

10 TOP HEALTH SYSTEMS: STUDY OVERVIEW AND RESEARCH FINDINGS

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INTRODUCTION

OBJECTIVE RESEARCH EVALUATES SYSTEM LEADERS, REVEALS OPPORTUNITIES

The Thomson Reuters *10 Top Health Systems* study objectively measures health system quality, revealing a group of top performers and providing health system leaders with useful data for performance benchmarking. The only study that aggregates individual hospital performance into system-level data, this research allows health system leaders to understand how they measure up in terms of clinical quality and efficiency. The winning systems highlight the potential for all health systems to impact quality initiatives, improve perceptions, and increase value to their communities.

This year's study contained nearly 300 organizations — almost every U.S. system with two or more acute-care member hospitals, including critical access hospitals. Derived from the 100 Top Hospitals® National Balanced Scorecard,¹ performance measures focused on clinical quality and efficiency and were aggregated across the entire system. 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 10 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 10 highest-performing health systems in the study population, based on a composite score of eight measures of quality and efficiency. In doing so, we've established national benchmarks and provided valuable goals for others. This year's Thomson Reuters *10 Top Health Systems* are:

WINNING HEALTH SYSTEM	LOCATION
Advocate Health Care	Oak Brook, IL
Cape Cod Healthcare	Hyannis, MA
CareGroup Healthcare System	Boston, MA
Kettering Health Network	Dayton, OH
Maury Regional Healthcare System	Columbia, TN
Mayo Foundation	Rochester, MN
NorthShore University HealthSystem	Evanston, IL
OhioHealth	Columbus, OH
Partners HealthCare	Boston, MA
Spectrum Health	Grand Rapids, MI

The winners of the *10 Top Health Systems* award outperformed their peers in a number of ways. They:

- Saved more lives and caused fewer patient complications with 30 percent lower mortality rates and 13 percent lower complications rates
- 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

Although the winning health systems have excellence in quality and efficiency in common, they differ in many ways — including their teaching status, size, and the geographic distribution of their member hospitals.

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 Highlighting the top-performing health systems is the first step in understanding what practices lead to better outcomes and more successful performance improvement. Understanding the similarities and differences between high-, median-, and low-performing health systems will be a focus of our research over the next few years.

AN OBJECTIVE EVALUATION OF PERFORMANCE

For 18 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 *10 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
- 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

HELPING HEALTH SYSTEMS EMBRACE PERFORMANCE IMPROVEMENT

Implementing quality performance improvement across all facilities is a new concept for many health systems. Health system leaders likely have many questions: How do we drive consistent performance improvement across the entire system? Where does this fit in our mission? What have other systems done to achieve a quality-driven culture that continually improves patient care and safety?

Understanding what the top performers are doing right, what the lower performers are doing wrong, and how an individual system compares are necessary component 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.

In fact, by showing what the top performers have accomplished, we offer concrete goals for the entire industry. The data in Table 1 show how the *10 Top Health Systems*, as a group, scored on the study's performance measures, and how this performance compared with their peers (nonwinning health systems). A number of important differences emerge when the data are studied closely.

TABLE 1. NATIONAL HEALTH SYSTEM PERFORMANCE COMPARISONS

PERFORMANCE MEASURE	MEDIANS ¹		BENCHMARK COMPARED WITH PEER GROUP		
	WINNING HEALTH SYSTEMS	PEER GROUP OF U.S. HEALTH SYSTEMS	DIFFERENCE	PERCENT DIFFERENCE	
Mortality Index ¹	0.72	1.02	-0.31	-29.8%	lower mortality
Complications Index ¹	0.82	0.94	-0.12	-13.2%	lower complications
Patient Safety Index ²	0.87	1.01	-0.14	-13.9%	better patient safety
Core Measures Mean Percent ³	96.6	94.5	2.1	N/A ⁵	better core measure performance
30-Day Mortality Rate (%) ⁴	11.7	12.7	-0.9	N/A ⁵	lower 30-day mortality
30-Day Readmission Rate (%) ⁴	21.0	20.9	0.1	N/A ⁵	higher 30-day readmissions
Average Length of Stay (ALOS) (days) ¹	4.7	5.2	-0.5	-9.4%	shorter ALOS
HCAHPS Score ³	263.5	257.2	6.3	2.4%	higher patient rating of hospital care

1. Based on present on admission (POA)-enabled risk models applied to MedPAR 2009 data. Ratings greater than 1.0 indicate more adverse events than expected; ratings less than 1.0 indicate fewer.

2. Based on AHRQ POA-enabled risk models applied to MedPAR 2008 and 2009 data. Eight PSIs included. See Appendix C for list.

3. From CMS Hospital Compare 2009 calendar year data. See Appendix C for included core measures.

4. From CMS Hospital Compare data set, July 1, 2006, through June 30, 2009. Includes heart attack, heart failure, and pneumonia data.

