



100 TOP HOSPITALS

15 Top Health Systems Study

5th Edition
April 15, 2013

TRUVEN HEALTH ANALYTICS 

**100 TOP
HOSPITALS**

TRUVEN 
HEALTH ANALYTICS™

Truven Health Analytics
777 E. Eisenhower Parkway
Ann Arbor, MI 48108 USA
+1.800.366.7526

Truven Health 15 Top Health Systems, 2013 Study
100 Top Hospitals is a registered trademark of Truven Health Analytics.

©2013 Truven Health Analytics Inc.
All rights reserved.
Printed and bound in the United States of America

The information contained in this publication is intended to serve as a guide for general comparisons and evaluations, but not as the sole basis upon which any specific conduct is to be recommended or undertaken. The reader bears sole risk and responsibility for any analysis, interpretation, or conclusion based on the information contained in this publication, and Truven Health Analytics shall not be responsible for any errors, misstatements, inaccuracies, or omissions contained herein. No part of this publication may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying, recording, or by any information storage and retrieval system, without permission in writing from Truven Health Analytics.

ISBN 978-1-57372-461-6

Table of Contents

Identifying Industry Leaders With System-Wide	
Data Analysis.....	1–3
The 15 Top Health Systems.....	2
The 100 Top Hospitals Program	3
About Truven Health Analytics	3
Findings	5–11
Winner Versus Peer Results.....	6–8
Winning Health System Results.....	9
Top and Bottom Quintile Results.....	10
Methodology.....	11–21
Building the Database of Health Systems	11–13
Identifying Health Systems	13–14
Classifying Health Systems Into Comparison Groups.....	14
Scoring Health Systems on Weighted Performance Measures... ..	14–16
Performance Measures Details	16–20
Determining the 15 Top Health Systems	21
Winners Through The Years	23
Appendix A: Health System Winners and	
Their Hospitals.....	25–27
Appendix B: The Top Quintile: Best-Performing Systems... ..	29–30
Appendix C: Methodology Details	31–41
Methods for Identifying Complications of Care	31–36
Core Measures.....	36–37
30-Day Risk-Adjusted Mortality Rates	
and 30-Day Risk-Adjusted Readmission Rates.....	38
HCAHPS Overall Hospital Rating	38–40
Length of Stay Methodologies.....	40
Performance Measure Normalization	41
Why We Have Not Calculated Percent Change in	
Specific Instances	41
Protecting Patient Privacy	41
Appendix D: All Health Systems in Study	43–50
References.....	51–53

Identifying Industry Leaders With System-Wide Data Analysis

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.

Truven Health 15 Top Health Systems is the only study that aggregates individual hospital performance into system-level data. Building on the Truven Health 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 health systems and 2,200 member 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 15 Top Health Systems, placed into size categories by total operating expense, are:

Large Health Systems (>\$1.5 billion)	Location
Advocate Health Care	Oak Brook, IL
Banner Health	Phoenix, AZ
Memorial Hermann Healthcare System	Houston, TX
OhioHealth	Columbus, OH
Scripps Health	San Diego, CA

Medium Health Systems (\$750 million - \$1.5 billion)	Location
Alegent Creighton Health	Omaha, NE
Exempla Healthcare	Denver, CO
Mission Health	Asheville, NC
Prime Healthcare Services	Ontario, CA
TriHealth	Cincinnati, OH

Small Health Systems (<\$750 million)	Location
Asante	Medford, OR
Cape Cod Healthcare	Hyannis, MA
Mercy Health Southwest Ohio Region	Cincinnati, OH
Poudre Valley Health System	Fort Collins, CO
Roper St. Francis Healthcare	Charleston, SC

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

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.²⁻²⁴

The 100 Top Hospitals Program

For 20 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 Truven Health Analytics

Truven Health Analytics delivers unbiased information, analytic tools, benchmarks, and services to the healthcare industry. Hospitals, government agencies, employers, health plans, clinicians, pharmaceutical, and medical device companies have relied on us for more than 30 years. We combine our deep clinical, financial, and healthcare management expertise with innovative technology platforms and information assets to make healthcare better by collaborating with our customers to uncover and realize opportunities for improving quality, efficiency, and outcomes. With more than 2,000 employees globally, we have major offices in Ann Arbor, Mich.; Chicago; and Denver. Advantage Suite, Micromedex, ActionOI, MarketScan, and 100 Top Hospitals are registered trademarks or trademarks of Truven Health Analytics.

