 2010* | City       |
|--|------------|
| <b>Washington</b>                                      |            |
| Evergreen Hospital Medical Center                      | Kirkland   |
| Providence Regional Medical Center Everett             | Everett    |
| <b>West Virginia</b>                                   |            |
| Princeton Community Hospital                           | Princeton  |
| <b>Wisconsin</b>                                       |            |
| Aurora St. Luke's Medical Center                       | Milwaukee  |
| <i>including:</i> St. Luke's Medical Center            | Cudahy     |
| Gundersen Lutheran Medical Center                      | La Crosse  |
| West Allis Memorial Hospital                           | West Allis |
| Wheaton Franciscan Healthcare - Elmbrook Memorial      | Brookfield |

\* Distinction cannot be used without a Licensing Agreement from Health Grades, Inc.

**Appendix B: Inhospital Mortality Performance:  
Distinguished Hospitals for Clinical Excellence (DH-CE) Compared to All Other U.S. Hospitals**

(3-Year Aggregate Relative Risk-Adjusted Inhospital Mortality Performance: 2006-2008)

| Procedure or Diagnosis                                 | Year      | Total Number of U.S. Medicare Hospitalizations | DH-CE Hospitals Average Observed-to-Expected Inhospital Mortality Ratio | % Improvement by DH-CE Hospitals <sup>1</sup> | All Other U.S. Hospitals Average Observed-to-Expected Inhospital Mortality Ratio | % Improvement by All Other Hospitals <sup>2</sup> | Relative Risk Reduction Associated with DH-CE Hospitals Compared to All Other U.S. Hospitals <sup>3</sup> | Number of Lives That Could Have Been Saved if All Patients were Treated at DH-CE Hospitals (2006-2008) <sup>4</sup> | P-Value (DH-CE Hospital Mortality Compared to National Mortality Average) |
|--|-----------|--|---|---|--|---|---|---|---|
| Bowel Obstruction                                      | 2006      | 150,810  | .76   |   | 1.10   |   |   |   | <.001   |
|  | 2007      | 147,947  | .67   |   | 1.05   |   |   |   | <.001   |
|  | 2008      | 153,394  | .67   |   | 1.06   |   |   |   | <.001   |
|  | 2006-2008 | 452,151  | .70   | 12.10%  | 1.07   | 3.55%   | 34.67%  | 4,375   | <.001   |
| Chronic Obstructive Pulmonary Disease (COPD)           | 2006      | 329,033  | .76   |   | 1.19   |   |   |   | <.001   |
|  | 2007      | 316,165  | .63   |   | 1.09   |   |   |   | <.001   |
|  | 2008      | 373,110  | .60   |   | .95  |   |   |   | <.001   |
|  | 2006-2008 | 1,018,308                                      | .66   | 20.89%  | 1.07   | 20.22%  | 38.32%  | 6,598   | <.001   |
| Coronary Bypass Surgery                                | 2006      | 90,297   | .92   |   | 1.14   |   |   |   | .023  |
|  | 2007      | 82,740   | .80   |   | 1.05   |   |   |   | <.001   |
|  | 2008      | 76,361   | .75   |   | .98  |   |   |   | <.001   |
|  | 2006-2008 | 249,398  | .83   | 18.42%  | 1.06   | 14.34%  | 21.78%  | 1,145   | <.001   |
| Coronary Interventional Procedures (Angioplasty/Stent) | 2006      | 323,383  | .87   |   | 1.13   |   |   |   | <.001   |
|  | 2007      | 284,950  | .83   |   | 1.04   |   |   |   | <.001   |
|  | 2008      | 261,144  | .79   |   | 1.02   |   |   |   | <.001   |
|  | 2006-2008 | 869,477  | .83   | 9.17%   | 1.06   | 9.51%   | 21.66%  | 2,060   | <.001   |
| Diabetic Acidosis and Coma                             | 2006      | 54,085   | .71   |   | 1.03   |   |   |   | <.001   |
|  | 2007      | 53,600   | .52   |   | 1.13   |   |   |   | <.001   |
|  | 2008      | 54,759   | .64   |   | 1.09   |   |   |   | <.001   |
|  | 2006-2008 | 162,444  | .63   | 9.38%   | 1.08   | -5.25%  | 41.89%  | 931   | <.001   |
| Gastrointestinal Bleed                                 | 2006      | 261,394  | .78   |   | 1.17   |   |   |   | <.001   |
|  | 2007      | 251,910  | .71   |   | 1.04   |   |   |   | <.001   |
|  | 2008      | 245,583  | .63   |   | 1.01   |   |   |   | <.001   |
|  | 2006-2008 | 758,887  | .71   | 19.60%  | 1.07   | 13.90%  | 33.88%  | 4,476   | <.001   |