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

The top health systems have better short- and longer-term survival rates and fewer patient complications

The top health systems are providing higher-quality care, as judged by fewer mortalities and patient complications, and better adherence to patient safety standards and core measures of care. The winners' patient mortality index of 0.72 means that they had 28 percent fewer deaths than expected considering patient severity. On the other hand, their peers, with an index of 1.02, had 2 percent more deaths than expected. While not as dramatic, the benchmark-versus-peer differences for patient complications scores were also significant. Patients at the winning systems' member hospitals had better longer-term survival rates, too, as displayed by their lower median 30-day mortality rate.

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

The top health systems are also doing a better job avoiding adverse patient safety events and are following accepted care standards more closely. A patient safety index of 0.87 tells us that winning hospitals had 13 percent fewer adverse patient safety events than expected, given patient severity. By contrast, their peers had more adverse events than expected. The winning hospitals' higher core measures mean percentage of 96.6 tells us that they had better adherence to recommended core measures of care than their peers.

Patients treated at hospitals in the winning systems return home sooner

Winning health systems are treating patients more efficiently — they are achieving the better clinical outcomes outlined above and releasing patients sooner. Winning systems have a median average length of stay of 4.7 days, which is half a day less than their peers' median of 5.2 days.

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

Finally, the winners' higher median Hospital Consumer Assessment of Healthcare Providers and Systems (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.

In Table 2, we provide the *10 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.)

TOP SYSTEMS ACHIEVE BETTER OUTCOMES DESPITE GREATER STRESSES

To provide even more significant comparisons, we divided all 285 of the health systems in this study into performance quintiles, based on their performance on the study's measures. In Table 3, we highlight the difference between the highest- and lowest-performing quintiles, using a variety of characteristics, in addition to the study performance measures. (See Appendix B for a list of the 57 health systems included in the top-performance quintile and Appendix D for the 285 systems included in the study.)

The top-performing systems appear to care for sicker and poorer patients. The top systems have a slightly higher median case mix index (1.48 versus 1.41 for nonwinning systems) and have a higher percentage of hospital members that are critical access hospitals (CAHs). CAHs, located in rural areas, tend to treat sicker, older, and lower-income patients than their urban counterparts. Despite their sicker patient load, the top systems:

- Have much better patient outcomes — a third fewer mortalities and a quarter fewer complications
- Provide higher-quality care — they follow accepted care protocols (core measures) more closely and have nearly a third fewer adverse patient safety events
- Are more efficient, releasing patients more than a day sooner than the lowest performers
- Have better patient satisfaction scores

TABLE 2. WINNING HEALTH SYSTEMS PERFORMANCE MEASURES RESULTS¹

WINNING SYSTEM NAME	MORTALITY INDEX ¹	COMPLICATIONS INDEX ¹	PATIENT SAFETY INDEX ²	CORE MEASURES MEAN PERCENT (%) ³	30-DAY MORTALITY RATE (%) ⁴	30-DAY READMISSION RATE (%) ⁴	AVERAGE LENGTH OF STAY (DAYS) ¹	HCAHPS SCORE ³
Advocate Health Care	0.69	0.62	0.80	97.7	11.7	22.0	4.7	250.3
Cape Cod Healthcare	0.56	0.91	0.90	94.3	11.4	19.8	4.5	263.0
CareGroup Healthcare System	0.74	1.02	0.86	96.3	10.3	23.3	4.8	264.0
Kettering Health Network	0.63	0.78	1.02	97.6	12.5	20.2	4.7	254.0
Maury Regional Healthcare System	0.59	0.43	0.85	95.1	14.1	21.1	4.3	264.1
Mayo Foundation	1.16	0.89	0.94	96.5	11.7	20.4	4.7	266.3
NorthShore University HealthSystem	0.69	0.84	0.74	96.7	10.4	21.0	4.7	246.0
OhioHealth	0.89	0.81	0.95	97.7	13.3	21.0	4.9	262.0
Partners HealthCare	0.90	0.80	0.67	95.9	10.5	21.0	5.3	266.5
Spectrum Health	1.00	0.82	0.87	96.8	12.0	19.0	5.0	267.3
Benchmark Medians	0.72	0.82	0.87	96.6	11.7	21.0	4.7	263.5
Peer Medians	1.02	0.94	1.01	94.5	12.7	20.9	5.2	257.2

1. Based on present on admission-enabled risk models applied to MedPAR 2009 data. Ratings greater than 1.0 indicate more adverse events than expected; ratings less than 1.0 indicate fewer.
2. Based on AHRQ POA-enabled risk models applied to MedPAR 2008 and 2009 data. Eight PSIs included. See Appendix C for list.
3. From CMS Hospital Compare 2009 calendar year data. See Appendix C for included core measures.
4. From CMS Hospital Compare data set, July 1, 2006, through June 30, 2009. Includes heart attack, heart failure, and pneumonia data.

