

15 TOP HEALTH SYSTEMS: STUDY OVERVIEW AND RESEARCH FINDINGS

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Thomson Reuters
777 E. Eisenhower Parkway
Ann Arbor, MI 48108
+1 800 366 7526

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INTRODUCTION

IDENTIFYING IMPROVEMENT OPPORTUNITIES FOR THE ENTIRE INDUSTRY

Although hospitals have been using facility-wide performance improvement programs for quite some time, many health systems do not have such a program in place. One of the roadblocks is the lack of reliable and consistent performance measure data across the nation's healthcare systems.

Thomson Reuters *15 Top Health Systems* is the only study that aggregates individual hospital performance into system-level data. Building on the *100 Top Hospitals*® National Balanced Scorecard concept,¹ this research allows health system leaders to understand how they measure up in terms of clinical quality and efficiency. By objectively measuring health system quality and revealing a group of top performers, the study provides health system leaders with useful data for performance benchmarking.

This year's study contained more than 300 organizations — almost every U.S. system with two or more acute-care member hospitals, including critical access hospitals. Like all *100 Top Hospitals* studies, the research uses publicly available data and objective statistical analysis developed and carried out by a well-rounded team of researchers that includes epidemiologists, statisticians, physicians, and former hospital executives.

THE 15 TOP HEALTH SYSTEMS

To survive in an industry challenged by a slow-to-improve national economy, increased competition, and a new set of rules imposed by healthcare reform, providers must deliver ever-higher quality and become more efficient — doing more with potentially lower reimbursements.

To show health system leaders what the highest performers have achieved, we selected the 15 highest-performing health systems in the study population, based on a composite score of eight measures of quality and efficiency. This year's Thomson Reuters *15 Top Health Systems*, placed into size categories by total operating expense, are:

Large Health Systems (>\$1.5 billion)	Location
Banner Health	Phoenix, AZ
CareGroup Healthcare System	Boston, MA
Jefferson Health System	Radnor, PA
Memorial Hermann Healthcare System	Houston, TX
St. Vincent Health	Indianapolis, IN
Medium Health Systems (\$750 million – \$1.5 billion)	Location
Baystate Health	Springfield, MA
Geisinger Health System	Danville, PA
HCA Central and West Texas Division	Austin, TX
Mission Health System	Asheville, NC
Prime Healthcare Services	Ontario, CA
Small Health Systems (<\$750 million)	Location
Baptist Health	Montgomery, AL
Maury Regional Healthcare System	Columbia, TN
Poudre Valley Health System	Fort Collins, CO
Saint Joseph Regional Health System	Mishawaka, IN
Tanner Health System	Carrollton, GA

The winners of the *15 Top Health Systems* award outperformed their peers in a number of ways. They:

- Saved more lives and caused fewer patient complications
- Followed industry-recommended standards of care more closely
- Made fewer patient safety errors
- Released patients half a day sooner
- Scored better on overall patient satisfaction surveys

And despite the long-heralded and widely known statistics on decreasing mortality rates at U.S. hospitals, new research from Thomson Reuters finds that the rate of patients dying **after they leave the hospital** is increasing for U.S. hospitals overall. Hospitals that are part of the *15 Top Health Systems* are bucking this trend.

Understanding the similarities and differences between high and low performers provides benchmarks for the entire industry. Each year, the relevant benchmarks and robust findings we assemble for the *100 Top Hospitals*® studies provide numerous examples of excellence, as evidenced in a number of published studies.²⁻¹⁸ To read more about the differences between this year's health systems study winners and their peers, see the Findings section.

THE 100 TOP HOSPITALS PROGRAM

For 19 years, the *100 Top Hospitals* program has used independent and objective research to guide hospitals and health systems to improve their performance. Hospitals and health systems do not apply, and winners do not pay to market this honor. To increase understanding of trends in specific areas of the industry, the program includes a range of studies and reports in addition to the *15 Top Health Systems* study, including:

- *100 Top Hospitals*, our flagship study, identifying the top U.S. acute-care hospitals, using a set of measures that evaluate performance excellence in clinical care, patient perception of care, operational efficiency, and financial stability

- The *100 Top Hospitals Everest Award*, identifying a unique group of hospitals with both the best current performance and the best performance improvement over five years
- The *50 Top Cardiovascular Hospitals* study, identifying hospitals that demonstrate the highest performance in hospital cardiovascular services
- A variety of custom benchmark reports designed to help executives understand how their performance compares with their peers

You can read more about these studies, and see lists of all winners, by visiting 100tophospitals.com.

ABOUT THOMSON REUTERS

Thomson Reuters is the world's leading source of intelligent information for businesses and professionals. We combine industry expertise with innovative technology to deliver critical information to leading decision makers in the financial, legal, tax and accounting, healthcare, science, and media markets, powered by the world's most trusted news organization. With headquarters in New York and major operations in London and Eagan, Minnesota, Thomson Reuters employs 55,000 people and operates in over 100 countries.

FINDINGS

BEGINNING THE PERFORMANCE IMPROVEMENT PROCESS

System-wide performance improvement is a somewhat new concept for health systems. Health system leaders embarking on the process must determine how the process fits into their mission and design a process to drive consistent improvement across the entire system.

Understanding what other systems have done to achieve a quality-driven culture — one that continually improves patient care and safety — is a vital first step. Analyzing what the top performers do right, what the lower performers do wrong, and how an individual system compares are necessary components of any health system's performance improvement plan. The findings we present here take a first step — giving leaders of health systems benchmarks for what the top systems are achieving. The benchmarks illustrate what is possible and can help systems set realistic targets for improvement efforts.

30-DAY POST-DISCHARGE MORTALITY RATES INCREASING, BUT HOSPITALS AT WINNING HEALTH SYSTEMS HAVE BETTER RESULTS

Despite the long-heralded and widely known statistics on decreasing mortality rates at U.S. hospitals, new research from Thomson Reuters finds that the rate of patients dying within 30 days of admission, but after they leave the hospital, is increasing for U.S. hospitals overall. Hospitals that were members of the *15 Top Health Systems*, on the other hand, did not have a statistically significant increase.

The 30-day mortality rate, which shows the rates of death 30 days after a patient's admission, is watched closely in the industry because it is part of CMS' value-based purchasing program. Hospitals

that do not meet certain standards for 30-day mortality rates for heart failure, heart attack, and pneumonia patients are financially penalized with lower reimbursements. These 30-day mortality rates include all deaths, whether they occur while the patient is still in the hospital or after they are discharged, no matter the cause of death. CMS chose the 30-day period because it is believed to reflect when deaths are most likely to be related to the care patients received at the hospital.

Our research confirms what is well known: that 30-day mortality rates are decreasing, and that top-performing hospitals and health systems continue to have lower inpatient and 30-day mortality rates. But by splitting the 30-day mortality rate into two statistics: deaths that occurred during the patient's hospital stay and those that occurred after, we found an unpleasant statistic — the rate of patients who died after being discharged is increasing overall. This highlights an important consideration that should not be overlooked when evaluating the 30-day mortality rate statistic: decreasing death rates for patients who die while still in the hospital are masking increasing post-discharge death rates.

When evaluating these statistics for winners and nonwinners of the *15 Top Health Systems* award, we found that hospitals at nonwinning systems have had a significant upward trend in post-discharge 30-day death rates, while hospitals at winning systems did not. Our risk-adjusted analysis set both groups at the observed rate of 4.31 percent in 2005, which was used as the reference year. By 2010, the nonwinners' rate had increased by 6.77 percent, while the winners' rate had risen by only 2.26 percent (a statistically insignificant increase). During this time, winners also had lower death rates for both the overall 30-day statistic and the post-discharge 30-day statistic.

Figure 1: Risk-Adjusted, Post-Discharge, 30-Day Mortality, Winners versus Nonwinners



WINNER VERSUS PEER RESULTS

By providing detailed performance measure data, we show what the top performers have accomplished and offer concrete goals for the entire industry. The data in Table 1 show how the 15 Top Health Systems scored on the study's performance measures, and how this performance compared with their peers (nonwinning health systems).

To develop more actionable benchmarks for like systems, we have refined this year's study by dividing health systems into three comparison groups based on the total operating expense of their member hospitals. (For more details on the comparison groups, see the Methodology section.) Tables 2 through 4 detail how the systems in these groups scored on the study's performance measures and how this performance compared with their nonwinning peers. Below, we highlight some important differences between the winners and their peers, and between the different size health systems.

The top health systems have better survival rates

- The winners had 17 percent fewer deaths than expected, considering patient severity, while

their nonwinning peers had 4 percent more deaths than expected (Table 1).

- The winning medium health systems had the lowest mortality rates, with 20 percent fewer than expected (Table 3).

The top health systems have fewer patient complications

- Patients at the winning systems' member hospitals had fewer patient complications. Their rates were 19 percent lower than at nonwinning system hospitals.
- Small* health systems had the lowest complications rates and outperformed their peers by the widest margin. Hospitals in these winning systems had 28 percent fewer complications than expected, while their peers had just 5 percent fewer (Table 4).

Top systems have better longer-term outcomes

- 30-day mortality and readmission rates are lower at hospitals in the 15 top-performing systems.
- The large* winning systems had the lowest 30-day mortality rates, while the small and medium winning systems had the lowest readmission rates (Tables 2, 3, and 4).

* As defined by total operating expense. See Methodology section for details.

The top health systems are following accepted care protocols and patient safety standards more closely

- The top health systems do a better job avoiding adverse patient safety events and are following accepted care standards (core measures) more closely.
- A patient safety index of 0.77 tells us that winning systems had 23 percent fewer adverse patient safety events than expected; their peers had only 2 percent fewer adverse events than expected.
- The winning systems' higher core measures mean percentage of 96.9 tells us that they had better adherence to recommended core measures of care than their peers.
- Winning medium* systems had the best patient safety index scores.
- Winning large* systems had the best core measures scores (Table 2).

Patients treated at hospitals in the winning systems return home sooner

- Winning systems have a median average length of stay (ALOS) of 4.7 days, nearly half a day shorter than their peers' median of 5.1 days.
- The winning small* systems had the shortest ALOS — 4.4 days.

Patients treated by members of the top health systems report a better overall hospital experience than those treated in peer hospitals

- The winners' higher median HCAHPS score tells us that patients treated by members of the top health systems are reporting a better overall hospital experience than those treated in peer hospitals.
- The top small* systems had the highest HCAHPS scores.

Table 1: National Health System Performance Comparisons (All Systems)

PERFORMANCE MEASURE	MEDIANS		BENCHMARK COMPARED WITH PEER GROUP		
	Benchmark Health Systems	Peer Group of U.S. Health Systems	Difference	Percent Difference	Desired Direction
Mortality Index ¹	0.83	1.04	-0.21	-20.5%	Lower mortality
Complications Index ¹	0.79	0.98	-0.19	-19.2%	Lower complications
Patient Safety Index ²	0.77	0.98	-0.21	-21.7%	Better patient safety
Core Measures Mean Percent ³	96.9	95.8	1.08	n/a ⁵	Better Core Measure performance
AMI 30-Day Mortality Rate (%) ⁴	15.1	15.3	-0.23	n/a ⁵	Lower 30-day mortality
HF 30-Day Mortality Rate (%) ⁴	11.1	11.2	-0.01	n/a ⁵	Lower 30-day mortality
Pneumonia 30-Day Mortality Rate (%) ⁴	11.3	11.5	-0.27	n/a ⁵	Lower 30-day mortality
AMI 30-Day Readmission Rate (%) ⁴	18.8	19.8	-1.00	n/a ⁵	Lower 30-day readmissions
HF 30-Day Readmission Rate (%) ⁴	23.5	24.6	-1.09	n/a ⁵	Lower 30-day readmissions
Pneumonia 30-Day Readmission Rate (%) ⁴	18.2	18.5	-0.34	n/a ⁵	Lower 30-day readmissions
Average Length of Stay (days) ¹	4.7	5.1	-0.45	-8.8%	Shorter ALOS
HCAHPS Score ³	265.8	259.0	6.8	2.6%	Higher patient rating of hospital care

1. Based on POA enabled risk models applied to MedPAR 2009 and 2010 data.

2. Based on AHRQ POA-enabled risk models applied to MedPAR 2009 and 2010 data. Ten PSIs included. See Appendix C for list.

3. Data from CMS Hospital Compare 2011 Q2 dataset. See Appendix C for included core measures.

4. 30-day rates from CMS Hospital Compare dataset, July 1, 2007 — June 30, 2010.

5. We do not calculate percentage difference for this measure because it is already a percent value.

* As defined by total operating expense. See Methodology section for details.

Table 2: Large Health System Performance Comparisons

PERFORMANCE MEASURE	MEDIANS		BENCHMARK COMPARED WITH PEER GROUP		
	Benchmark Health Systems	Peer Group of U.S. Health Systems	Difference	Percent Difference	Desired Direction
Mortality Index ¹	0.81	1.02	-0.21	-20.5%	Lower mortality
Complications Index ¹	0.85	1.02	-0.17	-16.9%	Lower complications
Patient Safety Index ²	0.91	0.97	-0.06	-6.0%	Better patient safety
Core Measures Mean Percent ³	97.3	96.7	0.63	n/a ⁵	Better Core Measure performance
AMI 30-Day Mortality Rate (%) ⁴	14.3	15.1	-0.72	n/a ⁵	Lower 30-day mortality
HF 30-Day Mortality Rate (%) ⁴	10.0	10.9	-0.88	n/a ⁵	Lower 30-day mortality
Pneumonia 30-Day Mortality Rate (%) ⁴	11.0	11.5	-0.49	n/a ⁵	Lower 30-day mortality
AMI 30-Day Readmission Rate (%) ⁴	20.3	19.8	0.52	n/a ⁵	Lower 30-day readmissions
HF 30-Day Readmission Rate (%) ⁴	24.9	24.8	0.09	n/a ⁵	Lower 30-day readmissions
Pneumonia 30-Day Readmission Rate (%) ⁴	18.4	18.6	-0.21	n/a ⁵	Lower 30-day readmissions
Average Length of Stay (days) ¹	4.8	5.1	-0.30	-5.8%	Shorter ALOS
HCAHPS Score ³	265.4	259.0	6.4	2.5%	Higher patient rating of hospital care

1. Based on POA enabled risk models applied to MedPAR 2009 and 2010 data.

2. Based on AHRQ POA-enabled risk models applied to MedPAR 2009 and 2010 data. Ten PSIs included. See Appendix C for list.