| Procedure or Diagnosis                    | Year      | Total Number of U.S. Medicare Hospitalizations | DH-CE Hospitals Average Observed-to-Expected Inhospital Mortality Ratio | % Improvement by DH-CE Hospitals <sup>1</sup> | All Other U.S. Hospitals Average Observed-to-Expected Inhospital Mortality Ratio | % Improvement by All Other Hospitals <sup>2</sup> | Relative Risk Reduction Associated with DH-CE Hospitals Compared to All Other U.S. Hospitals <sup>3</sup> | Number of Lives That Could Have Been Saved If All Patients were Treated at DH-CE Hospitals (2006-2008) <sup>4</sup> | P-Value (DH-CE Hospital Mortality Compared to National Mortality Average) |
|---|-----------|--|---|---|--|---|---|---|---|
| Gastrointestinal Surgeries and Procedures | 2006      | 81,348   | .82   |   | 1.09   |   |   |   | <.001   |
|   | 2007      | 79,648   | .77   |   | 1.03   |   |   |   | <.001   |
|   | 2008      | 80,305   | .80   |   | 1.04   |   |   |   | <.001   |
|   | 2006-2008 | 241,301  | .80   | 2.09%   | 1.05   | 5.16%   | 24.49%  | 4,952   | <.001   |
| Heart Attack                              | 2006      | 244,954  | .92   |   | 1.08   |   |   |   | <.001   |
|   | 2007      | 233,731  | .85   |   | 1.03   |   |   |   | <.001   |
|   | 2008      | 232,202  | .78   |   | .99  |   |   |   | <.001   |
|   | 2006-2008 | 710,887  | .85   | 15.43%  | 1.03   | 8.26%   | 17.56%  | 10,327  | <.001   |
| Heart Failure                             | 2006      | 613,332  | .76   |   | 1.13   |   |   |   | <.001   |
|   | 2007      | 570,903  | .67   |   | 1.03   |   |   |   | <.001   |
|   | 2008      | 536,230  | .66   |   | 1.05   |   |   |   | <.001   |
|   | 2006-2008 | 1,720,465                                      | .70   | 13.51%  | 1.07   | 6.79%   | 34.95%  | 19,785  | <.001   |
| Pancreatitis                              | 2006      | 50,316   | .75   |   | 1.11   |   |   |   | <.001   |
|   | 2007      | 48,368   | .69   |   | 1.12   |   |   |   | <.001   |
|   | 2008      | 46,423   | .66   |   | .98  |   |   |   | <.001   |
|   | 2006-2008 | 145,107  | .70   | 11.79%  | 1.07   | 11.72%  | 34.20%  | 1,127   | <.001   |
| Pneumonia                                 | 2006      | 513,531  | .73   |   | 1.13   |   |   |   | <.001   |
|   | 2007      | 484,840  | .64   |   | 1.04   |   |   |   | <.001   |
|   | 2008      | 454,662  | .59   |   | 1.01   |   |   |   | <.001   |
|   | 2006-2008 | 1,453,033                                      | .66   | 19.18%  | 1.06   | 10.87%  | 38.22%  | 24,714  | <.001   |
| Pulmonary Embolism                        | 2006      | 50,618   | .77   |   | 1.20   |   |   |   | <.001   |
|   | 2007      | 52,464   | .68   |   | 1.08   |   |   |   | <.001   |
|   | 2008      | 51,252   | .66   |   | .98  |   |   |   | <.001   |
|   | 2006-2008 | 154,334  | .70   | 13.85%  | 1.08   | 18.29%  | 35.24%  | 2,089   | <.001   |
| Resection/Replacement of Abdominal Aorta  | 2006      | 21,535   | .94   |   | 1.08   |   |   |   | .166  |
|   | 2007      | 21,387   | .85   |   | 1.06   |   |   |   | .020  |
|   | 2008      | 20,990   | .82   |   | .97  |   |   |   | .007  |
|   | 2006-2008 | 63,912   | .88   | 12.05%  | 1.03   | 9.98%   | 15.31%  | 356   | <.001   |

| Procedure or Diagnosis             | Year      | Total Number of U.S. Medicare Hospitalizations | DH-CE Hospitals Average Observed-to-Expected Inhospital Mortality Ratio | % Improvement by DH-CE Hospitals <sup>1</sup> | All Other U.S. Hospitals Average Observed-to-Expected Inhospital Mortality Ratio | % Improvement by All Other Hospitals <sup>2</sup> | Relative Risk Reduction Associated with DH-CE Hospitals Compared to All Other U.S. Hospitals <sup>3</sup> | Number of Lives That Could Have Been Saved if All Patients were Treated at DH-CE Hospitals (2006-2008) <sup>4</sup> | P-Value (DH-CE Hospital Mortality Compared to National Mortality Average) |
|------------------------------------|-----------|--|---|---|--|---|---|---|---|
| Respiratory Failure                | 2006      | 144,514  | .86   |   | 1.10   |   |   |   | <.001   |
|                                    | 2007      | 143,122  | .80   |   | 1.06   |   |   |   | <.001   |
|                                    | 2008      | 157,129  | .74   |   | .99  |   |   |   | <.001   |
|                                    | 2006-2008 | 444,765  | .80   | 14.44%  | 1.05   | 9.95%   | 23.54%  | 18,699  | <.001   |
| Sepsis                             | 2006      | 257,026  | .86   |   | 1.12   |   |   |   | <.001   |
|                                    | 2007      | 269,596  | .79   |   | 1.05   |   |   |   | <.001   |
|                                    | 2008      | 309,808  | .76   |   | 1.00   |   |   |   | <.001   |
|                                    | 2006-2008 | 836,430  | .80   | 11.44%  | 1.05   | 11.25%  | 24.02%  | 35,716  | <.001   |
| Stroke                             | 2006      | 220,937  | .80   |   | 1.12   |   |   |   | <.001   |
|                                    | 2007      | 210,085  | .75   |   | 1.06   |   |   |   | <.001   |
|                                    | 2008      | 206,846  | .67   |   | 1.00   |   |   |   | <.001   |
|                                    | 2006-2008 | 637,868  | .74   | 15.48%  | 1.06   | 10.49%  | 30.43%  | 11,828  | <.001   |
| Valve Replacement Surgery          | 2006      | 38,424   | .96   |   | 1.15   |   |   |   | .155  |
|                                    | 2007      | 37,275   | .87   |   | 1.05   |   |   |   | <.001   |
|                                    | 2008      | 37,654   | .79   |   | .94  |   |   |   | <.001   |
|                                    | 2006-2008 | 113,353  | .88   | 17.59%  | 1.04   | 17.96%  | 16.07%  | 954   | <.001   |
| <b>Totals</b>                      |           | <b>10,032,120</b>                              |   |   |  |   |   | <b>150,132</b>  |   |
| <b>3-Year Performance Averages</b> |           |  | <b>0.76</b>   | <b>13.91%</b>                                 | <b>1.06</b>  | <b>10.41%</b>                                     | <b>28.60%</b>   |   |   |

<sup>1</sup> Percent improvement determines improvement over time (2006 through 2008) for aggregate DH-CE hospitals. Calculated as follows: (O/E for 2006 – O/E for 2008) / (O/E for 2006) where the O/E is for the DH-CE hospitals.