TABLE 3: PERFORMANCE CHARACTERISTICS OF HEALTH SYSTEMS IN THE TOP AND BOTTOM QUINTILES OF PERFORMANCE

PERFORMANCE MEASURE/ CHARACTERISTIC	TOP PERFORMERS	BOTTOM PERFORMERS	TOP VERSUS BOTTOM QUINTILE
Mortality Index ¹	0.84	1.18	34% lower mortality
Complications Index ¹	0.84	1.09	25% fewer complications
Patient Safety Index ¹	0.88	1.17	29% fewer patient safety incidents
Core Measures Mean Percent (%)	95.6	93.0	higher core measures compliance
30-Day Mortality Rate (%)	12.5	13.1	lower 30-day mortality
30-Day Readmission Rate (%)	20.8	21.5	fewer 30-day readmissions
Average Length of Stay (Days)	5.0	5.6	2/3 day shorter average length of stay
HCAHPS Score	262.1	247.0	higher patient rating of care
Average Number of Hospitals per System	7.1	8.6	roughly equal number of hospitals
% Critical Access Hospitals (CAHs) per System	8.9%	2.0%	significantly higher number of CAHs

1. Based on present on admission-enabled risk models applied to MedPAR 2009 data. Ratings greater than 1.0 indicate more adverse events than expected; ratings less than 1.0 indicate fewer.

METHODOLOGY

OVERVIEW

The *10 Top Health Systems* study is the latest addition to the Thomson Reuters 100 Top Hospitals® family. It is a quantitative study that identifies 10 health systems with the highest achievement on a modified clinical, efficiency, and patient satisfaction version of the *100 Top Hospitals* National Balanced Scorecard.

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 hospitals; and critical access hospitals (CAHs) who are members of health systems.

The main steps we take in selecting the top 10 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
- Ranking systems on each of the performance measures
- Determining 10 top performers by ranking health systems overall 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 *10 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 medical record information to calculate mortality, complications, patient safety, and length of stay at the health system level, using 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 — 2008 and 2009. The 2009 MedPAR dataset now includes health maintenance organization (HMO) encounters. To be included in the study, a hospital must have 2009 MedPAR data available.¹⁹

We used the CMS Hospital Compare dataset published in the third quarter of 2010 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 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 teaching hospitals, 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 study. Performance based on Medicare data has been found to be highly representative of all-payer data.

Present on Admission Data

The study's mortality, complications, and length-of-stay measures use Thomson Reuters propriety risk-adjustment models. These models now are calibrated for present on admission (POA) data that was reported in the 2009 MedPAR dataset. The patient safety index measure, which uses the Agency for Healthcare Research and Quality (AHRQ) Patient Safety Indicator (PSI) models, is also now calibrated for POA data. Under the Deficit Reduction Act of 2005, as of federal fiscal year 2008, hospitals do not receive payment 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.²¹

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

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

- Specialty hospitals (e.g., children's, women's, psychiatric, substance abuse, rehabilitation, orthopedic, cancer, and long-term acute-care 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 2009
- Hospitals with no reported Medicare patient deaths in FFY 2009
- Hospitals for which a current Medicare Cost Report was not available
- Hospitals with a current Medicare Cost Report

that was not for a 12-month reporting period

- Hospitals that did not report POA information because their data are not comparable to other hospitals (affects most Maryland* hospitals in the Medicare waiver program)
- Hospitals missing data required to calculate performance measures

Cardiac 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
- For the mortality-risk model only, patients receiving palliative care (ICD-9-CM code V66.7)
- Patients with stays shorter than one day

In this study, we did not exclude hospitals with missing 30-day mortality or 30-day readmission data because CMS does not publish rates for smaller hospitals with lower patient counts. 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.

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 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' 2009 Medicare Cost Reports. Although many large health systems have regional or other subdivisions, these are not reliably identified on the Medicare Cost Report, so we did not subdivide these systems in the study. 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

* Maryland's hospitals are not paid under Medicare's inpatient prospective payment system. Instead, they have a Medicare waiver agreement that allows Medicare reimbursement according to rates set by the state's Health Services Cost Review Commission. For more information, see mhcc.maryland.gov/consumerinfo/hospitalguide/patients/other_information/overview_of_maryland_regulatory_system_for_hospital_oversight.html.

determine system performance below. After all exclusions were applied and parent systems identified, the final study group included 285 health systems with the following profile:

System Category	Systems	Member Hospitals	Patient Discharges, 2009	Average Hospitals per System	Average Discharges per System
Winning Systems	10	51	250,827	5.1	25,083
Nonwinning Systems	275	1,893	6,432,965	6.9	23,393
TOTAL SYSTEMS	285	1,944	6,683,792	6.8	23,452

CLASSIFYING HOSPITALS INTO COMPARISON GROUPS

Bed size, teaching status, and residency/fellowship program involvement have a profound effect on the types of patients a hospital treats and the scope of services it provides. 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. We then used this classification to normalize system aggregate expected values for mortality, complications, patient safety, and average length of stay, based on the distribution of hospitals by group in each system.