Findings

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 is a 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.

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 divide 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 3-percent fewer deaths than expected, considering patient severity, while their nonwinning peers had as many deaths as expected (Table 1).
- Mortality rate results were consistent among the health system size grouping.

The top health systems have fewer patient complications.

- Patients treated at the winning systems' member hospitals had fewer complications. Their rates were 3-percent lower than at nonwinning system hospitals.
- Results were fairly consistent among the health system size groupings, but small health systems had the lowest complication rates and outperformed their peers by the widest margin. Hospitals in these winning systems had 5-percent fewer complications than expected, while their peers had as many as expected (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 small* winning systems outperformed their peers by the widest margin in the 30-day measures (Table 4).

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 0.93 tells us that winning systems had 7-percent fewer adverse patient safety events than expected; their peers had as many adverse events as expected.
- The winning systems' higher core measures mean percentage of 97.63 tells us that they used recommended core measures of care more consistently than did their peers.
- Winning medium and small* systems had the best patient safety index scores (Table 3 and 4).
- 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 4.49 days, nearly half a day shorter than their peers' median of 5.06 days.
- The winning small* systems had the shortest ALOS — 4.5 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 Hospital Consumer Assessment of Health Plans Survey (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.

* As defined by total operating expense of the member hospitals. See page 16 for details.

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	0.97	1.00	-0.03	-3.4%	lower mortality
Complications Index ¹	0.97	1.00	-0.03	-2.6%	lower complications
Patient Safety Index ²	0.93	1.00	-0.07	-7.4%	better patient safety
Core Measures Mean Percent ³	97.63	96.54	1.09	n/a ⁶	better core measure performance
30-Day Mortality Rate for AMI (%) ⁴	14.52	15.10	-0.58	n/a ⁶	lower 30-day mortality
30-Day Mortality Rate for HF (%) ⁴	11.25	11.42	-0.17	n/a ⁶	lower 30-day mortality
30-Day Mortality Rate for Pneumonia (%) ⁴	11.01	11.74	-0.73	n/a ⁶	lower 30-day mortality
30-Day Readmission Rate for AMI (%) ⁴	19.55	19.71	-0.16	n/a ⁶	lower 30-day readmissions
30-Day Readmission Rate for HF (%) ⁴	23.55	24.56	-1.00	n/a ⁶	lower 30-day readmissions
30-Day Readmission Rate for Pneumonia (%) ⁴	18.13	18.62	-0.49	n/a ⁶	lower 30-day readmissions
Average Length of Stay (days) ⁵	4.49	5.06	-0.57	-11.3%	shorter ALOS
HCAHPS Score ³	266.0	260.0	6.0	2.3%	higher patient rating of hospital care

1. Mortality, complications, and average length of stay based on Present-on-Admission (POA)-enabled risk models applied to MedPAR 2010 and 2011 data.

2. PSI based on AHRQ POA-enabled risk models applied to MedPAR 2010 and 2011 data. Ten PSIs included; see Appendix C for list.

3. Core Measures and HCAHPS data from CMS Hospital Compare 2012 Q3 data. See Appendix C for included core measures.

4. 30-day rates from CMS Hospital Compare data set, July 1, 2008–June 30, 2011. Includes heart attack, heart failure, and pneumonia 30-day rates.

5. Average length of stay based on Present-on-Admission (POA)-enabled risk models applied to MedPAR 2011 data.

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

Note: Measure values are rounded for reporting, which may cause calculated differences to appear off.

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	0.97	1.00	-0.03	-3.3%	lower mortality
Complications Index ¹	0.97	1.00	-0.03	-2.7%	lower complications
Patient Safety Index ²	0.98	1.00	-0.02	-1.8%	better patient safety
Core Measures Mean Percent ³	98.4	97.1	1.32	n/a ⁶	better core measure performance
30-Day Mortality Rate for AMI (%) ⁴	14.7	14.8	-0.17	n/a ⁶	lower 30-day mortality
30-Day Mortality Rate for HF (%) ⁴	10.7	11.4	-0.65	n/a ⁶	lower 30-day mortality
30-Day Mortality Rate for Pneumonia (%) ⁴	11.2	11.7	-0.49	n/a ⁶	lower 30-day mortality
30-Day Readmission Rate for AMI (%) ⁴	18.6	19.6	-0.99	n/a ⁶	lower 30-day readmissions
30-Day Readmission Rate for HF (%) ⁴	24.5	24.8	-0.30	n/a ⁶	lower 30-day readmissions
30-Day Readmission Rate for Pneumonia (%) ⁴	18.8	18.8	0.02	n/a ⁶	lower 30-day readmissions
Average Length of Stay (days) ⁵	4.6	5.1	-0.44	-8.7%	shorter ALOS
HCAHPS Score ³	265.2	260.2	5.0	1.9%	higher patient rating of hospital care

1. Mortality, complications, and average length of stay based on Present-on-Admission (POA)-enabled risk models applied to MedPAR 2010 and 2011 data.