<sup>2</sup> Percent improvement determines improvement over time (2006 through 2008) for aggregate Non-DH-CE hospitals. Calculated as follows: (O/E for 2006 – O/E for 2008) / (O/E for 2006) where the O/E is for the Non-DH-CE hospitals.

<sup>3</sup> Relative Risk Reduction determines the difference in performance between DH-CE and All Other hospitals. Calculated as follows: (Non-DH-CE O/E – DH-CE O/E) / Non-DH-CE O/E.

<sup>4</sup> Lives saved were calculated: All Other hospitals' 3-year actual number of mortalities – (All Other hospitals' 3-year expected number of mortalities x DH-CE O/E ratio).

## Appendix C: Inhospital Complications Performance: Distinguished Hospitals for Clinical Excellence (DH-CE) Compared to All Other U.S. Hospitals

(3-Year Aggregate Relative Risk-Adjusted Inhospital Complications Performance: 2006-2008)

| Procedure or Diagnosis                       | Year      | Total Number of U.S. Medicare Hospitalizations | DH-CE Hospitals Average Observed-to-Expected Inhospital Complications Ratio | % Improvement by DH-CE Hospitals <sup>1</sup> | All Other U.S. Hospitals Average Observed-to-Expected Inhospital Complications Ratio | % Improvement by All Other Hospitals <sup>2</sup> | Relative Risk Reduction Associated with DH-CE Hospitals Compared to All Other U.S. Hospitals <sup>3</sup> | Number of Patients That Could Have Avoided Developing One or More Post-Op Complications If All Patients were Treated at DH-CE Hospitals (2006-2008) <sup>4</sup> | P-Value (DH-CE Hospital Complications Compared to National Complication Average) |
|--|-----------|--|---|---|--|---|---|--|--|
| Back and Neck Surgery (Spinal Fusion)        | 2006      | 50,770   | .96   |   | 1.03   |   |   |  | .029   |
|  | 2007      | 52,670   | .93   |   | 1.01   |   |   |  | <.001  |
|  | 2008      | 56,484   | 1.01  |   | 1.04   |   |   |  | .657   |
|  | 2006-2008 | 159,924  | .97   | -5.09%  | 1.03   | -.85%   | 6.07%   | 1,249  | .003   |
| Back and Neck Surgery (Except Spinal Fusion) | 2006      | 57,208   | .90   |   | .99  |   |   |  | <.001  |
|  | 2007      | 53,695   | .96   |   | 1.02   |   |   |  | .047   |
|  | 2008      | 54,096   | .96   |   | 1.06   |   |   |  | .041   |
|  | 2006-2008 | 164,999  | .94   | -6.25%  | 1.02   | -7.34%  | 8.55%   | 1,249  | <.001  |
| Carotid Surgery                              | 2006      | 70,065   | .95   |   | .99  |   |   |  | .044   |
|  | 2007      | 67,028   | .95   |   | .97  |   |   |  | .033   |
|  | 2008      | 64,263   | .99   |   | 1.04   |   |   |  | .383   |
|  | 2006-2008 | 201,356  | .96   | -4.19%  | 1.00   | -5.40%  | 3.82%   | 418  | .013   |
| Cholecystectomy                              | 2006      | 68,121   | .94   |   | 1.00   |   |   |  | .002   |
|  | 2007      | 65,709   | .96   |   | 1.01   |   |   |  | .016   |
|  | 2008      | 64,821   | .95   |   | 1.04   |   |   |  | .009   |
|  | 2006-2008 | 198,651  | .95   | -.93%   | 1.02   | -4.04%  | 6.45%   | 1,531  | <.001  |
| Hip Fracture Repair                          | 2006      | 130,879  | .91   |   | 1.02   |   |   |  | <.001  |
|  | 2007      | 128,628  | .92   |   | .97  |   |   |  | <.001  |
|  | 2008      | 129,060  | .97   |   | 1.06   |   |   |  | .043   |
|  | 2006-2008 | 388,567  | .93   | -7.46%  | 1.02   | -4.11%  | 8.41%   | 3,187  | <.001  |



| Procedure or Diagnosis            | Year      | Total Number of U.S. Medicare Hospitalizations | DH-CE Hospitals Average Observed-to-Expected Inhospital Complications Ratio | % Improvement by DH-CE Hospitals <sup>1</sup> | All Other U.S. Hospitals Average Observed-to-Expected Inhospital Complications Ratio | % Improvement by All Other Hospitals <sup>2</sup> | Relative Risk Reduction Associated with DH-CE Hospitals Compared to All Other U.S. Hospitals <sup>3</sup> | Number of Patients That Could Have Avoided Developing One or More Post-Op Complications If All Patients were Treated at DH-CE Hospitals (2006-2008) <sup>4</sup> | P-Value (DH-CE Hospital Complications Compared to National Complication Average) |
|-----------------------------------|-----------|--|---|---|--|---|---|--|--|
| Peripheral Vascular Bypass        | 2006      | 20,598   | .96   |   | 1.02   |   |   |  | .193   |
|                                   | 2007      | 18,187   | .85   |   | 1.06   |   |   |  | .001   |
|                                   | 2008      | 16,810   | .98   |   | 1.01   |   |   |  | .360   |
|                                   | 2006-2008 | 55,595   | .93   | -2.35%  | 1.03   | .71%  | 9.69%   | 370  | .007   |
| Prostatectomy                     | 2006      | 57,024   | .90   |   | 1.05   |   |   |  | .001   |
|                                   | 2007      | 54,739   | .89   |   | 1.00   |   |   |  | <.001  |
|                                   | 2008      | 53,409   | .86   |   | 1.00   |   |   |  | <.001  |
|                                   | 2006-2008 | 165,172  | .88   | 3.90%   | 1.02   | 4.57%   | 13.58%  | 1,047  | <.001  |
| Total Hip Replacement             | 2006      | 72,400   | .85   |   | 1.00   |   |   |  | <.001  |
|                                   | 2007      | 72,797   | .83   |   | 1.01   |   |   |  | <.001  |
|                                   | 2008      | 75,398   | 1.00  |   | 1.10   |   |   |  | .579   |
|                                   | 2006-2008 | 220,595  | .89   | -18.34%                                       | 1.04   | -10.36%   | 13.80%  | 1,796  | <.001  |
| Total Knee Replacement            | 2006      | 182,028  | .94   |   | 1.03   |   |   |  | <.001  |
|                                   | 2007      | 180,162  | .92   |   | 1.00   |   |   |  | <.001  |
|                                   | 2008      | 185,611  | .99   |   | 1.05   |   |   |  | .187   |
|                                   | 2006-2008 | 547,801  | .95   | -4.48%  | 1.03   | -1.77%  | 7.57%   | 2,257  | <.001  |
| <b>Totals</b>                     |           | <b>2,102,660</b>                               |   |   |  |   |   | <b>13,104</b>  |  |
| <b>3-Year Performance Average</b> |           |  | <b>0.93</b>   | <b>-5.02%</b>                                 | <b>1.02</b>  | <b>-3.18%</b>                                     | <b>8.66%</b>  |  |  |