The six hospital comparison groups used in the health system study are listed below. 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).

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

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 health systems 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 eight 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-infection prevention. Our core measures score is based on the heart attack, heart failure, pneumonia, and surgical-infection prevention 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, 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). 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. Only one year of MedPAR data (2009) was included, so that POA-enabled risk models could be used.</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 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. The complications risk model takes into account POA coding in determining expected complications.</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. Only one year of MedPAR data (2009) was included so that POA-enabled risk models could be used.</p>	<p>Lower</p>

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 eight included PSIs (see Appendix C for a list), we calculate an index value based on the number of actual PSI occurrences for 2008 and 2009, 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. We applied the hospital-level AHRQ PSI risk models to the 2008 and 2009 MedPAR acute-care data, using AHRQ program codes 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 eight selected PSIs, expressed in standard deviation units (z-score).^{22,23} We used two years of MedPAR data (2008 and 2009) to reduce the influence of chance fluctuation. The AHRQ PSI risk models used POA coding in 2009 MedPAR data and imputed POA in 2008 MedPAR data. Health system ranking was based on the mean of the eight 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>	<p>Lower</p>

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 patient counts less than or equal to 25 or with relative standard error values 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 website, for calendar year 2009. We excluded a number of core measures in our analysis due to lack of discriminatory power, limited reporting, and small-numbers issues. We excluded all AMI core measures for small community hospitals due to the latter two issues. For a list of the measures used, and those excluded, please see Appendix C.</p>	<p>Higher</p>

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. 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. We calculate a mean 30-day mortality rate for reporting.</p>	<p>Data are from the CMS Hospital Compare dataset for the third quarter of 2010. This contains data from July 1, 2006, through June 30, 2009, combined. For more information about this data set, see Appendix C.</p>	<p>Higher</p>

30-DAY RISK-ADJUSTED READMISSION RATES FOR AMI, HEART FAILURE, AND PNEUMONIA PATIENTS

RATIONALE	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. 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 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 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. We calculate a mean 30-day mortality rate for reporting.</p>	<p>Data are from the CMS Hospital Compare dataset for the third quarter of 2010. This contains data from July 1, 2006, through June 30, 2009, combined. For more information about this data set, 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. 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 2009. For more information on this model, see Appendix C.</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. Hospitals were then ranked by this weighted percent sum. The highest possible HCAHPS score is 300 (100 percent of patients rate the hospital high).</p> <p>To calculate the system-level score, we weighted the HCAHPS scores for each 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). 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, third quarter 2010, database. This database contains the HCAHPS results for data period Jan. 1 through Dec. 31, 2009.</p>	<p>Higher</p>

SUMMARY OF MEASURE DATA SOURCES AND DATA PERIODS

Measure	Data Source/Data Period
Risk-adjusted mortality index	MedPAR FFY 2009
Risk-adjusted complications index	MedPAR FFY 2009
Risk-adjusted patient safety index	MedPAR FFY 2008 and 2009
Core measures mean percent	CMS Hospital Compare, 3rd quarter 2010 (calendar year (CY) 2009 dataset)
30-day mortality rates (AMI, heart failure, pneumonia)	CMS Hospital Compare, 3rd quarter 2010 (July 1, 2006 – June 30, 2009 dataset)
30-day readmission rates (AMI, heart failure, pneumonia)	CMS Hospital Compare, 3rd quarter 2010 (July 1, 2006 – June 30, 2009 dataset)
Severity-adjusted average length of stay	MedPAR FFY 2009
HCAHPS score	CMS Hospital Compare, 3rd quarter 2010 (CY 2009 dataset)

DETERMINING THE 10 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. We then summed each system's individual performance

measure rankings and reranked overall to arrive at a final rank for the system. The top 10 health systems with the best final rank were selected as the 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 heart attack 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 heart attack 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 average length of stay	1
HCAHPS score (patient rating of overall hospital performance)	1