3. Data from CMS Hospital Compare 2011 Q2 dataset. See Appendix C for included core measures.

4. 30-day rates from CMS Hospital Compare dataset, July 1, 2007 – June 30, 2010.

5. We do not calculate percentage difference for this measure because it is already a percent value.

Table 3: Medium Health System Performance Comparisons

PERFORMANCE MEASURE	MEDIANS		BENCHMARK COMPARED WITH PEER GROUP		
	Benchmark Health Systems	Peer Group of U.S. Health Systems	Difference	Percent Difference	Desired Direction
Mortality Index ¹	0.80	1.06	-0.26	-24.4%	Lower mortality
Complications Index ¹	0.86	1.01	-0.15	-14.5%	Lower complications
Patient Safety Index ²	0.69	1.01	-0.32	-31.7%	Better patient safety
Core Measures Mean Percent ³	96.9	95.8	1.11	n/a ⁵	Better Core Measure performance
AMI 30-Day Mortality Rate (%) ⁴	15.2	15.2	0.02	n/a ⁵	Lower 30-day mortality
HF 30-Day Mortality Rate (%) ⁴	11.7	11.2	0.53	n/a ⁵	Lower 30-day mortality
Pneumonia 30-Day Mortality Rate (%) ⁴	12.0	11.5	0.52	n/a ⁵	Lower 30-day mortality
AMI 30-Day Readmission Rate (%) ⁴	18.8	19.8	-0.98	n/a ⁵	Lower 30-day readmissions
HF 30-Day Readmission Rate (%) ⁴	23.3	24.5	-1.19	n/a ⁵	Lower 30-day readmissions
Pneumonia 30-Day Readmission Rate (%) ⁴	18.2	18.5	-0.31	n/a ⁵	Lower 30-day readmissions
Average Length of Stay (days) ¹	4.7	5.0	-0.38	-7.6%	Shorter ALOS
HCAHPS Score ³	260.5	260.1	0.4	0.1%	Higher patient rating of hospital care

1. Based on POA enabled risk models applied to MedPAR 2009 and 2010 data.

2. Based on AHRQ POA-enabled risk models applied to MedPAR 2009 and 2010 data. Ten PSIs included. See Appendix C for list.

3. Data from CMS Hospital Compare 2011 Q2 dataset. See Appendix C for included core measures.

4. 30-day rates from CMS Hospital Compare dataset, July 1, 2007 – June 30, 2010.

5. We do not calculate percentage difference for this measure because it is already a percent value.

Table 4: Small Health System Performance Comparisons

PERFORMANCE MEASURE	MEDIAN		BENCHMARK COMPARED WITH PEER GROUP		
	Benchmark Health Systems	Peer Group of U.S. Health Systems	Difference	Percent Difference	Desired Direction
Mortality Index ¹	0.92	1.05	-0.13	-12.1%	Lower mortality
Complications Index ¹	0.72	0.95	-0.23	-24.1%	Lower complications
Patient Safety Index ²	0.76	0.93	-0.16	-17.5%	Better patient safety
Core Measures Mean Percent ³	96.8	95.3	1.51	n/a ⁵	Better Core Measure performance
AMI 30-Day Mortality Rate (%) ⁴	15.9	15.8	0.10	n/a ⁵	Lower 30-day mortality
HF 30-Day Mortality Rate (%) ⁴	11.8	11.3	0.54	n/a ⁵	Lower 30-day mortality
Pneumonia 30-Day Mortality Rate (%) ⁴	12.4	11.7	0.73	n/a ⁵	Lower 30-day mortality
AMI 30-Day Readmission Rate (%) ⁴	18.6	19.9	-1.29	n/a ⁵	Lower 30-day readmissions
HF 30-Day Readmission Rate (%) ⁴	23.5	24.6	-1.10	n/a ⁵	Lower 30-day readmissions
Pneumonia 30-Day Readmission Rate (%) ⁴	17.7	18.5	-0.73	n/a ⁵	Lower 30-day readmissions
Average Length of Stay (days) ¹	4.4	5.1	-0.72	-14.1%	Shorter ALOS
HCAHPS Score ³	272.0	258.7	13.3	5.2%	Higher patient rating of hospital care

1. Based on POA enabled risk models applied to MedPAR 2009 and 2010 data.

2. Based on AHRQ POA-enabled risk models applied to MedPAR 2009 and 2010 data. Ten PSIs included. See Appendix C for list.

3. Data from CMS Hospital Compare 2011 Q2 dataset. See Appendix C for included core measures.

4. 30-day rates from CMS Hospital Compare dataset, July 1, 2007 – June 30, 2010.

5. We do not calculate percentage difference for this measure because it is already a percent value.

WINNING HEALTH SYSTEM RESULTS

In Table 5, we provide the *15 Top Health Systems'* scores for each of the study's performance measures. For comparative purposes, we also

repeat the group medians for all winners and all nonwinners in this table. (For a list of all hospitals included in each winning health system, see Appendix A.)

Table 5: Winning Health Systems Performance Measure Results

WINNING SYSTEM NAME	Core Measures				Pneumonia				Pneumonia			
	Mortality Index ¹	Complications Index ¹	Patient Safety Index ²	Mean Percent ³	AMI 30-Day Mortality Rate (%) ⁴	HF 30-Day Mortality Rate (%) ⁴	30-Day Mortality Rate (%) ⁴	AMI 30-Day Readmission Rate (%) ⁴	HF 30-Day Readmission Rate (%) ⁴	30-Day Readmission Rate (%) ⁴	Average Length of Stay	HCAHPS Score ³
Banner Health	0.85	0.98	0.91	96.4	14.3	11.1	11.3	20.3	24.9	17.8	4.8	262.4
Baptist Health	0.93	0.72	0.72	97.2	17.3	11.0	12.7	20.3	24.9	18.9	4.5	267.7
Baystate Health	0.65	0.86	0.60	96.6	15.5	10.6	12.0	18.8	23.5	19.3	4.8	257.0
CareGroup Healthcare System	0.81	1.42	0.70	97.3	12.5	9.4	9.0	22.0	27.3	20.6	4.8	270.8
Geisinger Health System	0.80	1.04	0.82	96.2	15.7	14.8	12.6	18.3	23.1	17.7	4.5	260.5
HCA Central and West Texas Division	0.83	0.86	0.86	99.2	15.2	11.7	12.0	19.9	23.3	17.6	5.2	262.8
Jefferson Health System	0.81	0.85	1.01	98.1	15.1	9.2	11.0	20.3	26.2	19.1	4.9	265.4
Maury Regional Hospital System	0.70	0.62	0.77	95.3	15.9	12.6	13.6	18.8	24.9	19.0	4.1	265.8
Memorial Hermann Healthcare System	0.70	0.73	0.94	97.4	17.3	10.0	10.6	18.2	23.8	15.7	4.9	261.0
Mission Health System Inc	0.97	0.73	0.69	96.9	12.6	13.1	10.2	17.9	20.9	18.2	4.7	266.3
Poudre Valley Health System	0.91	1.05	0.63	95.5	14.2	11.3	10.3	16.6	22.2	17.0	4.2	277.0
Prime Healthcare Services	0.55	0.63	0.55	99.0	14.8	9.0	9.7	21.4	26.3	18.5	4.3	239.2
Saint Joseph Regional Health System	0.99	0.79	0.77	97.6	14.3	12.5	11.3	18.6	21.4	17.7	4.4	272.0
St. Vincent Health	1.04	0.68	0.88	93.8	12.7	10.6	11.0	17.9	23.5	18.4	4.7	267.7
Tanner Health System	0.92	0.62	0.76	96.8	16.3	11.8	12.4	18.6	23.5	17.7	4.5	273.6
Benchmark Medians	0.83	0.79	0.77	96.9	15.1	11.1	11.3	18.8	23.5	18.2	4.7	265.8
Peer Medians	1.04	0.98	0.98	95.8	15.3	11.2	11.5	19.8	24.6	18.5	5.1	259.0

1. Mortality and complications based on one year of POA-coded MedPAR 2009 and 2010 data.

2. Based on AHRQ POA-enabled risk models applied to MedPAR 2009 and 2010 data. Ten PSIs included; see appendix C for list.

3. Core Measures and HCAHPS based on CMS Hospital Compare 2011 Q2 data. ALOS based on MedPAR 2009 data.

4. 30-day rates from CMS Hospital Compare data set, July 1, 2007–June 30, 2010.

TOP AND BOTTOM QUINTILE RESULTS

To provide more significant comparisons, we divided all of the health systems in this study into performance quintiles, by comparison group, based on their performance on the study's measures. In Table 6, we highlight differences between the highest- and lowest-performing quintiles by providing their median scores on the study performance measures. (See Appendix B for a list of the health systems included in the top-performance quintile and Appendix D for all systems included in the study.)

Some highlights of how the top quintile systems outperform their peers in the lowest quintile:

- Have much better patient outcomes — approximately 16 percent fewer in-hospital mortalities and complications
- Provide higher-quality care — they follow accepted care protocols (core measures) more closely and have nearly a quarter fewer adverse patient safety events
- Have about 6 percent fewer 30-day readmissions for heart attack, heart failure, and pneumonia patients
- Are more efficient, releasing patients nearly a full day sooner than the lowest performers
- Score 10 points higher on the HCAHPS overall patient rating of care

Table 6: Performance Characteristics of Health Systems in the Top and Bottom Quintiles of Performance¹

PERFORMANCE MEASURE	Top Quintile Median	Bottom Quintile Median	Difference	Percent Difference	Top Versus Bottom Quintile
Mortality Index ²	0.93	1.09	-0.17	15.2%	Lower mortality
Complications Index ²	0.86	1.02	-0.16	16.1%	Lower complications
Patient Safety Index ³	0.87	1.13	-0.26	22.8%	Better patient safety
Core Measures Mean Percent ⁴	96.9	94.2	2.7	n/a ⁶	Better core measure performance
AMI 30-Day Mortality Rate (%) ⁵	15.1	16.1	-1.0	n/a ⁶	Lower 30-day mortality
HF 30-Day Mortality Rate (%) ⁵	11.1	11.3	-0.1	n/a ⁶	Lower 30-day mortality
Pneumonia 30-Day Mortality Rate (%) ⁵	11.3	12.0	-0.7	n/a ⁶	Lower 30-day mortality
AMI 30-Day Readmission Rate (%) ⁵	19.3	20.0	-0.8	n/a ⁶	Lower 30-day readmissions
HF 30-Day Readmission Rate (%) ⁵	23.8	25.6	-1.8	n/a ⁶	Lower 30-day readmissions
Pneumonia 30-Day Readmission Rate (%) ⁵	18.2	19.4	-1.2	n/a ⁶	Lower 30-day readmissions
Average Length of Stay (Days) ²	4.7	5.5	-0.8	14.7%	Shorter ALOS
HCAHPS Score	264.0	253.5	10.5	4.1%	Higher patient rating of hospital care

1. Top and bottom performance quintiles were determined by comparison group and aggregated to calculate medians.

2. Based on POA-enabled risk models applied to MedPAR 2009 and 2010 data.

3. Based on AHRQ POA-enabled risk models applied to MedPAR 2009 and 2010 data. Ten PSIs included; see Appendix C for list.

4. Data from CMS Hospital Compare 2011 Q2 data set. See Appendix C for included core measures.

5. 30-day rates from CMS Hospital Compare dataset, July 1, 2007–June 30, 2010.

6. We do not calculate percent difference for this measure because it is already a percent value.

METHODOLOGY

OVERVIEW

The *15 Top Health Systems* study is the latest addition to the Thomson Reuters *100 Top Hospitals*[®] family. It is a quantitative study that identifies 15 health systems with the highest achievement on clinical performance, efficiency, and patient satisfaction, based on the *100 Top Hospitals* National Balanced Scorecard methodologies.

This study is based on eight measures that provide a valid comparison of health system performance using publicly available data. The health systems with the highest achievement are those with the highest ranking on a composite score of the eight measures. This study includes short-term acute-care, nonfederal U.S. hospitals; cardiac and orthopedic hospitals; and critical access hospitals (CAHs) that are members of health systems.

The main steps we take in selecting the top 15 health systems are:

- Building the database of hospitals, including special selection and exclusion criteria
- Identifying which hospitals are members of health systems
- Aggregating the patient-level data from member hospitals using a methodology that accounts for hospital size and teaching status, and calculating a set of performance measures at the system level
- Classifying health systems into comparison groups based on total operating expense
- Ranking systems on each of the performance measures, by comparison group
- Determining 15 top performers — 5 in each comparison group — from the health systems' overall ranking based on their aggregate performance (sum of individual measure ranks)

The following section is intended to be an overview of these steps. To request more detailed information on any of the study methodologies outlined here, please email us at healthcare.pubs@thomsonreuters.com or call +1 800 366 7526.