<sup>1</sup> Percent improvement determines improvement over time (2006 through 2008) for aggregate DH-CE hospitals. Calculated as follows: (O/E for 2006 – O/E for 2008) / (O/E for 2006) where the O/E is for the DH-CE hospitals.

<sup>2</sup> Percent improvement determines improvement over time (2006 through 2008) for aggregate Non-DH-CE hospitals. Calculated as follows: (O/E for 2006 – O/E for 2008) / (O/E for 2006) where the O/E is for the Non-DH-CE hospitals.

<sup>3</sup> Relative Risk Reduction determines the difference in performance between DH-CE and All Other hospitals. Calculated as follows: (Non-DH-CE O/E – DH-CE O/E) / Non-DH-CE O/E.

<sup>4</sup> Complications avoided were calculated: All Other hospitals' 3-year actual number of complications – (All Other hospitals' 3-year expected number of complications x DH-CE O/E ratio).

## Appendix D: Hospital Report Cards™ Mortality and Complication Based Outcomes 2010 Methodology

Visit [www.HealthGrades.com](http://www.HealthGrades.com) to read the complete methodology white paper *Hospital Report Cards™ Mortality and Complication Based Outcomes 2010 Methodology*.

### Introduction

To help consumers evaluate and compare hospital performance, HealthGrades analyzed patient outcome data for virtually every hospital in the country. HealthGrades uses the following data source:

- Medicare inpatient data from the MedPAR database (purchased from the Centers for Medicare and Medicaid Services) for fiscal years 2006 through 2008.

Ratings were based upon HealthGrades' risk-adjustment methodology described below. The purpose of risk adjustment is to obtain fair statistical comparisons among disparate populations or groups. Significant differences in demographic and clinical risk factors are found among patients treated in different hospitals. Risk adjustment of the data is needed to make accurate and valid comparisons of clinical outcomes at different hospitals.

### Data Acquisition

The MedPAR data was selected for several reasons.

- Included in the database is virtually every hospital in the country, with the exception of military and Veterans Administration hospitals.
- Accuracy is regulated; hospitals are required by law to submit complete and accurate information with substantial penalties for those that report inaccurate or incomplete data.
- The Medicare population represents a majority of the patients for virtually all of the clinical categories studied. For example, Medicare patients account for approximately 55 – 60% of all cardiac patients.

For Multivariate Logistic Regression-Based Ratings (see below), HealthGrades conducted a series of data quality checks to preserve the integrity of the ratings. Based on the results of these checks, we excluded a limited number of cases because they were inappropriate for inclusion in the database or miscoded.

Examples of excluded patient records were:

- Patients under the age of 65
- Patients who left the hospital against medical advice or who were transferred to another acute care hospital
- Patients discharged alive with a length of stay that is inconsistent with the reason for admission. (For example, a patient discharged alive with a one-day length of stay for valve replacement surgery would be excluded because this procedure requires several days for recovery.)
- Patients who were still in the hospital when the Medicare claim was filed
- Patients with an invalid gender (for example, a prostatectomy related to a female patient)

## Methodology for Ratings

HealthGrades' Multivariate Logistic Regression-Based Ratings methodology takes into account patient characteristics such as age, gender, and underlying medical conditions that could increase the patient's risk of mortality or complication.

### Multivariate Logistic Regression-Based Ratings

The inpatient data for 26 procedures and diagnoses on the HealthGrades Web site represent three years of patient discharges from Medicare fiscal year 2006 through 2008.

In the initial analysis of the data, a separate data set was created for each group of patients having a specific procedure or diagnosis based on ICD-9-CM coding (e.g., coronary bypass surgery, total hip replacement). Each group of patients was defined by using the information on diagnoses and procedures coded in the patient records. See *Appendix A* in the complete *Hospital Report Cards™ Mortality and Complication Based Outcomes Methodology* for a list of the diagnosis and procedure codes that define each patient cohort. The quality measure for some cohorts was mortality, whereas for other cohorts the quality measure was major complications.

For each patient cohort, HealthGrades developed a list of specific procedures and diagnosis that define the cohort, a list of risk factors (see *Appendix C* in the complete *Hospital Report Cards™ Mortality and Complication Based Outcomes Methodology*), and a list of post-surgical complications. These latter two lists were developed in the following manner:

1. Potential risk factors were identified as all clinically relevant diagnoses occurring in more than 0.5% of the patient population, demographic characteristics, and clinically relevant procedures.
2. Post-surgical complications were identified using a panel of clinical and coding experts.