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

APPENDIX A

Health System Winners and Their Member Hospitals

SYSTEM/HOSPITAL NAME	HOSPITAL LOCATION	HOSPITAL MEDICARE ID
Advocate Health Care, Oak Brook, IL		
Advocate Trinity Hospital	Chicago, IL	140048
Advocate Illinois Masonic Medical Center	Chicago, IL	140182
Advocate Condell Medical Center	Libertyville, IL	140202
Advocate Lutheran General Hospital	Park Ridge, IL	140223
Advocate South Suburban Hospital	Hazel Crest, IL	140250
Advocate Good Samaritan Hospital	Downers Grove, IL	140288
Advocate Good Shepherd Hospital	Barrington, IL	140291
Eureka Community Hospital	Eureka, IL	141309
Cape Cod Healthcare, Hyannis, MA		
Cape Cod Hospital	Hyannis, MA	220012
Falmouth Hospital	Falmouth, MA	220135
CareGroup Healthcare System, Boston, MA		
Mount Auburn Hospital	Cambridge, MA	220002
Beth Israel Deaconess Hospital Neeham	Needham, MA	220083
Beth Israel Deaconess Medical Center	Boston, MA	220086
Kettering Health Network, Dayton, OH		
Greene Memorial Hospital	Xenia, OH	360026
Kettering Medical Center	Kettering, OH	360079
Fort Hamilton Hughes Memorial Hospital	Hamilton, OH	360132
Grandview Hospital & Medical Center	Dayton, OH	360133
Sycamore Medical Center	Miamisburg, OH	360239
Maury Regional Healthcare System, Columbia, TN		
Wayne Medical Center	Waynesboro, TN	440010
Maury Regional Hospital	Columbia, TN	440073
Mayo Foundation, Rochester, MN		
Mayo Clinic Hospital	Phoenix, AZ	030103
Mayo Clinic	Jacksonville, FL	100151
Mayo Clinic Saint Marys Hospital	Rochester, MN	240010
Naeve Hospital	Albert Lea, MN	240043
Mayo Clinic - Rochester Methodist Hospital	Rochester, MN	240061
Immanuel St Josephs Mayo Health System	Mankato, MN	240093
Austin Medical Center	Austin, MN	240117
Fairmont Medical Center	Fairmont, MN	240166
St James Medical Center Mayo Health	St James, MN	241333
Franciscan Skemp La Crosse Hospital	La Crosse, WI	520004
Luther Hospital Mayo Health System	Eau Claire, WI	520070
Luther Midelfort Chippewa Valley Mayo	Bloomer, WI	521314
Luther Midelfort Northland Mayo Health	Barron, WI	521315

NorthShore University HealthSystem, Evanston, IL		
NorthShore University HealthSystem	Evanston, IL	140010
Skokie Hospital	Skokie, IL	140051
OhioHealth, Columbus, OH		
Riverside Methodist Hospital	Columbus, OH	360006
Marion General Hospital	Marion, OH	360011
Grant Medical Center	Columbus, OH	360017
Doctors Hospital	Columbus, OH	360152
Grady Memorial Hospital	Delaware, OH	360210
Dublin Methodist Hospital	Dublin, OH	360348
Partners HealthCare, Boston, MA		
North Shore Medical Center	Salem, MA	220035
Massachusetts General Hospital	Boston, MA	220071
Newton Wellesley Hospital	Newton, MA	220101
Brigham and Women's Hospital	Boston, MA	220110
Faulkner Hospital	Boston, MA	220119
Nantucket Cottage Hospital	Nantucket, MA	220177
Martha's Vineyard Hospital	Oak Bluffs, MA	221300
Spectrum Health, Grand Rapids, MI		
Spectrum Health United Memorial	Greenville, MI	230035
Spectrum Health Hospital Group	Grand Rapids, MI	230038
Gerber Memorial Hospital	Fremont, MI	230106

APPENDIX B

The Top Quintile: Best-Performing Systems*

HEALTH SYSTEM	LOCATION
THE AWARD WINNERS	
Advocate Health Care	Oak Brook, IL
Cape Cod Healthcare	Hyannis, MA
CareGroup Healthcare System	Boston, MA
Kettering Health Network	Dayton, OH
Maury Regional Healthcare System	Columbia, TN
Mayo Foundation	Rochester, MN
NorthShore University HealthSystem	Evanston, IL
OhioHealth	Columbus, OH
Partners HealthCare	Boston, MA
Spectrum Health	Grand Rapids, MI
Affinity Health System	Menasha, WI
Alegent Health	Omaha, NE
Allina Hospitals & Clinics	Minneapolis, MN
Asante Health System	Medford, OR
Ascension Health	Saint Louis, MO
Avera Health	Sioux Falls, SD
Baptist Health System	Montgomery, AL
Baylor Health Care System	Dallas, TX
Beaumont Hospitals	Royal Oak, MI
BJC HealthCare	Saint Louis, MO
Catholic Health Initiatives	Englewood, CO
Catholic Health Partners	Cincinnati, OH
CHRISTUS Health	Irving, TX
Cleveland Clinic	Cleveland, OH
Covenant Health	Knoxville, TN
Dartmouth-Hitchcock Health	Lebanon, NH
Exempla Healthcare	Denver, CO
Franciscan Sisters of Christian Charity	Manitowoc, WI
Infirmity Health Systems	Mobile, AL
INTEGRIS Health	Oklahoma City, OK
IU Health	Indianapolis, IN
Jefferson Health System	Radnor, PA
Lakeland HealthCare	St. Joseph, MI
Lehigh Valley Health Network	Allentown, PA
Memorial Healthcare System	Hollywood, FL
Memorial Hermann Healthcare System	Houston, TX
MidMichigan Health	Midland, MI
Ministry Health Care	Milwaukee, WI

* Based on the 285 organizations analyzed in this study. Ordered alphabetically.