BUILDING THE DATABASE OF HEALTH SYSTEMS

Like all the *100 Top Hospitals* studies, the *15 Top Health Systems* study uses only publicly available data. The data for this study primarily come from:

- The Medicare Provider Analysis and Review (MedPAR) dataset
- The Centers for Medicare and Medicaid Services (CMS) Hospital Compare dataset

We use MedPAR patient-level claims data to calculate mortality, complications, patient safety, and length of stay at the health system level, aggregating member hospital data. The MedPAR dataset contains information on the approximately 12 million Medicare patients discharged annually from U.S. acute-care hospitals. In this year's study, we used the most recent two federal fiscal years of MedPAR data available — 2009 and 2010 — which include Medicare HMO encounters.¹⁹

We used the CMS Hospital Compare dataset published in the second quarter of 2011 for core measures, 30-day mortality rates, 30-day readmission rates and Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) patient perception of care data.²⁰

In addition to the MedPAR and Hospital Compare data, we used a number of supplemental public data sources. The hospital-specific "home office" or "related organization" identification filed by hospitals on the 2010 (or 2009) Medicare Cost Report is used to create our proprietary database for determining system membership. Hospital classification information about bed size, and number of residents and fellows is also obtained from the Medicare Cost Report. Residency program information, used in classifying hospitals for data aggregation, is from the American Medical Association (for Accreditation Council for Graduate Medical Education (ACGME)-accredited programs) and the American Osteopathic Association.

We and many others in the healthcare industry have used these public data sources for many years. We believe them to be accurate and reliable sources for the types of analyses performed in this

Major changes to this year's study:

- Divided health systems into three size groups for more valid comparisons
- Included both parent systems and their qualifying subsystems
- Included palliative care patients in the mortality risk model

study. Performance based on Medicare data has been found to be highly representative of all-payer data.

Present on Admission Data

Under the Deficit Reduction Act of 2005, as of federal fiscal year (FFY) 2008, hospitals receive reduced payments for cases with certain conditions — such as falls, surgical site infections, and pressure ulcers — that were not present on the patient’s admission but occur during hospitalization. As a result, CMS now requires all inpatient prospective payment system hospitals to document whether a patient has these conditions when admitted. Thomson Reuters’ proprietary risk-adjustment models for mortality, complications, and length of stay (LOS) include POA data that was reported in the 2009 and 2010 MedPAR datasets (2010 only for LOS data). The patient safety index measure, which uses the Agency for Healthcare Research and Quality (AHRQ) Patient Safety Indicator (PSI) models²¹, is also calibrated for POA data.

Data periods included in each dataset vary and are discussed at the end of this section.

Hospitals Excluded

After building the database, we excluded a number of hospitals that would have skewed the study results. Excluded from the study were:

- Certain specialty hospitals (children’s, psychiatric, substance abuse, rehabilitation, cancer, long-term acute-care, and women’s hospitals)
- Federally owned hospitals
- Non-U.S. hospitals (such as those in Puerto Rico, Guam, and the U.S. Virgin Islands)
- Hospitals with Medicare average lengths of stay longer than 30 days in FFY 2010
- Hospitals with no reported Medicare patient deaths in FFY 2010
- Cardiac and orthopedic hospitals and CAHs were included in the study, as long as they were not excluded for any other criteria listed above

In addition, specific patient records were also excluded:

- Patients who were discharged to another short-term facility (this is done to avoid double counting)
- Patients who were not at least 65 years old

- Rehabilitation, psychiatric, and substance-abuse patients
- Patients with stays shorter than one day

Health Systems Excluded

Health systems were excluded if one or more measures, other than the 30-day mortality and readmissions rates, were missing. We did not exclude health systems with missing 30-day mortality or 30-day readmission data because CMS does not publish rates for smaller hospitals with lower patient counts, and very small systems may have one or more of these measures missing entirely. We calculated a median health system value for each 30-day rate and used that to neutralize the measure in any case where a health system had no data for that measure. This allowed us to keep health systems in the study that were unavoidably missing these data. Systems missing these data were, however, excluded from winner selection.

IDENTIFYING HEALTH SYSTEMS

To be included in the study, a health system must contain at least two short-term, general, acute-care hospitals, as identified using the *100 Top Hospitals* specialty algorithm and after hospital exclusions have been applied. In addition, we also included any cardiac and orthopedic hospitals and CAHs that passed the exclusion rules cited above. We identified the “parent” system by finding the “home office” or “related organization,” as reported on the hospitals’ 2010 (or 2009) Medicare Cost Reports.

This year, we also identified health systems that have subsystems with their own reported home offices or related organization relationships. Both the parent system and any identified subsystems were treated as “health systems” for purposes of this study and were independently profiled. Hospitals that belong to a parent health system and a subsystem were included in both for analysis.

To analyze health system performance, we aggregated data from all of a system’s included hospitals. We provide specific details about the calculations used for each performance measure and how these measures are aggregated to determine system performance below.

After all exclusions were applied and parent systems identified, the final study group included 321 health systems with the following profile:

The final study group contained:

SYSTEM CATEGORY	SYSTEMS	MEMBER HOSPITALS	PATIENT DISCHARGES, 2010	AVERAGE HOSPITALS PER SYSTEM	AVERAGE DISCHARGES PER SYSTEM
Winning Systems	15	86	307,941	5.7	20,529
Nonwinning Systems	306	2,108	7,765,338	6.9	25,377
Total Systems	321	2,194	8,073,279	6.8	25,150

CLASSIFYING HEALTH SYSTEMS INTO COMPARISON GROUPS

Health System Comparison Groups

This year, we have refined the analysis of health

systems by dividing them into three comparison groups based on total operating expense of the member hospitals. This was done to develop more actionable benchmarks for like systems. The three comparison groups we use are:

HEALTH SYSTEM COMPARISON GROUP	TOTAL OPERATING EXPENSE	NUMBER OF SYSTEMS IN STUDY	NUMBER OF WINNERS
Large	> \$1.5 billion	85	5
Medium	\$750 million – \$1.5 billion	103	5
Small	< \$750 million	133	5
Total Systems	n/a	321	15

Hospital Comparison Groups Used for Data Aggregation

We assigned each hospital to one of five comparison groups, or classes, according to its size and teaching status. These groups are identical to those used in the *100 Top Hospitals* national study. For this study, we added a separate group for CAHs. The six hospital comparison groups we used to normalize hospital expected values for mortality, complications, PSIs, and LOS prior to aggregating the data to the health system level are:

- Major Teaching Hospitals
- Teaching Hospitals
- Large Community Hospitals
- Medium Community Hospitals
- Small Community Hospitals
- Critical Access Hospitals (CAHs)

For more information on the methodology used to classify hospitals, see *100 Top Hospitals® Study Overview and Research Findings*, 18th Edition, March 28, 2011 (visit 100tophospitals.com to download).

SCORING HEALTH SYSTEMS ON WEIGHTED PERFORMANCE MEASURES

Evolution of Performance Measures

We use a balanced scorecard approach, based on public data, to select the measures most useful for boards and CEOs in the current healthcare operating environment. We gather feedback from industry leaders, hospital and health system executives, academic leaders, and internal experts; review trends in the healthcare market; and survey hospitals in demanding marketplaces to learn what measures are valid and reflective of top performance. As the market has changed, our methods have evolved.

In addition to a lack of reliable, publicly available financial data for health systems, measures of financial health and efficiency could not be fairly compared across such a wide variety of operating conditions. For this reason, financial measures are not included in the health system study.

We use a balance of measures to evaluate patient outcomes and processes of care, efficiency of care delivery, and patient perception of care:

1. Risk-adjusted mortality index (in-hospital)
2. Risk-adjusted complications index
3. Risk-adjusted patient safety index
4. Core measures mean percent
5. 30-day risk-adjusted mortality rates for acute myocardial infarction (AMI), heart failure, and pneumonia
6. 30-day risk-adjusted readmission rates for AMI, heart failure, and pneumonia
7. Severity-adjusted average length of stay
8. HCAHPS score (patient rating of overall hospital performance)

Below we provide a rationale for the selection of our balanced scorecard categories and the measures used for each.

Patient Outcomes and Processes of Care

The mortality index, complications index, 30-day mortality rate, 30-day readmission rate, risk-adjusted patient safety index, and core measures mean percent are all vital measures of clinical excellence. The mortality and complications measures show us how the health system member hospitals are performing on the most basic and essential care standards — survival and error-free care — while treating patients in the hospital. The extended outcomes measures — 30-day mortality and readmission rates for AMI, heart failure, and pneumonia patients — help us understand how the hospital's patients are faring over a longer period. These measures are part of CMS' value-based purchasing program and are watched closely in the industry. At the aggregate level, health systems with lower values appear to be providing care with better medium-term results for these conditions.

Patient safety is another important measure of hospital quality tracked closely in the industry. The risk-adjusted patient safety index is based on the AHRQ's PSIs.²¹ Patient safety measures reflect both clinical quality and the effectiveness of patient-care systems within the hospital. Because they use hospital administrative data and focus on surgical complications and other iatrogenic events, we feel that AHRQ's PSIs provide an unbiased look at many aspects of patient safety inside hospitals. The risk-adjusted patient safety index facilitates comparison of health system performance using a group of 10 PSIs, which allows us to gauge the results of health system-wide patient safety performance.

To be truly balanced, a scorecard must include various measures of quality. To this end, we also include an aggregate core measures score. Core measures were developed by the Joint Commission and CMS and endorsed by the National Quality Forum as minimum basic process of care standards. They are a widely accepted method for measuring patient care quality that includes specific guidelines for heart attack, heart failure, pneumonia, pregnancy and related conditions, and surgical care improvement. Our core measures score is based on the heart attack, heart failure, pneumonia, and surgical care improvement areas of this program, using Hospital Compare data reported on the CMS website.²⁰

Efficiency of Care Delivery

This category includes the severity-adjusted average length of stay, a measure that has long served as a proxy for clinical efficiency. To increase the validity of comparisons across health systems, we adjust this measure for differences in illness severity. Shorter patient stays generally indicate more efficient consumption of hospital resources and reduced risk to patients.

Patient Perception of Care

We believe that a measure of patient perception of care is crucial to the balanced scorecard concept. Understanding how patients perceive the care a health system provides within its member hospitals, and how that perception compares and contrasts with perceptions of its peers, is an important step a health system must take in pursuing performance improvement. As such, this study includes the HCAHPS score, based on patient perception of care data from the HCAHPS patient survey. In this study, the HCAHPS score is based on the HCAHPS overall hospital rating question only.

Through the combined measures described above, we hope to provide a balanced picture of health system performance. Full details about each of these performance measures are included on the following pages.

PERFORMANCE MEASURES USED IN THE STUDY

Risk-Adjusted Mortality Index (In-Hospital)			
RATIONALE	CALCULATION	COMMENT	FAVORABLE VALUES ARE
<p>Patient survival is a universally accepted measure of hospital quality. The lower the mortality index, the greater the survival of the patients in the system's hospitals, considering what would be expected based on patient characteristics. While all hospitals have patient deaths, this measure can show where deaths did not occur but were expected, or the reverse, given the patient's condition.</p>	<p>We calculate a mortality index value based on the aggregate number of actual in-hospital deaths in 2009 and 2010 for all hospitals in each system, divided by the number expected, given the risk of death for each patient. We normalize the hospital-level expected values using the observed-to-expected ratio for in-study, health system member hospitals. Separate normalization factors are calculated for each hospital comparison group.</p> <p>This measure is based on our proprietary, mortality risk-adjustment model, which is designed to predict the likelihood of a patient's death based on patient-level characteristics (age, sex, presence of complicating diagnoses, and other characteristics) and factors associated with the hospital (size, teaching status, geographic location, and community setting). Palliative care patients are included in the mortality risk model. Post-discharge deaths are not included in this measure. The mortality risk model takes into account POA coding in determining expected deaths.</p> <p>For more details, see Appendix C. The reference value for this index is 1.00; a value of 1.15 indicates 15 percent more deaths occurred than were predicted, and a value of 0.85 indicates 15 percent fewer deaths than predicted.</p>	<p>We based the health system ranking on the difference between observed and expected deaths, expressed in normalized standard deviation units (z-score).^{22,23} Health systems with the fewest deaths, relative to the number expected, after accounting for standard binomial variability, received the most favorable scores.</p> <p>We used two years of MedPAR data (2009 and 2010) to reduce the influence of chance fluctuation.</p>	<p>Lower</p>

Risk-Adjusted Complications Index

RATIONALE	CALCULATION	COMMENT	FAVORABLE VALUES ARE
<p>Keeping patients free from potentially avoidable complications is an important goal for all healthcare providers. A lower complications index indicates fewer patients with complications, considering what would be expected based on patient characteristics. Like the mortality index, this measure can show where complications did not occur but were expected, or the reverse, given the patient's condition.</p>	<p>We calculate a complications index value based on the aggregate number of cases with complications in 2009 and 2010 for all hospitals in each system, divided by the number expected, given the risk of complications for each patient. We normalize the hospital-level expected values using the observed-to-expected ratio for in-study, health system member hospitals. We calculate separate normalization factors for each hospital comparison group.</p> <p>This measure uses our proprietary complications risk-adjustment models. These models account for patient-level characteristics (age, sex, principal diagnosis, comorbid conditions, and other characteristics), as well as differences in hospital characteristics (size, teaching status, geographic location, and community setting). Complication rates are calculated from normative data for two patient risk groups — medical and surgical. POA data are considered as part of the risk model. For more details, see Appendix C.</p> <p>The reference value for this index is 1.00; a value of 1.15 indicates 15 percent more complications occurred than were predicted, and a value of 0.85 indicates 15 percent fewer complications than predicted.</p>	<p>We based the health system ranking on the difference between the observed and expected number of patients with complications, expressed in normalized standard deviation units (z-score).^{4,5} Health systems with the fewest observed complications, relative to the number expected, after accounting for standard binomial variability, received the most favorable scores.</p> <p>We used two years of MedPAR data (2009 and 2010) to reduce the influence of chance fluctuation.</p>	Lower