In some cases an ICD-9 code can be either a risk or a complication. In these cases, a code is differentiated by the presence of a 900 post-operative complication code. For example in the case where a patient record contains 427.31 Atrial Fibrillation, that code is considered a co-morbid risk if it occurs by itself and a complication if there is a corresponding 997.1 Cardiac Complications, NEC code also present in the patient record.

Some diagnosis codes were merged together (e.g., primary and secondary pulmonary hypertension) to minimize the impact of coding variations.

Outcomes were binary, with documented major complications either present or not, and patients recorded as either alive or expired. In cohorts where the quality measure is major complications, mortality is considered a complication. See *Appendix B* in the complete *Hospital Report Cards™ Mortality and Complication Based Outcomes Methodology* for a list of complications included in the quality measure "Major Complications."

### Risk-Adjustment Methodology

Fair and valid comparisons between hospital providers can be made only to the extent that the risk-adjustment methodology considers important differences in patient demographic and clinical characteristics. The risk-adjustment methodology used by HealthGrades defines risk factors as those clinical and demographic variables that influence patient outcomes in significant and systematic ways.

Risk factors may include age, gender, specific procedure performed, and co-morbid conditions such as hypertension, chronic renal failure, heart failure, and diabetes. The methodology is disease-specific and outcome specific. This means that individual risk models are constructed and tailored for each clinical condition or procedure, and also for each outcome. (For most mortality cohorts, outcomes studied included in-hospital, 30 day, and 180 day mortality.)

Developing the HealthGrades ratings involved four steps for each disease state or procedure specific cohort (e.g., coronary bypass surgery) and quality measure (e.g., in-hospital mortality or complications).

1. First, the predicted value (predicted number of deaths or complications at each hospital) was obtained using logistic regression models discussed in the next section *Statistical Models*.
2. Second, the predicted value was compared with the actual or observed, value (actual number of deaths or complications at each hospital). Only hospitals with at least 30 cases across three years of data and at least five cases in the most current year were included.
3. Third, a test was conducted to determine whether the difference between the predicted and actual values was statistically significant. This test was performed to make sure that differences were unlikely to be caused by chance alone.
4. Fourth, a star rating was assigned based upon the outcome of the test for statistical significance.

### Statistical Models

Unique statistical models were developed for each patient cohort and each outcome using logistic regression.

Co-morbid diagnoses (e.g., hypertension, chronic renal failure, anemia, diabetes), demographic characteristics (e.g., age and gender), and specific procedures (e.g., percutaneous coronary intervention among coronary bypass surgery patients) were classified as potential risk factors. We used logistic regression to determine which of these were actually risk factors and to what extent they correlated with the quality measure (e.g., mortality). All risk factors that remained in the final model had to be **statistically significant** ( $p < 0.05$ ) in predicting the outcome (mortality, in-hospital complications). In addition, risk factors are required to have an **odds ratio greater than 1.0**. There were occasional exceptions to this rule; for example, risk factors that have been documented in the medical literature to be protective and risk factors that are part of the cohort definition remain in the model even if the odds ratio was less than one (e.g., Streptococcal pneumoniae pneumonia is one type of pneumonia that makes up the Pneumonia cohort).

Complications were *not* counted as risk factors as they were considered a result of care received during the admission. The top five risk factors are procedures/diagnoses that are most likely to lead to the outcome (e.g., highest odds ratio). They are not necessarily those with the highest volume. See *Appendix C* in the complete *Hospital Report Cards™ Mortality and Complication Based Outcomes Methodology* for a list of the top five risk factors for each procedure or diagnosis.

The statistical models were checked for validity and finalized. All of the models were highly significant, with c-statistics ranging from ~ 0.6 to ~ 0.9. These cohort and outcome-specific models were then used to estimate the probability of the outcome for each patient in the cohort. Patients were then aggregated for each hospital to obtain the predicted outcome for each hospital.

Statistical significance tests were performed for each patient cohort to identify, by hospital, whether the actual and predicted rates were significantly different. We used a standardized score (z-score) to establish an approximate 90% confidence interval.

### Assignment of Star Ratings

The following rating system was applied to the data for all procedures and diagnoses:

- ★★★★★ Actual performance was better than predicted and the difference was statistically significant.
- ★★★ Actual performance was not significantly different from what was predicted.
- ★ Actual performance was worse than predicted and the difference was statistically significant.

In general, 70% to 80% of hospitals in each procedure/diagnosis are classified as three stars, with actual results statistically the same as predicted results. Approximately 10% to 15% were 1-star hospitals and 10% to 15% were 5-star hospitals.

### Limitations of the Data Models

It must be understood that while these models may be valuable in identifying hospitals that perform better than others, one should not use this information alone to determine the quality of care provided at each hospital. The models are limited by the following factors:

- Cases may have been coded incorrectly or incompletely by the hospital.
- The models can only account for risk factors that are coded into the billing data—if a particular risk factor was not coded into the billing data, such as a patient's socioeconomic status and health behavior, then it was not accounted for with these models.
- Although Health Grades, Inc. has taken steps to carefully compile these data using its methodology, no techniques are infallible, and therefore some information may be missing, outdated or incorrect.

Please note that a high ranking for a particular hospital is not a recommendation or endorsement by Health Grades, Inc. of a particular hospital; it means that the data associated with a particular hospital has met the foregoing qualifications. Only individual patients can decide whether a particular hospital is suited for their unique needs.

Also note that if more than one hospital reported to CMS under a single provider ID, HealthGrades analyzed patient outcome data for those hospitals as a single unit. (Throughout this document, therefore, "hospital" refers to one hospital or a group of hospitals reporting under a single provider ID.)

## Patient Cohort Definitions

Excluded from each cohort were patients who have had any organ transplant.