HEALTH SYSTEM	LOCATION
Mission Health System Inc.	Asheville, NC
North Mississippi Health Services	Tupelo, MS
Ochsner Health System	New Orleans, LA
Parkview Health	Fort Wayne, IN
Piedmont Healthcare	Atlanta, GA
Poudre Valley Health System	Fort Collins, CO
ProHealth Care	Waukesha, WI
Scripps Health	San Diego, CA
Sisters of Charity Health System	Cleveland, OH
SSM Health Care	Saint Louis, MO
St John's Health System	Springfield, MO
St. Charles Health System	Bend, OR
Steward Health Care System	Boston, MA
Summa Health System	Akron, OH
Summit Health	Chambersburg, PA
Trinity Health	Novi, MI
UMass Memorial Health Care	Worcester, MA
University Hospitals	Cleveland, OH
West Penn Allegheny Health System	Pittsburgh, PA

* Based on the 285 organizations analyzed in this study. Ordered alphabetically.

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 2,500 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 coded as palliative care (ICD-9- CM code V66.7), 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
Postoperative complications relating to urinary tract	Surgical only
Postoperative 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
Postoperative 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 only
Miscellaneous complications	All patients
Cardio-respiratory arrest, shock, or failure	Surgical only
Postoperative complications relating to nervous system	Surgical only
Postoperative acute myocardial infarction	Surgical only
Postoperative cardiac abnormalities except AMI	Surgical only
Procedure-related perforation or laceration	All patients
Postoperative physiologic and metabolic derangements	Surgical, including cardiac
Postoperative coma or stupor	Surgical, including cardiac
Postoperative 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

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 2,500 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. We also exclude decubitus ulcer (PSI 3) and postoperative pulmonary embolism or deep vein thrombosis (PSI 12). Exclusion of these two PSIs will be reevaluated when we have more data that use POA coding. The AHRQ model version used in this study was Version 4.2, published September 2010. The model used POA coding in 2009 MedPAR data and imputed POA in 2008 MedPAR data.

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

- Death among surgical inpatients with serious, treatable complications (PSI 4)
- Iatrogenic pneumothorax (PSI 6)
- Selected infections due to medical care (PSI 7)
- Postoperative hemorrhage or hematoma (PSI 9)
- Postoperative physiologic and metabolic derangement (PSI 10)
- Postoperative respiratory failure (PSI 11)
- Postoperative sepsis (PSI 13)
- Postoperative wound dehiscence (PSI 14)

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 eight separate models that evaluate the occurrence of eight 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-infection prevention areas of this program, using Hospital Compare data reported on the Centers for Medicare and Medicaid Services (CMS) website.

AMI Core Measures

1. Patients given angiotensin-converting (ACE) inhibitor or angiotensin II receptor (ARB) for left ventricular systolic (LVS) dysfunction*
2. Patients given aspirin at discharge*
3. Patients given beta blocker at discharge*
4. Patients given percutaneous coronary intervention within 90 minutes of arrival

HF Core Measures

5. Patients given ACE inhibitor or ARB for LVS dysfunction
6. Patients given discharge instructions
7. Patients given an evaluation of LVS function
8. Patients given smoking cessation advice/counseling*

Pneumonia Core Measures

9. Patients given initial antibiotic(s) within six hours after arrival
10. Patients whose initial emergency room blood culture was performed before the administration of the first hospital dose of antibiotic(s)
11. Patients given the most appropriate initial antibiotic(s)
12. Patients assessed and given pneumococcal vaccination
13. Patients assessed and given influenza vaccination
14. Patients given smoking cessation advice/counseling

Surgical Care Improvement Project Core Measures

15. Patients who were given an antibiotic at the right time (within one hour before surgery) to help prevent infection
16. Patients whose preventative antibiotics were stopped at the right time (within 24 hours after surgery)
17. Patients who were given the right kind of antibiotic to help prevent infection
18. 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
19. Patients whose doctors ordered treatments to prevent blood clots after certain types of surgeries
20. All heart surgery patients whose blood sugar (blood glucose) was kept under good control in the days right after surgery*

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

21. 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)
22. Patients who were taking beta blockers before coming to the hospital, who were kept on the beta blockers during the period just before and after their surgery

We excluded three AMI measures — the first two due to lack of discriminatory power (over 95 percent of hospitals reported in the 95–100 percent compliance range) and the last due to nonreporting in the CMS Hospital Compare third quarter 2010 database. The excluded AMI measures are:

- Patients given aspirin at arrival
- Patients given smoking cessation advice/counseling
- Patients given fibrinolytic medication within 30 minutes of arrival

In addition, for all hospitals in the small community hospital comparison group, we excluded all of the AMI core measures and several other core measures due to lack of reporting or low patient count. These are footnoted in the core measures list above.