Risk-Adjusted Patient Safety Index

RATIONALE	CALCULATION	COMMENT	FAVORABLE VALUES ARE
<p>Patient safety has become an increasingly important measure of hospital quality. Patient safety measures are reflective of both clinical quality and the effectiveness of systems within the hospital. The AHRQ, a public health service agency within the federal government's Department of Health and Human Services, has developed a set of PSIs. These indicators are widely used as a means of measuring hospital safety. Because they use hospital administrative data and include surgical complications and other iatrogenic events, we feel that AHRQ's PSIs provide an unbiased look at the quality of care inside hospitals.</p>	<p>For each of the 10 included PSIs (see Appendix C for a list), we calculate an index value based on the number of actual PSI occurrences for 2009 and 2010, combined, for all hospitals in each system, divided by the aggregate number of normalized expected occurrences, given the risk of the PSI event for each patient. We normalize the hospital-level expected values for each PSI using the observed-to-expected ratio for in-study, health system member hospitals. Separate normalization factors are calculated for each hospital comparison group. We applied the hospital-level AHRQ PSI risk models to the 2009 and 2010 MedPAR acute-care data to adjust for risk.²¹ The PSI risk models take into account POA coding in determining expected patient safety incidents. For more information, see Appendix C.</p> <p>The reference value for this index is 1.00; a value of 1.15 indicates 15 percent more events than predicted, and a value of 0.85 indicates 15 percent fewer.</p>	<p>We calculated the difference between the observed and expected number of patients with PSI events, for each of the 10 selected PSIs, expressed in standard deviation units (z-score).^{22,23}</p> <p>We used two years of MedPAR data (2009 and 2010) to reduce the influence of chance fluctuation. The AHRQ PSI risk models used POA coding in the MedPAR data. Health system ranking was based on the mean of the 10 included PSI normalized z-scores. Health systems with the fewest observed PSIs, relative to the number expected, accounting for binomial variability, received the most favorable scores.</p>	Lower

Core Measures Mean Percent

RATIONALE	CALCULATION	COMMENT	FAVORABLE VALUES ARE
<p>To be truly balanced, a scorecard must include various measures of quality. Core measures were developed by the National Quality Forum as minimum basic standards. They are a widely accepted method for measuring patient care quality that includes specific guidelines for heart attack, heart failure, pneumonia, and surgical care.</p>	<p>For each included core measure, we calculate an aggregate core measure percent for each system. This is done by multiplying the hospital-level eligible patients by the reported hospital percent to determine the number of patients who received the core measure. We sum the recipient patient count and divide by the sum of eligible patients for member hospitals of each system. This value is multiplied by 100 to produce the system-level core measure percent for the individual core measure.</p> <p>For each health system, we calculate the arithmetic mean of the included core measure aggregate percent values. The aggregate core measure percent values reflect the percentage of eligible patients who received the expected standard of patient care at the member hospitals in each system. We consider aggregate core measure percents with relative standard error greater than or equal to 0.30 statistically unreliable. In these cases, we substitute the in-study systems' median percent value for the affected core measure.</p>	<p>Core measure values are from the CMS Hospital Compare database for the second quarter of 2011. This contains data from October 1, 2009, through September 20, 2010. Because of low reporting, we excluded a number of core measures for all hospital measures for small community hospitals. For a list of the measures used and those excluded, please see Appendix C.</p>	Higher

30-Day Risk-Adjusted Mortality Rates for AMI, Heart Failure, and Pneumonia Patients

RATIONALE	CALCULATION	COMMENT	FAVORABLE VALUES ARE
<p>30-day mortality rates are a widely accepted measure of the effectiveness of hospital care. They allow us to look beyond immediate inpatient outcomes and understand how the care the hospital provided to inpatients with these particular conditions may have contributed to their longer-term survival.</p> <p>Because these measures are part of CMS' value-based purchasing program, they are now being watched closely in the industry. In addition, tracking these measures may help hospitals identify patients at risk for post-discharge problems and target improvements in discharge planning and in aftercare processes. Hospitals that score well may be better prepared for a pay-for-performance structure.</p>	<p>CMS calculates a 30-day mortality rate for each patient condition using three years of MedPAR data, combined. (CMS does not calculate rates for hospitals where the number of cases is too small (less than 25).) We aggregate these data to produce a rate for each condition for each system. This is done by multiplying the hospital-level reported patient count (eligible patients) by the reported hospital rate to determine the number of patients who died within 30 days of admission. We sum the calculated deaths and divide by the sum of eligible patients for member hospitals of each system. This value is multiplied by 100 to produce the system-level 30-day mortality rate, expressed as a percent.</p> <p>We rank the health systems on the rates for each of the three patient conditions (heart attack, heart failure, and pneumonia) independently. Each receives a one-sixth weight in overall system ranking.</p>	<p>Data are from the CMS Hospital Compare dataset for the second quarter of 2011. This contains data from July 1, 2007, through June 30, 2010, combined. For more information about this dataset, see Appendix C.</p>	Lower

30-Day Risk-Adjusted Readmission Rates for AMI, Heart Failure, and Pneumonia Patients

WHY WE INCLUDE THIS ELEMENT	CALCULATION	COMMENT	FAVORABLE VALUES ARE
<p>30-day readmission rates are a widely accepted measure of the effectiveness of hospital care. They allow us to understand how the care the hospital provided to inpatients with these particular conditions may have contributed to issues with their post-discharge medical stability and recovery.</p> <p>Because these measures are part of CMS' value-based purchasing program, they are now being watched closely in the industry. In addition, tracking these measures may help hospitals identify patients at risk for post-discharge problems if discharged too soon, as well as target improvements in discharge planning and in aftercare processes. Hospitals that score well may be better prepared for a pay-for- performance structure.</p>	<p>CMS calculates a 30-day readmission rate for each patient condition using three years of MedPAR data, combined. (CMS does not calculate rates for hospitals where the number of cases is too small (less than 25).) We aggregate these data to produce a rate for each condition for each system. This is done by multiplying the hospital-level reported patient count (eligible patients) by the reported hospital rate to determine the number of patients who were readmitted within 30 days of original admission. We sum the calculated readmissions and divide by the sum of eligible patients for member hospitals of each system. This value is multiplied by 100 to produce the system-level 30-day readmission rate, expressed as a percent.</p> <p>We rank the health systems on the rates for each of the three patient conditions (heart attack, heart failure, and pneumonia) independently. Each receives a one-sixth weight in overall system ranking.</p>	<p>Data are from the CMS Hospital Compare dataset for the second quarter of 2011. This contains data from July 1, 2007, through June 30, 2010, combined. For more information about this dataset, see Appendix C.</p>	<p>Lower</p>

Severity-Adjusted Average Length of Stay

RATIONALE	CALCULATION	COMMENT	FAVORABLE VALUES ARE
<p>A lower severity-adjusted average length of stay (LOS) generally indicates more efficient consumption of hospital resources and reduced risk to patients.</p>	<p>We calculate an LOS index value for each health system by dividing the sum of the actual LOS by the sum of the normalized expected LOS for the hospitals in the system. Expected LOS adjusts for difference in severity of illness using a linear regression model. We normalize the expected values based on the observed and expected LOS of the hospitals, by comparison group.</p> <p>An aggregate average LOS in days is computed for each health system by multiplying the system's LOS index by the grand mean LOS for all in-study, health system member hospitals. See Appendix C for more information.</p>	<p>The LOS risk model takes into account POA coding in determining expected length of stay. This measure is based on MedPAR data for 2010. For more information on this model, see Appendix C.</p> <p>We calculate grand mean LOS by summing in-study health systems' LOS and dividing that by the number of health systems, excluding subsystems. This insures that underlying member hospital data will only be included once.</p>	<p>Lower</p>

HCAHPS Score (Patient Rating of Overall Hospital Performance)

RATIONALE	CALCULATION	COMMENT	FAVORABLE VALUES ARE
<p>We believe that including a measure of patient perception of care is crucial to the balanced scorecard concept. How patients perceive the care a hospital provides has a direct effect on its ability to remain competitive in the marketplace.</p>	<p>We used the HCAHPS survey instrument question, "How do patients rate the hospital overall?" to score hospitals. Patient responses could fall into three categories, and the number of patients in each category was reported as a percent by CMS:</p> <ul style="list-style-type: none"> Patients who gave a rating of 6 or lower (low) Patients who gave a rating of 7 or 8 (medium) Patients who gave a rating of 9 or 10 (high) <p>For each answer category, we assigned a weight as follows: 3 equals high or good performance, 2 equals medium or average performance, and 1 equals low or poor performance. We then calculated a weighted score for each hospital by multiplying the HCAHPS answer percent by the assigned weight. For each hospital, we summed the weighted percent values for the three answer categories. Weighted percent values can range from 100 to 300. This value represents each member hospital HCAHPS score.</p> <p>To calculate the system-level score, we weighted the HCAHPS scores for each member hospital in the system by a weight factor we assigned to each range of reported hospital patient counts. (Note: CMS does not report surveyed patient counts, only ranges of patient counts) For details on the weight categories, please see Appendix C. To calculate the mean weighted HCAHPS score for each health system, we summed the hospital weighted HCAHPS scores, summed the hospital weight factors, and then divided the sum of the weighted HCAHPS scores by the sum of the weight factors.</p>	<p>Data are from CMS Hospital Compare second quarter 2011 database. This database contains the HCAHPS results for data period October 1, 2009, through September 30, 2010.</p>	<p>Higher</p>

SUMMARY OF MEASURE DATA SOURCES AND DATA PERIODS

SCORECARD MEASURE	DATA SOURCE/DATA PERIOD
Risk-Adjusted Mortality Index	MedPAR FFY 2009 and 2010
Risk-Adjusted Complications Index	MedPAR FFY 2009 and 2010
Risk-Adjusted Patient Safety Index	MedPAR FFY 2009 and 2010
Core Measures Mean Percent	CMS Hospital Compare, second quarter 2011 release (October 1, 2009–September 30, 2010 dataset)
30-Day Mortality Rate (AMI, Heart Failure, Pneumonia)	CMS Hospital Compare, second quarter 2011 release (July 1, 2007–June 30, 2010 dataset)
30-Day Readmission Rate (AMI, Heart Failure, Pneumonia)	CMS Hospital Compare, second quarter 2011 release (July 1, 2007–June 30, 2010 dataset)
Severity-Adjusted Average Length of Stay	MedPAR FFY 2010
HCAHPS Score	CMS Hospital Compare, second quarter 2011 (October 1, 2009–September 30, 2010 dataset)

DETERMINING THE 15 TOP HEALTH SYSTEMS

Ranking

We ranked health systems on the basis of their performance on each of the performance measures relative to the other in-study systems, by comparison group. We then summed each system's

individual performance measure rankings and re-ranked overall to arrive at a final rank for the system. The top five health systems with the best final rank in each of the three comparison groups were selected as the winners (15 total winners).

The ranked performance measures were:

RANKED MEASURE	RANK WEIGHT IN OVERALL RANKING
Risk-adjusted mortality normalized z-score (in-hospital)	1
Risk-adjusted complications normalized z-score	1
Risk-adjusted patient safety mean normalized z-score	1
Core measures mean percent	1
30-day risk-adjusted mortality rate for AMI patients	1/6
30-day risk-adjusted mortality rate for heart failure patients	1/6
30-day risk-adjusted mortality rate for pneumonia patients	1/6
30-day risk-adjusted readmission rate for AMI patients	1/6
30-day risk-adjusted readmission rate for heart failure patients	1/6
30-day risk-adjusted readmission rate for pneumonia patients	1/6
Severity-adjusted length of stay index	1
HCAHPS score (patient rating of overall hospital performance)	1

Winner Exclusions

Health systems with missing 30-day mortality or 30-day readmission data were not eligible to be named winners.

We identified health systems with observed mortality that was statistically worse than expected (95% confidence). These health systems were excluded from consideration when selecting benchmark (winner) systems.

Thomson Reuters Policy on Revocation of a 100 Top Hospitals Award

To preserve the integrity of the study, it is the policy of Thomson Reuters to revoke a *100 Top Hospitals* award if a hospital is found to have submitted inaccurate or misleading data to any 100 Top Hospitals data source.

At the sole discretion of Thomson Reuters, the circumstances under which a *100 Top Hospitals* award could be revoked include, but are not limited to, the following:

1. Discovery by Thomson Reuters staff, through statistical analysis or other means, that a hospital has submitted inaccurate data.
2. Discovery of media or Internet reports of governmental or accrediting agency investigations or sanctions for actions by a hospital that could have an adverse impact on the integrity of the *100 Top Hospitals* studies or award winner selection.

WINNERS THROUGH THE YEARS*

HEALTH SYSTEM NAME	LOCATION	TOTAL YEAR(S) WON	STUDY EDITIONS			
			1st	2nd	3rd	4th
Advocate Health Care	Oak Brook, IL	3	•	•	•	
OhioHealth	Columbus, OH	3	•	•	•	
Banner Health	Phoenix, AZ	2		•		•
CareGroup Healthcare System	Boston, MA	2			•	•
Catholic Healthcare Partners	Cincinnati, OH	2	•	•		
Kettering Health Network	Dayton, OH	2		•	•	
Maury Regional Healthcare System	Columbia, TN	2			•	•
Mayo Foundation	Rochester, MN	2		•	•	
Prime Healthcare Services	Ontario, CA	2	•			•
Spectrum Health	Grand Rapids, MI	2		•	•	
University Hospitals	Cleveland, OH	2	•	•		
Baptist Health	Montgomery, AL	1				•
Baystate Health	Springfield, MA	1				•
Cape Cod Healthcare	Hyannis, MA	1			•	
Fairview Health Services	Minneapolis, MN	1		•		
Geisinger Health System	Danville, PA	1				•
HCA Central and West Texas Division	Austin, TX	1				•
Health Alliance of Greater Cincinnati	Cincinnati, OH	1	•			
HealthEast Care System	Saint Paul, MN	1	•			
Henry Ford Health System	Detroit, MI	1	•			
Jefferson Health System	Radnor, PA	1				•
Memorial Hermann Healthcare System	Houston, TX	1				•
Mission Health System	Asheville, NC	1				•
NorthShore University HealthSystem	Evanston, IL	1			•	
Partners HealthCare	Boston, MA	1			•	
Poudre Valley Health System	Fort Collins, CO	1				•
Saint Joseph Regional Health System	Mishawaka, IN	1				•
Scripps Health	San Diego, CA	1		•		
St. Vincent Health	Indianapolis, IN	1				•
Tanner Health System	Carrollton, GA	1				•
Trinity Health	Novi, MI	1	•			

*Health systems are ordered by number of wins, then alphabetically by name.