2. PSI based on AHRQ POA-enabled risk models applied to MedPAR 2010 and 2011 data. Ten PSIs included; see Appendix C for list.

3. Core Measures and HCAHPS data from CMS Hospital Compare 2012 Q3 data. See Appendix C for included core measures.

4. 30-day rates from CMS Hospital Compare data set, July 1, 2008–June 30, 2011. Includes heart attack, heart failure, and pneumonia 30-day rates.

5. Average length of stay based on Present-on-Admission (POA)-enabled risk models applied to MedPAR 2011 data.

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

Note: Measure values are rounded for reporting, which may cause calculated differences to appear off.

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	0.97	1.00	-0.03	-3.4%	lower mortality
Complications Index ¹	0.98	1.00	-0.02	-1.6%	lower complications
Patient Safety Index ²	0.89	1.01	-0.12	-11.6%	better patient safety
Core Measures Mean Percent ³	97.7	96.8	0.98	n/a ⁶	better core measure performance
30-Day Mortality Rate for AMI (%) ⁴	14.4	15.2	-0.78	n/a ⁶	lower 30-day mortality
30-Day Mortality Rate for HF (%) ⁴	11.2	11.3	-0.04	n/a ⁶	lower 30-day mortality
30-Day Mortality Rate for Pneumonia (%) ⁴	10.9	11.7	-0.75	n/a ⁶	lower 30-day mortality
30-Day Readmission Rate for AMI (%) ⁴	19.9	19.7	0.22	n/a ⁶	lower 30-day readmissions
30-Day Readmission Rate for HF (%) ⁴	23.6	24.5	-0.81	n/a ⁶	lower 30-day readmissions
30-Day Readmission Rate for Pneumonia (%) ⁴	18.1	18.7	-0.56	n/a ⁶	lower 30-day readmissions
Average Length of Stay (days) ⁵	4.7	5.0	-0.32	-6.4%	shorter ALOS
HCAHPS Score ³	266.5	261.5	5.0	1.9%	higher patient rating of hospital care

1. Mortality, complications, and average length of stay based on Present-on-Admission (POA)-enabled risk models applied to MedPAR 2010 and 2011 data.

2. PSI based on AHRQ POA-enabled risk models applied to MedPAR 2010 and 2011 data. Ten PSIs included; see Appendix C for list.

3. Core Measures and HCAHPS data from CMS Hospital Compare 2012 Q3 data. See Appendix C for included core measures.

4. 30-day rates from CMS Hospital Compare data set, July 1, 2008–June 30, 2011. Includes heart attack, heart failure, and pneumonia 30-day rates.

5. Average length of stay based on Present-on-Admission (POA)-enabled risk models applied to MedPAR 2011 data.

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

Note: Measure values are rounded for reporting, which may cause calculated differences to appear off.

Table 4: Small 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	0.97	1.00	-0.03	-3.5%	lower mortality
Complications Index ¹	0.95	1.00	-0.05	-4.7%	lower complications
Patient Safety Index ²	0.89	1.00	-0.12	-11.8%	better patient safety
Core Measures Mean Percent ³	97.2	96.0	1.22	n/a ⁶	better core measure performance
30-Day Mortality Rate for AMI (%) ⁴	14.6	15.3	-0.72	n/a ⁶	lower 30-day mortality
30-Day Mortality Rate for HF (%) ⁴	11.3	11.5	-0.29	n/a ⁶	lower 30-day mortality
30-Day Mortality Rate for Pneumonia (%) ⁴	10.5	11.9	-1.42	n/a ⁶	lower 30-day mortality
30-Day Readmission Rate for AMI (%) ⁴	18.5	19.8	-1.27	n/a ⁶	lower 30-day readmissions
30-Day Readmission Rate for HF (%) ⁴	22.7	24.4	-1.67	n/a ⁶	lower 30-day readmissions
30-Day Readmission Rate for Pneumonia (%) ⁴	17.2	18.5	-1.32	n/a ⁶	lower 30-day readmissions
Average Length of Stay (days) ⁵	4.5	5.1	-0.65	-12.7%	shorter ALOS
HCAHPS Score ³	268.0	258.2	9.8	3.8%	higher patient rating of hospital care

1. Mortality, complications, and average length of stay based on Present-on-Admission (POA)-enabled risk models applied to MedPAR 2010 and 2011 data.