If a health system was missing one or more core measure values, the health system 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 patient counts less than or equal to 25 or with Relative Standard Error values greater than or equal to 0.30. This was done because the percent values are statistically unreliable.

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 (third quarter, 2010). The longitudinal data period contained in this analysis is July 1, 2006, through June 30, 2009. 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 index 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 HCAHPS results, which encompassed eligible discharges from October 2006 through June 2007, occurred in 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 third quarter 2010 database. This database contains the HCAHPS results for data period Jan. 1 through Dec. 31, 2009. Although we are reporting hospital performance on all HCAHPS questions, only performance on the Overall Hospital Rating question, "How do patients rate the hospital overall?" is used to rank hospital performance. 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 scale value. 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	HCAHPS Answer	Weight	Reported Percent	Weighted Percent
How do patients rate the hospital overall?	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 2009 MedPAR dataset. Under the Deficit Reduction Act of 2005, as of federal fiscal year 2008, hospitals do not receive payment 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 CHANGE 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
- 30-day readmission rates for AMI, heart failure, and pneumonia
- Average LOS

APPENDIX D

All Health Systems in Study

HEALTH SYSTEM	LOCATION
Adventist Health System	Winter Park, FL
Adventist Health West	Roseville, CA
Advocate Health Care	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
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
Attentus Healthcare	Nashville, TN
Aurora Health Care	Milwaukee, WI
Avera Health	Sioux Falls, SD
Banner Health	Phoenix, AZ
Baptist Health (AL)	Montgomery, AL
Baptist Health (AR)	Little Rock, AR
Baptist Health Care	Pensacola, FL
Baptist Health of Northeast Florida	Jacksonville, FL
Baptist Health South Florida	Coral Gables, FL
Baptist Health System Inc.	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
Cape Cod Healthcare	Hyannis, MA
Capella Healthcare	Franklin, TN
Capital Health System	Trenton, NJ
CareAlliance Health Services	Charleston, SC

* Winners are listed in boldface text.

HEALTH SYSTEM	LOCATION
CareGroup Healthcare System	Boston, MA
Carilion Health System	Roanoke, VA
Carolinas HealthCare System	Charlotte, NC
Cascade Healthcare Community	Bend, OR
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 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
Clarian Health Partners	Indianapolis, IN
Cleveland Clinic	Cleveland, OH
Coffee Health Group	Florence, AL
Columbus Regional Healthcare System	Columbus, GA
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
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 System (TX)	Lubbock, TX
Covenant Health Systems (Northeast)	Syracuse, NY
Covenant Ministries of Benevolence	Chicago, IL
Crozer-Keystone Health System	Springfield, PA
Dartmouth Hitchcock Alliance	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
East Texas Medical Center Regional Healthcare System	Tyler, TX
Eastern Connecticut Health Network	Manchester, CT
Eastern Maine Healthcare Systems	Brewer, ME
EMH Regional Healthcare System	Elyria, OH
Emory Healthcare	Atlanta, GA

* Winners are listed in boldface text.

HEALTH SYSTEM	LOCATION
Essent Healthcare Inc.	Nashville, TN
Essentia Health	Duluth, MN
Excela Health	Greensburg, PA
Exempla Healthcare	Denver, CO
Fairview Health Services	Minneapolis, MN
FirstHealth of the Carolinas	Pinehurst, NC
Forum Health	Youngstown, OH
Franciscan Missionaries of Our Lady Health	Orange, 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	Nashville, TN
Health Alliance of Greater Cincinnati	Cincinnati, OH
Health Alliance of the Hudson Valley	Kingston, NY
Health First	Rockledge, FL
Health Management Associates	Naples, FL
Health Quest System	Poughkeepsie, NY
HealthEast Care System	Saint Paul, MN
Healthgroup of Alabama	Huntsville, AL
Healthplus	Los Angeles, CA
Henry Ford Health System	Detroit, MI
Heritage Valley Health System	Beaver, PA
HighPoint Health System	Gallatin, TN
Hospital Partners of America	Charlotte, NC
Hospital Sisters Health System	Springfield, IL
IASIS Healthcare	Franklin, TN
Infirmity Health System	Mobile, AL
InMed Group Inc.	Montgomery, AL
Inova Health System	Falls Church, VA
Integrated Healthcare Holding Inc.	Santa Ana, CA
Integrus Health	Oklahoma City, OK
Intermountain Health Care	Salt Lake City, UT
Iowa Health System	Des Moines, IA
Jefferson Health System	Radnor, PA
Jewish Hospital & St Marys Healthcare	Louisville, KY
John C. Lincoln Health Network	Phoenix, AZ
John D. Archbold Memorial Hospital	Thomasville, GA

* Winners are listed in boldface text.