APPENDIX A

Health System Winners and Their Member Hospitals*

HEALTH SYSTEM/HOSPITAL NAME	LOCATION	HOSPITAL MEDICARE ID
Banner Health	Phoenix, AZ	
Banner Good Samaritan Medical Center	Phoenix, AZ	030002
Banner Boswell Medical Center	Sun City, AZ	030061
Banner Desert Medical Center	Mesa, AZ	030065
Banner Baywood Medical Center	Mesa, AZ	030088
Banner Thunderbird Medical Center	Glendale, AZ	030089
Banner Del E Webb Medical Center	Sun City West, AZ	030093
Banner Baywood Heart Hospital	Mesa, AZ	030105
Banner Estrella Medical Center	Phoenix, AZ	030115
Banner Gateway Medical Center	Gilbert, AZ	030122
Page Hospital	Page, AZ	031304
Banner Lassen Medical Center	Susanville, CA	051320
North Colorado Medical Center	Greeley, CO	060001
McKee Medical Center	Loveland, CO	060030
Sterling Regional Medcenter	Sterling, CO	060076
East Morgan County Hospital	Brush, CO	061303
Ogallala Community Hospital	Ogallala, NE	281355
Banner Churchill Community Hospital	Fallon, NV	290006
Platte County Memorial Hospital	Wheatland, WY	531305
Washakie Medical Center	Worland, WY	531306
Community Hospital	Torrington, WY	531307
Baptist Health	Montgomery, AL	
Baptist Medical Center South	Montgomery, AL	010023
Prattville Baptist Hospital	Prattville, AL	010108
Baptist Medical Center East	Montgomery, AL	010149
Baystate Health	Springfield, MA	
Baystate Franklin Medical Center	Greenfield, MA	220016
Baystate Mary Lane Hospital Corporation	Ware, MA	220050
Baystate Medical Center	Springfield, MA	220077
CareGroup Healthcare System	Boston, MA	
Mount Auburn Hospital	Cambridge, MA	220002
Beth Israel Deaconess – Needham	Needham, MA	220083
Beth Israel Deaconess Medical Center	Boston, MA	220086
New England Baptist Hospital	Boston, MA	220088
Geisinger Health System	Danville, PA	
Geisinger Medical Center	Danville, PA	390006
Geisinger Wyoming Valley Medical Center	Wilkes-Barre, PA	390270
HCA Central and West Texas Division	Austin, TX	
Las Palmas Medical Center	El Paso, TX	450107
St. David's Medical Center	Austin, TX	450431
South Austin Hospital	Austin, TX	450713
Round Rock Medical Center	Round Rock, TX	450718
North Austin Medical Center	Austin, TX	450809

* Winning systems are ordered alphabetically. Member hospitals are ordered by Medicare ID.

* 2012 Winners are listed in boldface text.

HEALTH SYSTEM/HOSPITAL NAME	LOCATION	HOSPITAL MEDICARE ID
Jefferson Health System	Radnor, PA	
The Bryn Mawr Hospital	Bryn Mawr, PA	390139
Paoli Memorial Hospital	Paoli, PA	390153
Thomas Jefferson University Hospital	Philadelphia, PA	390174
The Lankenau Hospital	Wynnewood, PA	390195
Riddle Memorial Hospital	Media, PA	390222
Maury Regional Healthcare System	Columbia, TN	
Wayne Medical Center	Waynesboro, TN	440010
Maury Regional Hospital	Columbia, TN	440073
Marshall Medical Center	Lewisburg, TN	441309
Memorial Hermann Healthcare System	Houston, TX	
Memorial Hermann – Texas Medical Center	Houston, TX	450068
Memorial Hermann Hospital System	Houston, TX	450184
Memorial Hermann Memorial City Hospital	Houston, TX	450610
Memorial Hermann Northeast	Humble, TX	450684
Memorial Hermann Katy Hospital	Katy, TX	450847
Memorial Hermann Sugar Land Hospital	Sugar Land, TX	450848
Mission Health System	Asheville, NC	
Mission Hospital Inc	Asheville, NC	340002
Blue Ridge Hospital System	Spruce Pine, NC	340011
McDowell Hospital	Marion, NC	340087
Poudre Valley Health System	Fort Collins, CO	
Poudre Valley Hospital	Fort Collins, CO	060010
Medical Center of the Rockies	Loveland, CO	060119
Prime Healthcare Services	Ontario, CA	
Paradise Valley Hospital	National City, CA	050024
Encino Hospital Medical Center	Encino, CA	050158
Garden Grove Medical Center	Garden Grove, CA	050230
West Anaheim Medical Center	West Anaheim, CA	050426
Huntington Beach Hospital	Huntington Beach, CA	050526
La Palma Intercommunity Hospital	La Palma, CA	050580
Chino Valley Medical Center	Chino, CA	050586
San Dimas Community Hospital	San Dimas, CA	050588
Desert Valley Hospital Inc.	Victorville, CA	050709
Centinela Freeman RMC, Centinela Campus	Inglewood, CA	050739
Sherman Oaks Hospital and Health Center	Sherman Oaks, CA	050755
Montclair Hospital Medical Center	Montclair, CA	050758
Shasta Regional Medical Center	Redding, CA	050764
Saint Joseph Regional Health System	Mishawaka, IN	
Saint Joseph Regional Medical Center – Mishawaka Campus	Mishawaka, IN	150012
Saint Joseph Regional Medical Center – Plymouth Campus	Plymouth, IN	150076
St. Vincent Health	Indianapolis, IN	
St. Joseph Hospital & Health Center	Kokomo, IN	150010
St. Vincent Hospital & Health Care Center	Indianapolis, IN	150084
Saint John’s Health System	Anderson, IN	150088
St. Vincent Heart Center	Indianapolis, IN	150153
St. Vincent Carmel Hospital	Carmel, IN	150157
St. Vincent Randolph Hospital	Winchester, IN	151301

* Winning systems are ordered alphabetically. Member hospitals are ordered by Medicare ID.

* 2012 Winners are listed in boldface text.

HEALTH SYSTEM/HOSPITAL NAME	LOCATION	HOSPITAL MEDICARE ID
St. Vincent Jennings Hospital	North Vernon, IN	151303
St. Vincent Williamsport Hospital	Williamsport, IN	151307
St. Vincent Mercy Hospital	Elwood, IN	151308
St. Vincent Clay Hospital	Brazil, IN	151309
St. Vincent Frankfort Hospital	Frankfort, IN	151316
Tanner Health System	Carrollton, GA	
Tanner Medical Center	Carrollton, GA	110011
Tanner Medical Center-Villa Rica	Villa Rica, GA	110015
Higgins General Hospital	Bremen, GA	111320

* Winning systems are ordered alphabetically. Member hospitals are ordered by Medicare ID.

* 2012 Winners are listed in boldface text.

APPENDIX B

The Top Quintile: Best-Performing Systems*

HEALTH SYSTEM NAME	LOCATION
LARGE HEALTH SYSTEMS	
Advocate Health Care	Oak Brook, IL
Banner Health	Phoenix, AZ
Baylor Health Care System	Dallas, TX
CareGroup Healthcare System	Boston, MA
Carolinas HealthCare System	Charlotte, NC
HCA East Florida Division	Miami, FL
Jefferson Health System	Radnor, PA
Mayo Foundation	Rochester, MN
Memorial Hermann Healthcare System	Houston, TX
OhioHealth	Columbus, OH
Partners HealthCare	Boston, MA
Providence Health & Services	Renton, WA
Saint Barnabas Health Care System	West Orange, NJ
Saint Joseph Mercy Health System	Ann Arbor, MI
St. Vincent Health	Indianapolis, IN
The Methodist Hospital System	Houston, TX
UMass Memorial Health Care	Worcester, MA
MEDIUM HEALTH SYSTEMS	
Baystate Health	Springfield, MA
Franciscan Missionaries of Our Lady Health System	Baton Rouge, LA
Geisinger Health System	Danville, PA
HCA Central and West Texas Division	Austin, TX
INTEGRIS Health	Oklahoma City, OK
John Muir Health	Walnut Creek, CA
Kettering Health Network	Dayton, OH
Lehigh Valley Health Network	Allentown, PA
Mercy Health Partners (Southwest OH)	Cincinnati, OH
Ministry Health Care	Milwaukee, WI
Mission Health System	Asheville, NC
NorthShore University HealthSystem	Evanston, IL
Ochsner Health System	New Orleans, LA
Prime Healthcare Services	Ontario, CA
Scott & White Healthcare	Temple, TX
Scripps Health	San Diego, CA
Sparrow Health System	Lansing, MI

*Based on the 321 organizations analyzed in this study. Ordered alphabetically by size category. 2012 Winners are listed in boldface text. For category definitions, see the Methodology section.

HEALTH SYSTEM NAME	LOCATION
MEDIUM HEALTH SYSTEMS	
Spectrum Health	Grand Rapids, MI
St. Luke's Health System	Boise, ID
TriHealth	Cincinnati, OH
West Penn Allegheny Health System	Pittsburgh, PA
SMALL HEALTH SYSTEMS	
Affinity Health System	Menasha, WI
Asante Health System	Medford, OR
Baptist Health	Montgomery, AL
Cape Cod Healthcare	Hyannis, MA
Care Alliance Health Services	Charleston, SC
Centra Health	Lynchburg, VA
Central Florida Health Alliance	Leesburg, FL
Cottage Health System	Santa Barbara, CA
Genesis Health System	Davenport, IA
Good Shepherd Health System	Marshall, TX
Guthrie Healthcare System	Sayre, PA
HealthEast Care System	Saint Paul, MN
Lakeland HealthCare	St. Joseph, MI
Maury Regional Healthcare System	Columbia, TN
Mercy Health Partners	Muskegon, MI
Merit Health Systems	Louisville, KY
North Mississippi Health Services	Tupelo, MS
Palomar Pomerado Health	San Diego, CA
Parkview Health	Fort Wayne, IN
Poudre Valley Health System	Fort Collins, CO
Saint Joseph Regional Health System	Mishawaka, IN
Spartanburg Regional Healthcare System	Spartanburg, SC
St. Charles Health System	Bend, OR
Tanner Health System	Carrollton, GA
Trinity Mother Frances Health System	Tyler, TX
Trinity Regional Health System	Rock Island, IL

*Based on the 321 organizations analyzed in this study. Ordered alphabetically by size category. 2012 Winners are listed in boldface text. For category definitions, see the Methodology section.

APPENDIX C

Methodology Details

METHODS FOR IDENTIFYING COMPLICATIONS OF CARE

To make valid normative comparisons of hospital outcomes, it is necessary to adjust raw data to accommodate differences that result from the variety and severity of admitted cases. It is also necessary to account for individual facility characteristics that affect the clinical outcomes measures, such as the hospital's geographic location, size, teaching status, and community setting (urban versus rural).

Risk-Adjusted Mortality Index Models

We are able to make valid normative comparisons of mortality and complications rates by using patient-level data to control effectively for case mix and severity differences. We do this by evaluating ICD-9-CM diagnosis and procedure codes to adjust for severity within clinical case-mix groupings. Conceptually, we group patients with similar characteristics (i.e., age, sex, principal diagnosis, procedures performed, admission type, and comorbid conditions) to produce expected, or normative, comparisons. In the same way, we group facilities with similar characteristics. Through extensive testing, we have found that this methodology produces valid normative comparisons using readily available administrative data, eliminating the need for additional data collection.

We construct a normative database of case-level data from our Projected Inpatient Database (PIDB). This is a national all-payer database containing over 21 million all-payer discharges annually, obtained from approximately 2,600 hospitals, representing more than 50 percent of all discharges from short-term, general, nonfederal hospitals in the United States. The data include age, sex, and length of stay (LOS);

clinical groupings (Medicare Severity Diagnosis-Related Groups (MS-DRGs), ICD-9-CM principal and secondary diagnoses, ICD-9-CM principal and secondary procedures); hospital identification; admission source and type; present on admission (POA) codes; and discharge status. Hospital characteristics are obtained by linking each hospital's identification number with American Hospital Association and Medicare Cost Report data.

Excluded patient groups are neonates, cases transferred to other short-term hospitals, and cases with stays shorter than one day.

A standard logistic regression model is used to estimate the risk of mortality for each patient. This is done by weighting the patient records of the hospital by the logistic regression coefficients associated with the corresponding terms in the model and the intercept term. This produces the expected probability of an outcome for each eligible patient (numerator) based on the experience of the norm for patients with similar characteristics (age, clinical grouping, severity of illness, and so forth) at similar institutions (hospital bed size, census division, teaching status, urban or rural community setting).²⁴⁻²⁸ This methodology also ensures that facilities are compared to other facilities with similar characteristics.

Thomson Reuters staff physicians have suggested important clinical patient characteristics that were also incorporated into the models. After assigning the predicted probability of the outcome for each patient, the patient-level data can then be aggregated across a variety of groupings, including health system, hospital, service, or the DRG and MS-DRG classification systems.

Expected Complications Rate Index Models

Risk-adjusted complications refer to outcomes that may be of concern when they occur at a greater than expected rate among groups of patients, possibly reflecting systemic quality-of-care issues.