2. PSI based on AHRQ POA-enabled risk models applied to MedPAR 2010 and 2011 data. Ten PSIs included; see Appendix C for list.

3. Core Measures and HCAHPS data from CMS Hospital Compare 2012 Q3 data. See Appendix C for included core measures.

4. 30-day rates from CMS Hospital Compare data set, July 1, 2008–June 30, 2011. Includes heart attack, heart failure, and pneumonia 30-day rates.

5. Average length of stay based on Present-on-Admission (POA)-enabled risk models applied to MedPAR 2011 data.

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

Note: Measure values are rounded for reporting, which may cause calculated differences to appear off.

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 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	Mortality Index	Complications Index	Patient Safety Index	Core Measures Mean Percent	30-Day Mortality Rate for AMI (%)	30-Day Mortality Rate for HF (%)	30-Day Mortality Rate for Pneumonia (%)	30-Day Readmission Rate for AMI (%)	30-Day Readmission Rate for HF (%)	30-Day Readmission Rate for Pneumonia (%)	Average Length of Stay	HCAHPS Score
Advocate Health Care	0.97	0.95	0.97	98.4	14.7	10.7	11.6	20.7	25.7	19.0	4.7	260.4
Alegent Creighton Health	1.00	0.99	0.93	98.7	15.2	12.2	12.9	19.9	23.6	18.0	4.8	271.9
Asante	0.98	0.94	0.81	97.1	16.5	13.5	12.2	16.1	20.7	16.6	4.4	264.5
Banner Health	0.96	1.00	0.94	97.2	14.3	11.3	11.0	20.2	25.4	18.6	4.4	265.2
Cape Cod Healthcare	0.97	1.02	0.79	97.2	14.2	11.9	9.6	19.9	22.7	17.6	4.5	268.0
Exempla Healthcare	0.93	1.01	0.97	97.4	13.3	11.2	9.1	21.0	21.4	18.1	4.4	270.3
Memorial Hermann Healthcare System	0.96	0.95	1.08	98.1	16.5	10.5	11.2	18.3	23.1	15.7	4.7	264.8
Mercy Health Southwest Ohio Region	0.93	0.95	0.89	97.4	14.6	11.3	12.4	20.2	25.2	19.7	4.5	259.5
Mission Health	1.01	0.97	0.87	97.7	14.5	13.7	10.9	19.5	21.3	17.5	5.0	266.3
OhioHealth	0.98	0.97	0.99	98.6	17.1	11.8	12.3	18.6	24.5	19.8	4.4	265.8
Poudre Valley Health System	0.96	0.99	0.91	96.9	13.9	10.9	10.4	17.2	22.7	17.1	4.0	278.5
Prime Healthcare Services	0.94	0.89	0.72	97.8	14.4	8.9	9.6	20.8	25.4	18.6	4.0	247.5
Roper St. Francis Healthcare	0.99	0.91	0.93	97.3	16.2	10.5	10.5	18.5	22.2	17.2	5.0	277.3
Scripps Health	0.97	0.99	0.98	98.5	14.1	10.0	10.6	18.2	23.6	18.8	4.6	266.0
TriHealth	0.97	0.98	0.89	97.6	14.1	11.1	11.7	19.6	25.3	21.4	4.7	266.5
Bench Median	0.97	0.97	0.93	97.6	14.5	11.2	11.0	19.6	23.6	18.1	4.5	266.0
Peer Median	1.00	1.00	1.00	96.5	15.1	11.4	11.7	19.7	24.6	18.6	5.1	260.0

1. Mortality and complications based on two years of POA coded MedPAR 2010 and 2011 data.
2. PSI based on AHRQ POA-enabled risk models applied to MedPAR 2010 and 2011 data. Ten PSIs included.
3. Core Measures and HCAHPS based on CMS Hospital Compare 2012 Q3 data. ALOS based on MedPAR 2011 data
4. 30-day rates from CMS Hospital Compare data set, July 1, 2008–June 30, 2011. Includes heart attack, heart failure, and pneumonia 30-day rates.
5. Based on national norms, ratings greater than 1.0 indicate more adverse events than expected; ratings less than 1.0 indicate fewer.
6. Arithmetic mean of the heart attack, heart failure, and pneumonia 30-day rates.