HEALTH SYSTEM	LOCATION
John Muir Health	Walnut Creek, CA
Kaiser Foundation Hospitals	Oakland, 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
Liberty Health	Jersey City, NJ
LifePoint Hospitals Inc.	Brentwood, IN
Lifespan Corporation	Providence, RI
Los Angeles County-Department of Health Services	Los Angeles, CA
Loyola University Health System	Maywood, IL
LSU Health System	Baton Rouge, LA
MaineHealth	Portland, ME
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 System	Springfield, IL
Memorial Health System of East Texas	Lufkin, TX
Memorial Healthcare System	Hollywood, FL
Memorial Hermann Healthcare System	Houston, TX
Memorialcare Health System	Fountain Valley, CA
Mercy Health System	Philadelphia, PA
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 Inc.	Asheville, NC
Mississippi Baptist Health System	Jackson, MS
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

* Winners are listed in boldface text.

HEALTH SYSTEM	LOCATION
NorthShore University HealthSystem	Evanston, IL
Northside Hospital	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	Columbus, OH
Orlando Regional Healthcare	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 Care Inc.	Fort Collins, CO
Premier Health Partners	Dayton, OH
Presbyterian Healthcare Services	Albuquerque, NM
Prime Healthcare Services Inc.	Wildomar, CA
ProHealth Care Inc.	Waukesha, WI
ProMedica Health System	Toledo, OH
Provena Health	Mokena, IL
Providence Health & Services	Renton, WA
Regional Health	Rapid City, SD
Renaissance Healthcare Systems Inc.	Houston, TX
Renown Health	Reno, NV
Resurgence Health Group LLC	Sugar Hill, GA
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 Catherine Healthcare	Ashland, PA
Saint Francis Health System	Tulsa, OK
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

* Winners are listed in boldface text.

HEALTH SYSTEM	LOCATION
Sentara Healthcare	Norfolk, VA
Shands HealthCare	Gainesville, FL
Sharp Healthcare Corporation	San Diego, CA
Signature Hospital Corporation	Houston, TX
Sisters of Charity of Leavenworth Health System	Lenexa, KS
Sisters of Charity of St Augustine	Cleveland, OH
Sisters of Mercy Health System	Chesterfield, MO
Sisters of St Francis Health Services	Mishawaka, IN
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
Spectrum Health	Grand Rapids, MI
SSM Health Care	Saint Louis, MO
St John Health System (OK)	Tulsa, OK
St Johns Health System	Springfield, MO
St Johns Mercy Health Care	St. Louis, MO
St Joseph Health System	Orange, CA
St Joseph/Candler Health System	Savannah, GA
St Luke Hospitals St. Elizabeth Healthcare	Fort Thomas, KY
St Lukes Episcopal Health System	Houston, TX
St. Joseph's Healthcare System	Pateson, NJ
St. Lukes Regional Health System	Boise, ID
Steward Health Care System (formerly Caritas Christi)	Boston, MA
Strong Memorial Hospital	Rochester, NY
Success Health	Boca Raton, FL
Summa Health system	Akron, OH
Summit Health	Chambersburg, PA
SunLink Health Systems	Atlanta, GA
Sutter Health	Sacramento, CA
Tanner Health System	Carrollton, GA
Temple University Health System	Philadelphia, PA
Tenet Healthcare Corporation	Dallas, TX
Texas Health Presbyterian	Dallas, TX
Texas Health Resources	Arlington, TX
The Methodist Hospital	Houston, TX
ThedaCare	Appleton, WI
Trinity Health	Novi, MI
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

* Winners are listed in boldface text.

HEALTH SYSTEM	LOCATION
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 Missouri Health Care	Columbia, MO
University of North Carolina Health	Chapel Hill, NC
University of Pennsylvania Health System	Philadelphia, PA
University of Pittsburgh Medical Center	Pittsburgh, PA
University of Texas System	Austin, TX
Valley Baptist Health System	Harlingen, TX
Valley Health System	Winchester, VA
Valley Health System (CA)	Hemet, CA
Vanguard Health Systems	Nashville, TN
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	Wheaton, IA
Wheeling Hospital	Wheeling, WV
Wuesthoff Memorial Hospital	Rockledge, FL
Yale New Haven Health Services	New Haven, CT

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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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