The Thomson Reuters complications model uses clinical qualifiers to identify complications that have occurred in the inpatient setting. The complications used in the model are:

COMPLICATION	PATIENT GROUP
Post-operative complications relating to urinary tract	Surgical only
Post-operative complications relating to respiratory system except pneumonia	Surgical only
GI complications following procedure	Surgical only
Infection following injection/infusion	All patients
Decubitus ulcer	All patients
Post-operative septicemia, abscess, and wound infection	Surgical, including cardiac
Aspiration pneumonia	Surgical only
Tracheostomy complications	All patients
Complications of cardiac devices	Surgical, including cardiac
Complications of vascular and hemodialysis devices	Surgical only
Nervous system complications from devices/Complications of nervous system devices	Surgical only
Complications of genitourinary devices	Surgical only
Complications of orthopedic devices	Surgical only
Complications of other and unspecified devices, implants, and grafts	Surgical only
Other surgical complications	Surgical, including cardiac
Miscellaneous complications	All patients
Cardio-respiratory arrest, shock, or failure	Surgical only
Post-operative complications relating to nervous system	Surgical only
Post-operative acute myocardial infarction	Surgical only
Post-operative cardiac abnormalities except AMI	Surgical only
Procedure-related perforation or laceration	All patients
Post-operative physiologic and metabolic derangements	Surgical, including cardiac
Post-operative coma or stupor	Surgical, including cardiac
Post-operative pneumonia	Surgical, including cardiac
Pulmonary embolism	All patients
Venous thrombosis	All patients
Hemorrhage, hematoma or seroma complicating a procedure	All patients
Post-procedure complications of other body systems	All patients
Complications of transplanted organ (excludes skin and cornea)	Surgical only
Disruption of operative wound	Surgical only
Complications relating to anesthetic agents and CNS depressants	Surgical, including cardiac
Complications relating to antibiotics	All patients
Complications relating to other anti-infective drugs	All patients
Complications relating to anti-neoplastic and immunosuppressive drugs	All patients
Complications relating to anticoagulants and drugs affecting clotting factors	All patients
Complications relating to blood products	All patients

COMPLICATION	PATIENT GROUP
Complications relating to narcotics AND related analgesics	All patients
Complications relating to non-narcotic analgesics	All patients
Complications relating to anti-convulsants and anti-Parkinsonism drugs	All patients
Complications relating to sedatives and hypnotics	All patients
Complications relating to psychotropic agents	All patients
Complications relating to CNS stimulants and drugs affecting the autonomic nervous system	All patients
Complications relating to drugs affecting cardiac rhythm regulation	All patients
Complications relating to cardiotonic glycosides (digoxin) and drugs of similar action	All patients
Complications relating to other drugs affecting the cardiovascular system	All patients
Complications relating to anti-asthmatic drugs	All patients
Complications relating to other medications (includes hormones, insulin, iron, oxytocic agents)	All patients

A normative database of case-level data including age, sex, LOS, clinical grouping (MS-DRG), comorbid conditions, POA codes, and hospital identification is constructed using our PIDB national all-payer database. Hospital characteristics are obtained by linking each hospital's identification number with American Hospital Association and Medicare Cost Report data. The method includes patients from approximately 2,600 short-term, general, nonfederal hospitals that are generally representative of short-term, general, nonfederal hospitals in the United States. Excluded groups are neonates, cases transferred to other short-term hospitals, and cases with stays shorter than one day.

Complications rates are calculated from normative data for two patient risk groups—medical and surgical. A standard regression model is used to estimate the risk of experiencing a complication for each patient. This is done by weighting the patient records of the client hospital by the regression coefficients associated with the corresponding terms in the prediction models and intercept term. This method produces the expected probability of a complication for each patient based on the experience of the norm for patients with similar characteristics at similar institutions. After assigning the predicted probability of a complication for each patient in each risk group, it is then possible to aggregate the patient-level data across a variety of groupings.²⁹⁻³²

Patient Safety Indicators

The Agency for Healthcare Research and Quality (AHRQ) is a public health service agency within the federal government's Department of Health and

Human Services. The agency's mission includes both translating research findings into better patient care and providing policymakers and other healthcare leaders with information needed to make critical healthcare decisions. We use AHRQ's Patient Safety Indicators (PSIs) in calculating our risk-adjusted patient safety index performance measure. This information on PSIs is from the AHRQ website (ahrq.gov).

The AHRQ Quality Indicators measure healthcare quality by using readily available hospital inpatient administrative data. PSIs are a set of indicators providing information on potential in-hospital complications and adverse events following surgeries, procedures, and childbirths. The PSIs were developed after a comprehensive literature review, analysis of ICD-9-CM codes, review by a clinician panel, implementation of risk adjustment, and empirical analyses. The PSIs provide a perspective on patient safety events using hospital administrative data. PSIs also reflect quality of care inside hospitals but focus on surgical complications and other iatrogenic events.³³

For the risk-adjusted patient safety index performance measure, we began our research with all PSIs that occurred with sufficient frequency to generate provider-specific output. Of the 20 PSIs included in the original AHRQ methodology, only 15 produced nonzero PSI rates on the Medicare data. Four measures are for birth or other obstetrical-related conditions, which do not occur in the age group under study here. Transfusion reactions produced rates that were too low for the AHRQ PSI software to generate provider-specific output. Due to the unreliability of E coding, we also exclude complications of anesthesia (PSI 1), foreign

body left in during procedure (PSI 5), postoperative hip fracture (PSI 8), and accidental puncture and laceration (PSI 15), which rely on E codes. Since the original analysis was done, PSI 2 (death in low-mortality DRGs) no longer has risk values in the model. The AHRQ model version used in this study was Version 4.2, published September 2010. The model used POA coding in MedPAR data.

The final set of 10 PSIs included in this study was:

- PSI 3: Pressure ulcer
- PSI 4: Death among surgical inpatients with serious treatable complications
- PSI 6: Iatrogenic pneumothorax
- PSI 7: Central venous catheter-related bloodstream infections
- PSI 9: Postoperative hemorrhage or hematoma
- PSI 10: Postoperative physiologic and metabolic derangements
- PSI 11: Postoperative respiratory failure
- PSI 12: Postoperative pulmonary embolism or deep vein thrombosis
- PSI 13: Postoperative sepsis
- PSI 14: Postoperative wound dehiscence

ECRI and PSI: Complementary Methodologies

Given its high level of importance, we chose to increase our emphasis on patient safety by using both the PSI (AHRQ) and expected complications rate index (ECRI) methodologies to calculate two separate outcome measures. Both PSI and ECRI are methodologies for identifying complications of care. Although the definitions have some similarities, there are enough differences that the two are useful complements to each other. ECRI is an overall complication methodology in which the outcome is the occurrence of one or more of 30 complications of care. Whereas the AHRQ PSIs used in our study are based on 10 separate models that evaluate the occurrence of 10 distinct complications of care, one of which is mortality related — an adverse outcome that is not included in ECRI.

Index Interpretation

An outcome index is a ratio of an observed number of outcomes to an expected number of outcomes in a particular population. This index is used to make normative comparisons and is standardized in that the expected number of events is based on the occurrence of the event in a normative population. The normative population used to calculate expected numbers of events is selected to be similar to the comparison population with

respect to relevant characteristics, including age, sex, region, and case mix.

The index is simply the number of observed events divided by the number of expected events and can be calculated for outcomes that involve counts of occurrences (e.g., deaths or complications). Interpretation of the index relates the experience of the comparison population relative to a specified event to the expected experience based on the normative population.

Examples:

10 events observed ÷ 10 events expected = 1.0:
The observed number of events is equal to the expected number of events based on the normative experience.

10 events observed ÷ 5 events expected = 2.0:
The observed number of events is twice the expected number of events based on the normative experience.

10 events observed ÷ 25 events expected = 0.4:
The observed number of events is 60 percent lower than the expected number of events based on the normative experience.

Therefore, an index value of 1.0 indicates no difference between observed and expected outcome occurrence. An index value greater than 1.0 indicates an excess in the observed number of events relative to the expected based on the normative experience. An index value less than 1.0 indicates fewer events observed than would be expected based on the normative experience. An additional interpretation is that the difference between 1.0 and the index is the percentage difference in the number of events relative to the norm. In other words, an index of 1.05 indicates 5 percent more outcomes, and an index of 0.90 indicates 10 percent fewer outcomes than expected based on the experience of the norm. The index can be calculated across a variety of groupings (e.g., hospital, service, and DRG).

CORE MEASURES

Core measures were developed by the Joint Commission and endorsed by the National Quality Forum (NQF), the nonprofit public-private partnership organization that endorses national healthcare performance measures, as minimum basic care standards. Core measures are a widely accepted method for measuring quality of patient care that includes specific guidelines for heart

attack (acute myocardial infarction (AMI)), heart failure (HF), pneumonia, pregnancy and related conditions, and surgical-infection prevention.

Our composite core measures mean percent is based on the AMI, HF, pneumonia, and surgical care improvement project areas of this program, using Hospital Compare data reported on the Centers for Medicare and Medicaid Services (CMS) website. The data in this study are from the second quarter 2011 database. This contains data from October 1, 2009, through September 20, 2010.

AMI Core Measures

- AMI-1* Heart Attack Patients Given Aspirin at Arrival
- AMI-2* Heart Attack Patients Given Aspirin at Discharge
- AMI-3* Heart Attack Patients Given ACE Inhibitor or ARB for Left Ventricular Systolic Dysfunction (LVSD)
- AMI-4* Heart Attack Patients Given Smoking Cessation Advice/Counseling
- AMI-5* Heart Attack Patients Given Beta Blocker at Discharge
- AMI-8A* Heart Attack Patients Given PCI Within 90 Minutes Of Arrival

HF Core Measures

- HF-1 Heart Failure Patients Given Discharge Instructions
- HF-2 Heart Failure Patients Given an Evaluation of Left Ventricular Systolic (LVS) Function
- HF-3 Heart Failure Patients Given ACE Inhibitor or ARB for Left Ventricular Systolic Dysfunction (LVSD)
- HF-4* Heart Failure Patients Given Smoking Cessation Advice/Counseling

Pneumonia Core Measures

- PN-2 Pneumonia Patients Assessed and Given Pneumococcal Vaccination
- PN-3B Pneumonia Patients Whose Initial Emergency Room Blood Culture Was Performed Prior To The Administration Of The First Hospital Dose Of Antibiotics
- PN-4 Pneumonia Patients Given Smoking Cessation Advice/Counseling
- PN-5C Pneumonia Patients Given Initial Antibiotic(s) within 6 Hours After Arrival

- PN-6 Pneumonia Patients Given the Most Appropriate Initial Antibiotic(s)
- PN-7 Pneumonia Patients Assessed and Given Influenza Vaccination

Surgical Care Improvement Project Core Measures

- SCIP-CARD-2 Surgery patients who were taking heart drugs called beta blockers before coming to the hospital, who were kept on the beta blockers during the period just before and after their surgery
- SCIP-INF-1 Surgery patients who were given an antibiotic at the right time (within one hour before surgery) to help prevent infection
- SCIP-INF-2 Surgery patients who were given the right kind of antibiotic to help prevent infection
- SCIP-INF-3 Surgery patients whose preventive antibiotics were stopped at the right time (within 24 hours after surgery)
- SCIP-INF-4* Heart surgery patients whose blood sugar (blood glucose) is kept under good control in the days right after surgery
- SCIP-INF-6 Surgery patients needing hair removed from the surgical area before surgery, who had hair removed using a safer method (electric clippers or hair removal cream – not a razor)
- SCIP-VTE-1 Surgery patients whose doctors ordered treatments to prevent blood clots after certain types of surgeries
- SCIP-VTE-2 Patients who got treatment at the right time (within 24 hours before or after their surgery) to help prevent blood clots after certain types of surgery

If a health system was missing one or more core measure values, the comparison group median core measure value was substituted for each missing core measure when we calculated the health system core measure mean percent. In addition, the median core measure value was substituted if a health system had one or more core measures with Relative Standard Error greater than or equal to 0.30. This was done because the percent values are statistically unreliable.

* We did not include this measure for small community hospitals due to very low reporting.

30-DAY RISK-ADJUSTED MORTALITY RATES AND 30-DAY RISK-ADJUSTED READMISSION RATES

This study currently includes two extended outcome measures — 30-day mortality and 30-day readmission rates, as defined by the CMS Hospital Compare dataset (second quarter, 2011). The longitudinal data period contained in this analysis is July 1, 2007, through June 30, 2010. The Hospital Compare website and database were created by CMS, the Department of Health and Human Services, and other members of the Hospital Quality Alliance. The data on the website comes from hospitals that have agreed to submit quality information that will be made public. Both of the measures used in this study have been endorsed by the NQF.

CMS calculates the 30-day mortality and 30-day readmission rates from Medicare enrollment and claims records using sophisticated statistical modeling techniques that adjust for patient-level risk factors and account for the clustering of patients within hospitals. The 30-day mortality and 30-day readmission rates are reported for heart attack, heart failure, and pneumonia patients.

CMS' three mortality models (heart attack, heart failure, and pneumonia) estimate hospital-specific, risk-standardized, all-cause 30-day mortality rates for patients hospitalized with a principal diagnosis of heart attack, heart failure, or pneumonia. All-cause mortality is defined as death from any cause within 30 days after the admission date, regardless of whether the patient dies while still in the hospital or after discharge.

CMS' three readmission models estimate hospital-specific, risk-standardized, all-cause 30-day readmission rates for patients discharged alive to a nonacute-care setting with a principal diagnosis of heart attack, heart failure, or pneumonia. Patients may have been readmitted back to the same hospital or to a different hospital or acute-care facility. They may have been readmitted for the same condition as their recent hospital stay or for a different reason (this is to discourage hospitals from coding similar readmissions as different readmissions).³⁴

HCAHPS OVERALL HOSPITAL RATING

To measure patient perception of care, this study uses the Hospital Consumer Assessment

of Healthcare Providers and Systems (HCAHPS) patient survey. HCAHPS is a standardized survey instrument and data collection methodology for measuring patients' perception of hospital care. HCAHPS is a core set of questions that can be combined with customized, hospital-specific questions to produce information that complements the data hospitals currently collect to support internal customer service and quality-related activities.

HCAHPS was developed through a partnership between CMS and AHRQ that had three broad goals:

- Produce comparable data on patients' perspectives of care that allow objective and meaningful comparisons among hospitals on topics that are important to consumers
- Encourage public reporting of the survey results to create incentives for hospitals to improve quality of care
- Enhance public accountability in healthcare by increasing the transparency of the quality of hospital care provided in return for the public investment

The HCAHPS survey has been endorsed by the NQF and the Hospital Quality Alliance. The federal government's Office of Management and Budget has approved the national implementation of HCAHPS for public-reporting purposes.