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 — lower mortality and complications rates
- Provide higher-quality care — they follow accepted care protocols (core measures) more closely and have approximately 14-percent fewer patient safety incidents
- Have fewer 30-day mortalities and readmissions for heart attack, heart failure, and pneumonia patients
- Are more efficient, releasing patients nearly a full day sooner than the lowest performers
- Score nearly 11 points higher on the HCAHPS overall patient rating of care. This difference is telling – because CMS calculates the HCAHPS score using three years of data, it is particularly difficult for systems to show improvement in this measure.

Table 6: Comparison 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	0.98	1.02	-0.03	3.4%	Lower mortality
Complications Index ²	0.98	1.00	-0.02	2.1%	Fewer complications
Patient Safety Index ³	0.94	1.08	-0.14	12.6%	Fewer patient safety incidents
Core Measures Mean Percent ⁴	97.5	95.6	1.9	n/a ⁷	Higher core measures compliance
30-Day Mortality Rate for AMI (%) ⁵	14.9	15.4	-0.5	n/a ⁷	Lower 30-day mortality
30-Day Mortality Rate for HF (%) ⁵	11.4	11.5	-0.1	n/a ⁷	Lower 30-day mortality
30-Day Mortality Rate for Pneumonia (%) ⁵	11.6	12.2	-0.6	n/a ⁷	Lower 30-day mortality
30-Day Readmission Rate for AMI (%) ⁵	19.1	20.1	-1.1	n/a ⁷	Lower 30-day readmissions
30-Day Readmission Rate for HF (%) ⁵	23.9	25.3	-1.3	n/a ⁷	Lower 30-day readmissions
30-Day Readmission Rate for Pneumonia (%) ⁵	18.1	19.1	-1.0	n/a ⁷	Lower 30-day readmissions
Average Length of Stay (days) ⁶	4.6	5.5	-0.9	15.6%	Shorter average length of stay
HCAHPS Score ⁴	265.4	254.6	10.8	4.2%	Higher patient rating of care

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

2. Mortality and complications based on Present-on-Admission (POA)-enabled risk models applied to MedPAR 2010 and 2011 data.

3. PSI based on AHRQ POA-enabled risk models applied to MedPAR 2010 and 2011 data. Ten PSIs included; see Appendix C for list.

4. Core Measures and HCAHPS data from CMS Hospital Compare 2011 data set. See Appendix C for included core measures.

5. 30-day rates from CMS Hospital Compare data set, July 1, 2008–June 30, 2011. Includes heart attack, heart failure, and pneumonia 30-day rates.

6. Average length of stay based on Present-on-Admission (POA)-enabled risk models applied to MedPAR 2011 data.

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

Note: Measure values are rounded for reporting, which may cause calculated differences to appear off.

Methodology

The Truven Health 15 Top Health Systems study is the latest addition to the Truven Health 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; as well as cardiac, orthopedic, women's, 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 health systems, including special selection and exclusion criteria
- Identifying which hospitals are members of health systems
- Aggregating the patient-level data from member hospitals 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 — five 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 100tophospitals@truvenhealth.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 data to calculate mortality, complications, patient safety, and length of stay by aggregating member hospital data to the health system level. The MedPAR dataset contains information on the approximately 14 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 — 2010 and 2011 — which include Medicare HMO encounters.²⁵

We used the 2011 CMS Hospital Compare dataset published in the third quarter of 2012 for core measures, 30-day mortality rates, 30-day readmission rates, and HCAHPS patient perception of care data.²⁶

We also used the hospital-specific “home office” or “related organization” identification filed by hospitals on the 2011 Medicare Cost Report, published in the federal Hospital Cost Report Information System (HCRIS) third quarter 2012 dataset, to create our proprietary database for determining system membership. We obtained hospital classification information about bed size and number of residents and fellows from the Medicare cost report. This year, since a number of hospitals filed late due to the change in cost report format requirements and the late availability of the new software, we used the 2010 cost reports when the 2011 reports were missing.

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.

Severity-Adjustment Models and Present-on-Admission Data

Truven Health proprietary severity-adjustment models for mortality, complications, and length of stay (LOS) have been recalibrated using three years of MedPAR data to take advantage of available present-on-admission (POA) data that were reported in the 2009, 2010, and 2011 MedPAR data sets. In addition, the hospital characteristics factors were dropped, as analysis indicated they did not contribute to improved model performance.