### Cardiac Service Line

| Cohort  | Inclusions   | Exclusions   |
|---|--|--|
| <b>Coronary Bypass Surgery (CABG)</b><br>(Isolated)<br>Principal Procedure  | <ul style="list-style-type: none"> <li>Coronary bypass for cardiac revascularization with: internal mammary artery or vein</li> <li>One or more vessels</li> <li>Without valve replacement or repair</li> <li>Can have a PCI in this stay</li> </ul>   | <ul style="list-style-type: none"> <li>Valve repair &amp; replacement</li> <li>Aortic aneurysm repair</li> <li>Carotid endarterectomy</li> <li>Patients discharged alive with a length of stay &lt; 1 day</li> </ul>   |
| <b>Coronary Interventional Procedures (PCI)</b><br>Principal Procedure of PCI or Principal Procedure Intra-aortic balloon pump with PCI secondary | <ul style="list-style-type: none"> <li>Removal of coronary artery obstruction</li> <li>Single or multi-vessel</li> <li>Atherectomy or balloon angioplasty with or without thrombolytic agent</li> <li>Stent can be bare metal or drug eluting</li> <li>Can be multi-vessel</li> </ul>  | <ul style="list-style-type: none"> <li>Open chest</li> <li>Case associated with CABG or Valve in this stay</li> </ul>  |
| <b>Heart Attack</b><br>Principal Diagnosis  | <ul style="list-style-type: none"> <li>Anterior, inferior, posterior, lateral, RV infarcts                             <ul style="list-style-type: none"> <li>ST elevation</li> <li>Non ST elevation</li> <li>Not otherwise specified</li> </ul> </li> <li>Includes patients who receive thrombolytics, PCI, CABG, or medical management only</li> </ul> | <ul style="list-style-type: none"> <li>Metastatic cancers</li> <li>Palliative care patients (V66.7)</li> <li>Respirator dependent status (V46.11)</li> <li>Left ventricular assist device (V43.21)</li> <li>Discharge to hospice</li> </ul>  |
| <b>Heart Failure</b><br>Principal Diagnosis   | <ul style="list-style-type: none"> <li>Systolic or diastolic, combined, left, valvular, acute or chronic, decompensated or compensated</li> </ul>  | <ul style="list-style-type: none"> <li>Dialysis in this stay (39.95)</li> <li>Metastatic cancers</li> <li>Palliative care patients (V66.7)</li> <li>Respirator dependent status (V46.11)</li> <li>Left ventricular assist device (V43.21)</li> <li>Discharge to hospice</li> </ul> |
| <b>Valve Replacement Surgery</b><br>Principal or Secondary Procedure  | <ul style="list-style-type: none"> <li>Replacement with repair</li> <li>Aortic, mitral, pulmonary, or tricuspid</li> <li>With or without CABG</li> </ul>   | <ul style="list-style-type: none"> <li>Repair without replacement</li> <li>Thoracic and aortic dissections</li> <li>Patients discharged alive with a length of stay &lt; 1 day</li> </ul>  |



**Critical Care Service Line**

Excluded from each cohort were patients who have had any organ transplant.

| Cohort   | Inclusions   | Exclusions  |
|--|--|---|
| <b>Diabetic Acidosis and Coma</b><br>Principal Diagnosis | <ul style="list-style-type: none"> <li>• With coma</li> <li>• Hypoglycemic shock</li> </ul>  | <ul style="list-style-type: none"> <li>• Metastatic cancers</li> <li>• Palliative care patients (V66.7)</li> <li>• Left ventricular assist device (V43.21)</li> <li>• Respirator dependent status (V46.11)</li> <li>• Patients discharged alive with a length of stay &lt; 1 day</li> </ul> |
| <b>Sepsis</b><br>Principal Diagnosis                     | <ul style="list-style-type: none"> <li>• Salmonella septicemia</li> <li>• Listeriosis</li> <li>• Meningococemia</li> <li>• Streptococcal septicemia</li> <li>• Staphylococcal septicemia</li> <li>• Staphylococcus aureus</li> <li>• Pneumococcal septicemia</li> <li>• Septicemia due to anaerobes</li> <li>• Gram-negative organisms</li> <li>• Hemophilus influenzae</li> <li>• Escherichia coli</li> <li>• Pseudomonas</li> <li>• Serratia</li> <li>• Unspecified organism</li> <li>• Herpetic septicemia</li> <li>• Septic shock</li> <li>• SIRS</li> </ul> | <ul style="list-style-type: none"> <li>• Metastatic cancers</li> <li>• Palliative care patients (V66.7)</li> <li>• Left ventricular assist device (V43.21)</li> <li>• Patients discharged alive with a length of stay &lt; 1 day</li> <li>• Discharge to hospice</li> </ul>                 |
| <b>Pulmonary Embolism</b><br>Principal Diagnosis         | <ul style="list-style-type: none"> <li>• Pulmonary embolism &amp; infarction</li> <li>• Iatrogenic</li> </ul>  | <ul style="list-style-type: none"> <li>• Metastatic cancers</li> <li>• Palliative care patients (V66.7)</li> <li>• Left ventricular assist device (V43.21)</li> <li>• Patients discharged alive with a length of stay &lt; 1 day</li> <li>• Discharge to hospice</li> </ul>                 |
| <b>Respiratory Failure</b><br>Principal Diagnosis        | <ul style="list-style-type: none"> <li>• Acute respiratory failure</li> <li>• Acute on chronic respiratory failure</li> </ul>  | <ul style="list-style-type: none"> <li>• Metastatic cancers</li> <li>• Palliative care patients (V66.7)</li> <li>• Left ventricular assist device (V43.21)</li> <li>• Discharge to hospice</li> </ul>   |



### Gastrointestinal Service Line

Excluded from each cohort were patients who have had any organ transplant.