Voluntary collection of HCAHPS data for public reporting began in October 2006. The first public reporting of HCAHOS results, which encompassed eligible discharges from October 2006 through June 2007, occurred on March 2008. HCAHPS results are posted on the Hospital Compare website, found at hospitalcompare.hhs.gov, or through a link on medicare.gov. A downloadable version of HCAHPS results is available.³⁵

For this study edition, we used Hospital Compare data from the second quarter 2011 database. This database contains the HCAHPS results for data period October 1, 2009, through September 30, 2010. Although we are reporting health system performance on all HCAHPS questions, only performance on the Overall Hospital Rating question, "How do patients rate the hospital overall?" is used to rank health system performance.

* We did not include this measure for small community hospitals due to very low reporting.

Patient responses could fall into three categories, and the number of patients in each category was reported as a percent:

PATIENT RESPONSE CATEGORY	CATEGORY WEIGHT
Patients who gave a rating of 9 or 10 (high)	3
Patients who gave a rating of 7 or 8 (medium)	2
Patients who gave a rating of 6 or lower (low)	1

For each answer category, we assigned a weight as follows: 3 equals high or good performance, 2 equals medium or average performance, and 1 equals low or poor performance. We then calculated a weighted score for each hospital by multiplying the HCAHPS answer percent by the category weight. For each hospital, we summed the weighted percent values for the three answer categories. The highest possible HCAHPS score is 300 (100 percent of patients rate the hospital high). Example:

HCAHPS Question: How do patients rate the hospital overall?			
HCAHPS ANSWER	WEIGHT	REPORTED PERCENT	WEIGHTED PERCENT
Patients who gave a rating of 6 or lower (low)	1	13	13
Patients who gave a rating of 7 or 8 (medium)	2	25	50
Patients who gave a rating of 9 or 10 (high)	3	62	186
Hospital Total Weighted Score:			249

To calculate the system-level score, we multiplied the HCAHPS scores for every hospital in the system by a weight factor assigned to each range of reported hospital patient survey counts. This was done because CMS does not report patient survey counts, only ranges of counts. We used the following weight factors:

PATIENT SURVEY COUNT	WEIGHT FACTOR
Fewer than 100	50
Between 100 and 299	200
300 or more	350

To calculate the mean weighted HCAHPS score for each health system, we summed the member hospital weighted HCAHPS scores, summed the member hospital weight factors, and then divided the sum of the weighted HCAHPS scores by the sum of the weight factors.

LENGTH OF STAY METHODOLOGIES

The study's LOS performance measure uses the Thomson Reuters propriety severity-adjusted resource demand methodology. This model now includes POA data that was reported in the 2010 MedPAR dataset. Under the Deficit Reduction Act of 2005, as of federal fiscal year 2008, hospitals receive reduced payments for cases in which certain conditions — like falls, surgical site infections, and pressure ulcers — were not present on the patient's admission but occur during hospitalization. As a result, CMS now requires all inpatient prospective payment system hospitals to document whether a patient has these conditions when admitted.

Our severity-adjusted resource demand model allows us to produce risk-adjusted performance comparisons on LOS between or across virtually any subgroup of inpatients. These patient groupings can be based on MS-DRGs, health systems, hospitals, product lines, geographic regions, physicians, etc. The methodology adjusts for differences in diagnosis type and illness severity, based on ICD-9-CM coding. It also adjusts for patient age, gender, and admission status, in addition to selected hospital characteristics, such as bed size, census division, teaching status, and urban or rural community setting. Its associated LOS weights allow group comparisons on a national level and in a specific market area. These weights are calculated from the PIDB. PIDB discharges are statistically weighted to represent the universe of all short-term, general, nonfederal hospitals in the United States.

Compared with the RDRG grouper-based methodologies we used previously, this regression-based model incorporates more information, such as U.S. hospital characteristics, and provides more accuracy in predicting results. The POA component allows us to determine appropriate adjustments based on previously existing conditions versus complications of the hospital stay. We calculate expected values from model coefficients that are normalized to the clinical group and transformed from log scale. The model further adjusts for hospital factors to ensure accurate comparisons.

WHY WE HAVE NOT CALCULATED PERCENT DIFFERENCE IN SPECIFIC INSTANCES

Percent change is a meaningless statistic when the underlying quantity can be positive, negative, or zero. The actual change may mean something, but dividing it by a number that may be zero or of the opposite sign does not convey any meaningful information because the amount of change is not proportional to its previous value.³⁶

We also do not report percent change when the metrics are already percentages. In these cases, we report the simple difference between the two percentage values.

PROTECTING PATIENT PRIVACY

In accordance with patient privacy laws, we do not report any individual measure data that are based on 11 or fewer patients. This can affect the following measures:

- Risk-adjusted mortality index
- Risk-adjusted complications index
- 30-day mortality rates for AMI, heart failure, and pneumonia (CMS does not report at rate when count is less than 25)
- 30-day readmission rates for AMI, heart failure, and pneumonia (CMS does not report at rate when count is less than 25)
- Average LOS

APPENDIX D

All Health Systems in Study*

HEALTH SYSTEM NAME	LOCATION
Adventist Health System	Winter Park, FL
Adventist Health West	Roseville, CA
Adventist Healthcare	Rockville, MD
Advocate Healthcare	Oak Brook, IL
Affinity Health System	Menasha, WI
Alegent Health	Omaha, NE
Alexian Brothers Hospital Network	Arlington Heights, IL
Alhambra Hospital Medical Center Healthcare	Alhambra, CA
Allegiance Health Management	Shreveport, LA
Allina Health System	Minneapolis, MN
Alta Hospitals System LLC	Los Angeles, CA
Ameris Health Systems	Nashville, TN
Appalachian Regional Healthcare (ARH)	Lexington, KY
Ardent Health Services	Nashville, TN
Asante Health System	Medford, OR
Ascension Health	Saint Louis, MO
Atlantic Health System	Morristown, NJ
Aurora Health Care	Milwaukee, WI
Avera Health	Sioux Falls, SD
Banner Health	Phoenix, AZ
Baptist Health	Montgomery, AL
Baptist Health (AR)	Little Rock, AR
Baptist Health Care (FL)	Pensacola, FL
Baptist Health of Northeast Florida	Jacksonville, FL
Baptist Health South Florida	Coral Gables, FL
Baptist Health System (MS)	Jackson, MS
Baptist Health System Inc. (AL)	Birmingham, AL
Baptist Healthcare System (KY)	Louisville, KY
Baptist Memorial Health Care Corp.	Memphis, TN
BayCare Health System	Clearwater, FL
Baylor Health Care System	Dallas, TX
Baystate Health	Springfield, MA
Beaumont Hospitals	Royal Oak, MI
BJC Health System	Saint Louis, MO
Bon Secours Health System	Marriottsville, MD
Broward Health	Fort Lauderdale, FL

* 2012 Winners are listed in boldface text.

HEALTH SYSTEM NAME	LOCATION
Cape Cod Healthcare System	Hyannis, MA
Capella Healthcare	Franklin, TN
Capital Health System	Trenton, NJ
Care Alliance Health Services	Charleston, SC
CareGroup Healthcare System	Boston, MA
Carilion Health System	Roanoke, VA
Caritas Christi Healthcare	Boston, MA
Carolinas HealthCare System	Charlotte, NC
Carondelet Health Network	Tuscon, AZ
Carondelet Health System	Kansas City, MO
Catholic Health East	Newtown, PA
Catholic Health Initiatives	Denver, CO
Catholic Health Partners	Cincinnati, OH
Catholic Health Services of Long Island	Rockville Centre, NY
Catholic Health System (NY)	Buffalo, NY
Catholic Healthcare West	San Francisco, CA
Centegra Health System	Crystal Lake, IL
Centra Health	Lynchburg, VA
Central Florida Health Alliance	Leesburg, FL
Centura Health	Englewood, CO
Christus Health	Irving, TX
Citrus Valley Health Partners	Covina, CA
Cleveland Clinic	Cleveland, OH
Columbia Health System	Milwaukee, WI
Community Foundation of Northwest Indiana	Munster, IN
Community Health Network	Indianapolis, IN
Community Health Systems	Franklin, TN
Community Hospital Corp.	Plano, TX
Community Hospitals of Central California	Fresno, CA
Comprehensive Healthcare of Ohio	Elyria, OH
Conemaugh Health System	Johnstown, PA
Continuum Health Partners	New York, NY
Cook County Bureau of Health Services	Chicago, IL
Cottage Health System	Santa Barbara, CA
Covenant Health	Knoxville, TN
Covenant Health Systems (Northeast)	Syracuse, NY
Covenant Ministries of Benevolence	Chicago, IL
Crozer-Keystone Health System	Springfield, PA
Dartmouth Hitchcock Health	Lebanon, NH
Daughters of Charity Health System	Los Altos Hills, CA
DCH Health System	Tuscaloosa, AL
Dekalb Regional Healthcare System	Decatur, GA
Detroit Medical Center	Detroit, MI
Duke University Health System	Durham, NC

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HEALTH SYSTEM NAME	LOCATION
East Texas Medical Center Regional Healthcare System	Tyler, TX
Eastern Connecticut Health Network	Manchester, CT
Eastern Maine Healthcare Systems	Brewer, ME
Emory Healthcare	Atlanta, GA
Essent Healthcare Inc.	Nashville, TN
Essentia Health	Duluth, MN
Excela Health	Greensburg, PA
Exempla Healthcare	Denver, CO
Fairview Health Services	Minneapolis, MN
Franciscan Alliance	Mishawaka, IN
Franciscan Health System	Tacoma, WA
Franciscan Missionaries of Our Lady Health System	Baton Rouge, LA
Franciscan Services Corporation	Sylvania, OH
Franciscan Sisters	Manitowoc, WI
Geisinger Health System	Danville, PA
Genesis Health System	Davenport, IA
Good Shepherd Health System	Marshall, TX
Greenville Hospital System	Greenville, SC
Guthrie Healthcare System	Sayre, PA
Hawaii Health Systems Corporation	Honolulu, HI
Hawaii Medical Center	Honolulu, HI
Hawaii Pacific Health	Honolulu, HI
HCA Capital Division	Richmond, VA
HCA Central and West Texas Division	Austin, TX
HCA Continental Division	Denver, CO
HCA East Florida Division	Ft. Lauderdale, FL
HCA Far West Division	Las Vegas, NV
HCA Gulf Coast Division	Houston, TX
HCA MidAmerica North Division	Kansas City, MO
HCA MidAmerica South Division	Kansas City, MO
HCA Mountain Division	Salt Lake City, UT
HCA North Florida Division	Tallahassee, FL
HCA North Texas Division	Dallas, TX
HCA San Antonio Division	San Antonio, TX
HCA South Atlantic Division	Charleston, SC
HCA TriStar Division	Nashville, TN
HCA West Florida Division	Tampa, FL
Health Alliance of the Hudson Valley	Kingston, NY
Health First	Rockledge, FL
Health Group of Alabama	Huntsville, AL
Health Management Associates	Naples, FL
Health Quest System	Poughkeepsie, NY
HealthEast Care System	Saint Paul, MN
Henry Ford Health System	Detroit, MI

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HEALTH SYSTEM NAME	LOCATION
Hospital Sisters Health System	Springfield, IL
Humility of Mary Health Partners	Youngstown, OH
IASIS Healthcare	Franklin, TN
Indiana University Health	Indianapolis, IN
Infirmiry Health Systems	Mobile, AL
InMed Group Inc.	Montgomery, AL
Inova Health System	Falls Church, VA
Integrated Healthcare Holding Inc.	Santa Ana, CA
Integris Health	Oklahoma City, OK
Intermountain Health Care	Salt Lake City, UT
Iowa Health	Des Moines, IA
Jefferson Health System	Radnor, PA
Jewish Hospital & St. Mary's Healthcare	Louisville, KY
John C. Lincoln Health Network	Phoenix, AZ
John D. Archbold Memorial Hospital	Thomasville, GA
John Muir Health	Walnut Creek, CA
Kettering Health Network	Dayton, OH
Lakeland Healthcare	St. Joseph, MI
Lee Memorial Health System	Fort Myers, FL
Legacy Health System	Portland, OR
Lehigh Valley Network	Allentown, PA
LifePoint Hospitals Inc.	Brentwood, IN
Lifespan Corporation	Providence, RI
Los Angeles County-Department of Health Services	Los Angeles, CA
Lourdes Health System	Camden, NJ
Loyola University Health System	Maywood, IL
LSU Health System	Baton Rouge, LA
MaineHealth	Portland, ME
Mary Washington Healthcare	Fredericksburg, VA
Maury Regional Healthcare System	Columbia, TN
Mayo Foundation	Rochester, MN
McLaren Health Care Corp.	Flint, MI
McLeod Health	Florence, SC
Medcath Inc.	Charlotte, NC
MediSys Health Network	Jamaica, NY
MedStar Health	Columbia, MD
Memorial Health Services	Fountain Valley, CA
Memorial Health System	Springfield, IL
Memorial Health System of East Texas	Lufkin, TX
Memorial Healthcare System	Hollywood, FL
Memorial Hermann Healthcare System	Houston, TX
Mercy	Chesterfield, MO
Mercy Health Partners (MI)	Muskegon, MI
Mercy Health Partners (Northern OH)	Toledo, OH
Mercy Health Partners (Southwest OH)	Cincinnati, OH