| Cohort  | Inclusions   | Exclusions  |
|---|--|---|
| <b>Bowel Obstruction</b><br>Principal Diagnosis                         | <ul style="list-style-type: none"> <li>• Duodenal ulcer with obstruction</li> <li>• Gastrojejunal ulcer with obstruction</li> <li>• Pyloric stenosis</li> <li>• Other obstruction of duodenum</li> <li>• Hernia with obstruction</li> <li>• Intestinal obstruction without hernia</li> <li>• Gallstone ileus</li> <li>• Intussusception</li> </ul>   | <ul style="list-style-type: none"> <li>• Metastatic cancers</li> <li>• Palliative care patients (V66.7)</li> <li>• Left ventricular assist device (V43.21)</li> <li>• Discharge to hospice</li> <li>• Patients deceased with a length of stay &lt; 1 day</li> </ul>   |
| <b>Cholecystectomy</b><br>Principal Procedure                           | <ul style="list-style-type: none"> <li>• Open or laparoscopic</li> <li>• Partial</li> <li>• Revision of prior</li> </ul>   | <ul style="list-style-type: none"> <li>• Palliative care patients (V66.7)</li> <li>• Discharge to hospice</li> </ul>  |
| <b>Gastrointestinal Bleed</b><br>Principal Diagnosis                    | <ul style="list-style-type: none"> <li>• Bleeding/hemorrhage in any of the following areas:                             <ul style="list-style-type: none"> <li>• Esophageal varices</li> <li>• Ulcer of esophagus</li> <li>• Gastric ulcer</li> <li>• Duodenal ulcer</li> <li>• Peptic ulcer</li> <li>• Gastrojejunal</li> <li>• Gastritis or duodenitis</li> <li>• Angiodysplasia of stomach &amp; duodenum</li> <li>• Diverticulosis</li> <li>• Rectum or anus</li> <li>• Dieulafoy lesion of intestine</li> </ul> </li> <li>• Hematemesis</li> <li>• Melena</li> <li>• Hemorrhage of GI tract, unspecified</li> </ul> | <ul style="list-style-type: none"> <li>• Metastatic cancers</li> <li>• Palliative care patients (V66.7)</li> <li>• Left ventricular assist device (V43.21)</li> <li>• Respirator dependent status (V46.11)</li> <li>• Discharge to hospice</li> <li>• Patients deceased with a length of stay &lt; 1 day</li> </ul> |
| <b>Gastrointestinal Surgery &amp; Procedures</b><br>Principal Procedure | <ul style="list-style-type: none"> <li>• Gastrectomies</li> <li>• Vagotomies</li> <li>• Gastric repairs</li> <li>• Small and large intestine resections</li> <li>• Small and large intestine anastomoses</li> </ul>  | <ul style="list-style-type: none"> <li>• Primary &amp; metastatic cancers</li> </ul>  |
| <b>Pancreatitis</b><br>Principal Diagnosis                              | <ul style="list-style-type: none"> <li>• Acute</li> <li>• Chronic</li> </ul>   | <ul style="list-style-type: none"> <li>• Metastatic cancers</li> <li>• Palliative care patients (V66.7)</li> <li>• Left ventricular assist device (V43.21)</li> <li>• Respirator dependent status (V46.11)</li> <li>• Discharge to hospice</li> </ul>   |

### Orthopedic Service Line

Excluded from each cohort were patients who have had any organ transplant.

| Cohort   | Inclusions   | Exclusions   |
|--|--|--|
| <b>Back &amp; Neck Surgery (except Spinal Fusion)</b><br>Principal Procedure | <ul style="list-style-type: none"> <li>• Cervical, Thoracic, and/or Lumbar spine laminectomy, laminoplasty, foraminectomy,</li> <li>• Repair of vertebral fracture</li> <li>• Elevation of spinal bone fragments</li> <li>• Reduction of vertebral fracture</li> <li>• Removal on bony spicules</li> <li>• Excision or destruction of inter-vertebral disc</li> <li>• Removal of herniated nucleus pulpsus</li> <li>• Insertion of posterior spinal motion preservation devices</li> </ul> | <ul style="list-style-type: none"> <li>• Post laminectomy syndrome: cervical, thoracic, or lumbar</li> <li>• Reopening of laminectomy site</li> <li>• Repair of joint structure</li> <li>• Kyphoplasty</li> <li>• Vertebroplasty</li> <li>• Patients with secondary bone cancer</li> </ul>   |
| <b>Back &amp; Neck Surgery (Spinal Fusion)</b><br>Principal Procedure        | <ul style="list-style-type: none"> <li>• Fusion at any level: spinal, cervical, dorsal, dorsolumbar, lumbar, lumbosacral</li> <li>• Single incision approach</li> <li>• Any number of vertebrae</li> </ul>   | <ul style="list-style-type: none"> <li>• Post laminectomy syndrome</li> <li>• Reopening</li> <li>• Refusion</li> <li>• Kyphoplast</li> <li>• Vertebroplasty</li> <li>• Patients with secondary bone cancer</li> </ul>  |
| <b>Hip Fracture Repair</b><br>Principal Procedure                            | <ul style="list-style-type: none"> <li>• Closed reduction with internal fixation</li> <li>• Open reduction with and without internal fixation</li> <li>• Partial hip replacement</li> </ul>  | <ul style="list-style-type: none"> <li>• Hip replacement/Knee replacement during same hospital stay</li> <li>• Open skull fractures with lacerations</li> <li>• Open transcervical fractures</li> <li>• Open femur neck and trochanter fractures</li> <li>• Femur shaft fractures</li> <li>• Patients discharged alive with a length of stay &lt; 1 day</li> <li>• Palliative care patients (V66.7)</li> <li>• Discharge to hospice</li> </ul> |
| <b>Total Knee Replacement</b><br>Principal Procedure                         | <ul style="list-style-type: none"> <li>• Primary total knee replacement (bicompartamental, tricompartmental, unicompartamental (hemijoint))</li> <li>• Bilaterals</li> </ul>   | <ul style="list-style-type: none"> <li>• Revision</li> <li>• Accidental injury</li> <li>• Removal of hardware</li> <li>• Hip replacement (total or partial); hip resurfacing</li> </ul>  |
| <b>Total Hip Replacement</b><br>Principal Procedure                          | <ul style="list-style-type: none"> <li>• Primary total hip replacement</li> <li>• Bilaterals</li> <li>• Partial and total hip resurfacing</li> </ul>   | <ul style="list-style-type: none"> <li>• Knee replacement</li> <li>• Revision</li> <li>• Accidental injury</li> <li>• Removal of hardware</li> <li>• Femur neck fractures</li> </ul>   |

### Prostatectomy

Excluded from each cohort were patients who have had any organ transplant.

| Cohort                                      | Inclusions   | Exclusions |
|---|--|------------|
| <b>Prostatectomy</b><br>Principal Procedure | <ul style="list-style-type: none"> <li>• Transurethral</li> <li>• Suprapubic</li> <li>• Retropubic</li> <li>• Radical</li> <li>• Perineal</li> <li>• Local excision of lesion of prostate</li> </ul> |            |

### Pulmonary Service Line

Excluded from each cohort were patients who have had any organ transplant.

| Cohort  | Inclusions   | Exclusions  |
|---|--|---|
| <b>Chronic Obstructive Pulmonary Disease</b><br>Principal Diagnosis | <ul style="list-style-type: none"> <li>• Chronic bronchitis</li> <li>• Simple &amp; obstructive bronchitis with and without exacerbation</li> <li>• Other emphysema</li> <li>• Chronic obstructive asthma</li> <li>• Bronchiectasis</li> <li>• Chronic airway obstruction, not elsewhere classified</li> </ul>                                     | <ul style="list-style-type: none"> <li>• Metastatic cancers</li> <li>• Palliative care patients (V66.7)</li> <li>• Left ventricular assist device (V43.21)</li> <li>• Respirator dependent status (V46.11)</li> <li>• Discharge to hospice</li> </ul> |
| <b>Pneumonia</b><br>Principal Diagnosis                             | <ul style="list-style-type: none"> <li>• Streptococcal – Group A &amp; Group B</li> <li>• Staph pneumonia</li> <li>• Gram negative</li> <li>• Hemophilus influenzae</li> <li>• Mycoplasma</li> <li>• Chlamydia</li> <li>• Bronchopneumonia</li> <li>• Influenza w/ pneumonia</li> <li>• Legionnaire's</li> <li>• Organism not specified</li> </ul> | <ul style="list-style-type: none"> <li>• SARS-related</li> <li>• Metastatic cancers</li> <li>• Palliative care patients (V66.7)</li> <li>• Left ventricular assist device (V43.21)</li> <li>• Discharge to hospice</li> </ul>                         |

### Stroke Service Line

Excluded from each cohort were patients who have had any organ transplant.

| Cohort                        | Inclusions   | Exclusions  |
|-------------------------------|--|---|
| Stroke<br>Principal Diagnosis | <ul style="list-style-type: none"> <li>• Subarachnoid hemorrhage</li> <li>• Intracerebral hemorrhage</li> <li>• Unspecified intracranial hemorrhage</li> <li>• Occlusion and stenosis of basilar, carotid, and vertebral artery</li> <li>• Cerebral thrombosis, embolism, or occlusion</li> <li>• Acute but ill-defined cerebrovascular disease</li> </ul> | <ul style="list-style-type: none"> <li>• Metastatic cancers</li> <li>• Hospitals transferring more than 10% of their population</li> <li>• Subdural bleeds</li> <li>• Extradural bleeds</li> <li>• Palliative care patients (V66.7)</li> <li>• Left ventricular assist device (V43.21)</li> <li>• Respirator dependent status (V46.11)</li> <li>• Patients deceased with a length of stay &lt; 1 day</li> <li>• Patients discharged alive with a length of stay &lt; 1 day</li> <li>• Discharge to hospice</li> </ul> |

### Vascular Service Line

Excluded from each cohort were patients who have had any organ transplant.

| Cohort   | Inclusions  | Exclusions  |
|--|---|---|
| Carotid Surgery<br>Principal Procedure   | <ul style="list-style-type: none"> <li>• Carotid endarterectomy</li> <li>• Endovascular graft</li> <li>• Percutaneous insertion of carotid stent</li> <li>• Percutaneous angioplasty of precerebral vessels</li> </ul>  | <ul style="list-style-type: none"> <li>• Patients with coronary bypass surgery</li> <li>• Resection of other peripheral vessel with anastomosis</li> <li>• Subarachnoid, intracerebral and subdural hemorrhage</li> </ul>   |
| Peripheral Vascular Bypass<br>Principal Procedure                                      | <ul style="list-style-type: none"> <li>• Peripheral vascular shunt or bypass:</li> <li>• Axillary-brachial</li> <li>• Axillary-femoral</li> <li>• Brachial</li> <li>• Femoral-femoral</li> <li>• Femoroperoneal</li> <li>• Femoropopliteal</li> <li>• Femorotibial</li> <li>• Popliteal</li> <li>• Vascular bypass not otherwise specified</li> </ul> | <ul style="list-style-type: none"> <li>• Resection of upper extremities vascular procedures</li> <li>• Revisions</li> </ul>   |
| Resection /Replacement<br>Abdominal Aorta<br>Rupture & Elective<br>Principal Procedure | <ul style="list-style-type: none"> <li>• Excision of aneurysm and resection with anastomosis with and without replacement of the aorta</li> <li>• Endovascular implantation of a graft in the abdominal aorta</li> </ul>  | <ul style="list-style-type: none"> <li>• Aortic dissection</li> <li>• Patients with CABG &amp; Valves</li> <li>• Incision of vessel for embolectomy or thrombectomy</li> <li>• Aorto-renal bypass</li> <li>• Aorto-iliac-femoral bypass</li> <li>• Angioplasty of non-coronary vessel</li> <li>• Resection of thoracic vessel</li> <li>• Patients that have a combination of stenting/anastomosis procedures</li> </ul> |