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HEALTH SYSTEM NAME	LOCATION
Mercy Health System of Kansas	Independence, KS
Mercy Health System of Oklahoma	Oklahoma City, OK
Mercy Health System of Southeastern Pennsylvania	Philadelphia, PA
Meridia Health System	Independence, OH
Meridian Health	Neptune, NJ
Merit Health Systems	Louisville, KY
Methodist Healthcare	Memphis, TN
Methodist Hospitals of Dallas	Dallas, TX
Mid Michigan Health	Midland, MI
Ministry Health Care	Milwaukee, WI
Mission Health System	Asheville, NC
Mount Carmel Health System	Columbus, OH
Mountain States Health Alliance	Johnson City, TN
Multicare Medical Center	Tacoma, WA
Nebraska Methodist Health System	Omaha, NE
New York City Health and Hospitals Corporation (HHC)	New York, NY
New York-Presbyterian Healthcare System	New York, NY
North Mississippi Health Services	Tupelo, MS
North Shore - Long Island Jewish Health System	Great Neck, NY
NorthBay Healthcare System	Fairfield, CA
Northeast Health	Troy, NY
Northern Arizona Healthcare	Flagstaff, AZ
Northshore University Healthsystem	Evanston, IL
Northside Hospital System	Atlanta, GA
Novant Health Inc.	Winston-Salem, NC
Oakwood Healthcare	Dearborn, MI
Ochsner Health System	New Orleans, LA
Ohio Valley Health Services & Education Corp.	Wheeling, WV
OhioHealth Corporation	Columbus, OH
Orlando Health	Orlando, FL
OSF Healthcare System	Peoria, IL
Pacific Health Corporation	Tustin, CA
Pallottine Health Services	Huntington, WV
Palmetto Health Alliance	Columbia, SC
Palomar Pomerado Health Systems	San Diego, CA
Parkview Health System Inc.	Fort Wayne, IN
Partners Healthcare	Boston, MA
PeaceHealth	Bellevue, OR
Phoebe Putney Health System	Albany, GA
Piedmont Healthcare Inc.	Atlanta, GA
Poudre Valley Health System	Fort Collins, CO
Premier Health Partners	Dayton, OH
Presbyterian Healthcare Services	Albuquerque, NM
Prime Healthcare Services	Ontario, CA
ProHealth Care Inc.	Waukesha, WI

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HEALTH SYSTEM NAME	LOCATION
ProMedica Health System	Toledo, OH
Provena Health	Mokena, IL
Providence Health & Services	Renton, WA
Regional Health	Rapid City, SD
Renown Health	Reno, NV
Resurrection Health Care	Chicago, IL
Riverside Health System	Newport News, VA
Robert Wood Johnson Health Network	New Brunswick, NJ
Rochester General Health System	Rochester, NY
Saint Barnabas Health Care System	West Orange, NJ
Saint Francis Health System	Tulsa, OK
Saint Joseph Mercy Health System	Ann Arbor, MI
Saint Joseph Regional Health System	Mishawaka, IN
Saint Lukes Health System	Kansas City, MO
Samaritan Health Services	Corvallis, OR
Sanford Health	Sioux Falls, SD
Schuylkill Health System	Pottsville, PA
Scott & White	Temple, TX
Scottsdale Healthcare	Scottsdale, AZ
Scripps Health	San Diego, CA
Sentara Healthcare	Norfolk, VA
Seton Healthcare Network	Austin, TX
Shands HealthCare	Gainesville, FL
Sharp Healthcare Corporation	San Diego, CA
Signature Hospital Corporation	Houston, TX
Sisters of Charity Health System	Cleveland, OH
Sisters of Charity of Leavenworth Health System	Lenexa, KS
Sound Shore Health System	New Rochelle, NY
South Jersey Healthcare	Vineland, NJ
Southeast Georgia Health System	Brunswick, GA
Southern Illinois Healthcare	Carbondale, IL
Sparrow Health System	Lansing, MI
Spartanburg Regional Healthcare System	Spartanburg, SC
Spectrum Health	Grand Rapids, MI
SSM Health Care	Saint Louis, MO
St. Alphonsus Health System	Boise, ID
St. Charles Health System	Bend, OR
St. Clare's Health System	Denville, NJ
St. Elizabeth Healthcare	Fort Thomas, KY
St. John Health System (OK)	Tulsa, OK
St. John Providence Health (MI)	Detroit, MI
St. John's Health System	Springfield, MO
St. John's Mercy Health	Saint Louis, MO
St. Joseph Health System	Lexington, KY
St. Joseph Health System	Orange, CA

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HEALTH SYSTEM NAME	LOCATION
St. Joseph/Candler Health System	Savannah, GA
St. Joseph's Healthcare System	Pateson, NJ
St. Luke's Episcopal Health System	Houston, TX
St. Luke's Regional Health System	Boise, ID
St. Thomas Health	Nashville, TN
St. Vincent Health	Indianapolis, IN
St. Vincent Health System (AR)	Little Rock, AR
St. Vincent Health System (FL)	Jacksonville, FL
Success Health	Boca Raton, FL
Summa Health System	Akron, OH
Sumner Regional Health Systems	Gallatin, TN
SunLink Health Systems	Atlanta, GA
Sutter Health	Sacramento, CA
Swedish	Seattle, WA
Tanner Health System	Carrollton, GA
Temple University Health System	Philadelphia, PA
Tenet Healthcare Corporation	Dallas, TX
Texas Health	Arlington, TX
The Methodist Hospital	Houston, TX
ThedaCare	Appleton, WI
TriHealth	Cincinnati, OH
Trinity Health	Novi, MI
Trinity Mother Frances Health System	Tyler, TX
Trinity Regional Health System	Rock Island, IL
Truman Medical Center Inc.	Kansas City, MO
UAB Health System	Birmingham, AL
UMass Memorial Health Care	Worcester, MA
United Health Services	Binghamton, NY
Universal Health Services Inc.	King of Prussia, PA
University Community Health	Tampa, FL
University Health Systems of Eastern Carolina	Greenville, NC
University Hospitals Health System	Cleveland, OH
University of California Health System	Los Angeles, CA
University of Maryland Medical System	Baltimore, MD
University of Missouri Health Care	Columbia, MO
University of North Carolina Health	Chapel Hill, NC
University of Pennsylvania Health System	Philadelphia, PA
University of Rochester Medical Center	Rochester, NY
University of Texas System	Austin, TX
UPMC Health System	Pittsburgh, PA
UT Southwestern Medical Center	Dallas, TX
Valley Baptist Health System	Harlingen, TX
Valley Health System	Winchester, VA
Valley Health System (CA)	Hemet, CA
Vanguard Health Systems	Nashville, TN

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HEALTH SYSTEM NAME	LOCATION
Via Christi Health System	Wichita, KS
Virtua Health	Marlton, NJ
WakeMed	Raleigh, NC
Wellmont Health System	Kingsport, AL
WellSpan Health	York, PA
WellStar Health System	Marietta, GA
West Penn Allegheny Health System	Pittsburgh, PA
West Tennessee Healthcare	Jackson, TN
West Virginia United Health System	Fairmont, WV
Wheaton Franciscan Southeast Wisconsin	Glendale, WI
Wheaton Franciscan Healthcare (IA)	Wheaton, IA
Wheeling Hospital	Wheeling, WV
Willis-Knighton Health Systems	Shreveport, LA
Wuesthoff Memorial Hospital	Rockledge, FL
Yale New Haven Health Services	New Haven, CT

* 2012 Winners are listed in boldface text.

REFERENCES

1. Kaplan RS, Norton DP. The Balanced Scorecard: Measures That Drive Performance. *Harvard Bus Rev.* Jan–Feb 1992.
2. Griffith JR, Alexander JA, Foster DA. Is Anybody Managing the Store? National Trends in Hospital Performance. *Healthc Manag.* Nov–Dec 2006; 51(6):392-405; discussion 405-6.
3. McDonagh KJ. Hospital Governing Boards: A Study of Their Effectiveness in Relation to Organizational Performance. *Healthc Manag.* Nov–Dec 2006; 51(6).
4. Chenoweth J, Safavi K. Leadership Strategies for Reaching Top Performance Faster. *J Healthc Tech.* January 2007. HCT Project Volume 4.
5. Chenoweth J, Foster DA, Waibel BC. Best Practices in Board Oversight of Quality. *The Governance Institute.* June 2006.
6. Bass K, Foster DA, Chenoweth J. Study Results — *Proving Measurable Leadership and Engagement Impact on Quality, CMS Invitational Conference on Leadership and Quality.* Sept 28, 2006.
7. Health Research & Educational Trust and Prybil L. *Governance in High-Performing Organizations: A Comparative Study of Governing Boards in Not-For-Profit Hospitals.* Chicago: HRET in Partnership with AHA. 2005.
8. Cejka Search and Solucient, LLC. *Hospital CEO Leadership Survey.* 2005.
9. Griffith JR, Alexander JA, Jelinek RC. Measuring Comparative Hospital Performance. *Healthc Manag.* Jan-Feb 2002; 47(1).
10. Griffith JR, Knutzen SR, Alexander JA. Structural Versus Outcomes Measures in Hospitals: A Comparison of Joint Commission and Medicare Outcomes Scores in Hospitals. *Qual Manag Health Care.* 2002; 10(2): 29-38.
11. Lee DW, Foster DA. The Association Between Hospital Outcomes and Diagnostic Imaging: Early Findings. *J Am Coll Radiol.* Nov 2009; 6(11):780-5.
12. Bonis PA, Pickens GT, Rind DM, Foster DA. Association of a Clinical Knowledge Support System With Improved Patient Safety Reduced Complications and Shorter Length of Stay Among Medicare Beneficiaries in Acute-Care Hospitals in the United States. *Int J Med Inform.* Nov 2008;77(11):745-53. Epub Jun 19, 2008.
13. Kroch E, Vaughn T, Koepke M, Roman S, Foster DA, Sinha S, Levey S. Hospital Boards and Quality Dashboards. *J Patient Safety.* 2(1):10-19, March 2006.
14. Foster DA. *Top Cardiovascular Care Means Greater Clinical and Financial Value.* Ann Arbor, MI: Center for Healthcare Improvement, Thomson Reuters. November 2009.
15. Foster DA. *HCAHPS 2008: Comparison Results for 100 Top Hospitals® Winners Versus Non-Winners.* Ann Arbor, MI: Center for Healthcare Improvement, Thomson Reuters. August 2008.
16. Foster DA. *Risk-Adjusted Mortality Index Methodology.* Ann Arbor, MI: Center for Healthcare Improvement, Thomson Reuters. July 2008.
17. Foster DA. *Trends in Patient Safety Adverse Outcomes and 100 Top Hospitals® Performance, 2000–2005.* Ann Arbor, MI: Center for Healthcare Improvement, Thomson Reuters. March 2008.

18. Shook J, Young J. *Inpatient and Outpatient Growth by Service Line: 2006 Thomson Reuters 100 Top Hospitals®: Performance Improvement Leaders Versus Peer Hospitals*. Ann Arbor, MI: Center for Healthcare Improvement, Thomson Reuters. August 2007.
19. The MedPAR data years quoted in *100 Top Hospitals®* are federal fiscal years – a year that begins on October 1 of each calendar year and ends on September 30 of the following calendar year. Federal fiscal years (FFY) are identified by the year in which they end (e.g., FFY 2010 begins in 2009 and ends in 2010). Datasets include patients discharged in the specified FFY.
20. See the CMS Hospital Compare website at hospitalcompare.hhs.gov.
21. See the Agency for Healthcare Research and Quality (AHRQ) website at ahrq.gov.
22. Iezzoni L, Ash A, Schwartz M, Daley J, Hughes J, Mackiernan Y. Judging Hospitals by Severity-Adjusted Mortality Rates: The Influence of the Severity-Adjusted Method. *Am J Public Health* 1996; 86(10):1379-1387.
23. Iezzoni L, Schwartz M, Ash A, Hughes J, Daley J, Mackiernan Y. Using Severity-Adjusted Stroke Mortality Rates to Judge Hospitals. *Int J Qual Health C*. 1995; 7(2):81-94.
24. DesHarnais SI, McMahon LF Jr, Wroblewski RT. Measuring Outcomes of Hospital Care Using Multiple Risk-Adjusted Indexes. *Health Services Research*, 26, no. 4 (Oct 1991):425-445.
25. DesHarnais SI, et al. The Risk-Adjusted Mortality Index: A New Measure of Hospital Performance. *Medical Care*. 26, no. 12 (Dec 1988):1129-1148.
26. DesHarnais SI, et al. Risk-Adjusted Quality Outcome Measures: Indexes for Benchmarking Rates of Mortality, Complications, and Readmissions. *Qual Manag Health Care*. 5 (Winter 1997):80-87.
27. DesHarnais SI, et al. Measuring Hospital Performance: The Development and Validation of Risk-Adjusted Indexes of Mortality, Readmissions, and Complications. *Med Car*. 28, no. 12 (Dec 1990): 1127-1141.
28. Iezzoni LI, et al. Chronic Conditions and Risk of In-Hospital Death. *Health Serv Res*. 29, no. 4 (Oct 1994): 435-460.
29. Iezzoni LI, et al. Identifying Complications of Care Using Administrative Data. *Med Car*. 32, no.7 (Jul 1994): 700-715.
30. Iezzoni LI, et al. Using Administrative Data to Screen Hospitals for High Complication Rates. *Inquiry*. 31, no. 1 (Spring 1994): 40-55.
31. Iezzoni LI. Assessing Quality Using Administrative Data. *Ann Intern Med*. 127, no. 8 (Oct 1997): 666-674.
32. Weingart SN, et al. Use of Administrative Data to Find Substandard Care: Validation of the Complications Screening Program. *Med Care*. 38, no. 8 (Aug 2000):796-806.
33. See the AHRQ website at qualityindicators.ahrq.gov/data/hcup/psi.htm. Retrieved in June 2004.
34. See the CMS Hospital Compare website at hospitalcompare.hhs.gov.
35. See the CMS Hospital Compare website at cms.hhs.gov/hospitalqualityinits/30_hospitalhcahps.asp.
36. The Wall Street Journal, New York, NY, Online Help: Digest of Earnings (online.wsj.com/public/resources/documents/doe-help.htm).

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Thomson Reuters
777 E. Eisenhower Parkway
Ann Arbor, MI 48108 USA
Phone +1 800 366 7526

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