The improved severity adjustment models were used in producing the risk-adjusted mortality and complications indexes, based on two years of MedPAR data (2010 and 2011); and the severity-adjusted LOS, based on MedPAR 2011.

In addition, the Agency for Healthcare Research and Quality (AHRQ) Patient Safety Indicator risk models also take into account POA. Under the Deficit Reduction Act of 2005, as of federal fiscal year 2008, hospitals receive reduced payment for cases with certain conditions — like falls, surgical site infections, and pressure ulcers — that were not present on the patient's admission but occurred during their hospitalization. As a result, CMS now requires all inpatient prospective payment system hospitals to document whether a patient has these conditions when admitted.

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

* The Medicare cost report format requirement was changed from 2552-96 to 2552-10.

Hospitals Excluded

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; psychiatric; substance abuse; rehabilitation; cancer; and long-term, acute-care)
- 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 2011
- Hospitals with no reported Medicare patient deaths in FFY 2011
- Cardiac, orthopedic, and women’s 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

After all exclusions were applied, 2,254 individual hospitals were included in the study.

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 substituted the median 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, orthopedic, and women’s 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’ 2011 (or 2010) Medicare cost reports.

We 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 328 health systems with the following profile:

The final study group contained:

System Category	Systems	Member Hospitals	Patient Discharges, 2011	Average Hospitals per System	Average Discharges per System
Winning Systems	15	96	395,745	6.4	26,383
Nonwinning Systems	313	2,513	8,390,125	8.0	26,806
Total Systems	328	2,609	8,785,870	8.0	26,786

Classifying Health Systems into Comparison Groups

Health System Comparison Groups

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	100	5
Medium	\$750 million–\$1.5 billion	95	5
Small	< \$750 million	133	5
Total Systems	n/a	328	15

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.²⁷ 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.²⁶

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 important if a health system is to improve performance. 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 Measure Details

Risk-Adjusted Mortality Index (In-Hospital)			
Rationale	Calculation	Ranking	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 2010 and 2011 for all hospitals in each system, divided by the number expected, given the risk of death for each patient. We normalize the system-level expected values using the observed-to-expected ratio for in-study health systems. Separate normalization factors are calculated for each system 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). 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. 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 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).^{28, 29} 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 (2010 and 2011) to reduce the influence of chance fluctuation.</p>	<p>Lower</p>

Risk-Adjusted Complications Index

Rationale	Calculation	Ranking	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 during his or her hospital stay, considering what would be expected based on patient characteristics and their condition on admission. 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 2010 and 2011 for all hospitals in each system, divided by the number expected, given the risk of complications for each patient. We normalize the system-level expected values using the observed-to-expected ratio for in-study health systems. We calculate separate normalization factors for each system comparison group. Conditions that were present on admission are not counted as observed complications.</p> <p>This measure is based on our proprietary, complications risk-adjustment model, which is designed to predict the likelihood of a complication occurring during hospitalization. This model accounts for patient-level characteristics (age, sex, principal diagnosis, comorbid conditions, and other characteristics). 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).^{28, 29} 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 (2010 and 2011) to reduce the influence of chance fluctuation.</p>	<p>Lower</p>

Risk-Adjusted Patient Safety Index

Rationale	Calculation	Ranking	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 2010 and 2011, 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 system-level expected values for each PSI using the observed-to-expected ratio for in-study health systems. Separate normalization factors are calculated for each system comparison group. We applied the hospital-level AHRQ PSI risk models to the 2010 and 2011 MedPAR acute-care data to adjust for risk.²⁷ 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).^{28, 29}</p> <p>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. We used two years of MedPAR data (2010 and 2011) to reduce the influence of chance fluctuation.</p>	<p>Lower</p>

Core Measures Mean Percent

Rationale	Calculation	Ranking	Favorable Values Are
<p>Core measures were developed by the National Quality Forum as minimum basic standards of care. 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>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 third quarter of 2012. This contains data from January 1 through December 31, 2011. Because of low reporting, we excluded certain core measures for small community hospitals. For a list of the measures used and those excluded, please see Appendix C.</p>	<p>For each health system, we calculated the arithmetic mean of the calculated system-level core measure percent values. We rank health systems on the mean core measure percent.</p>	<p>Higher</p>

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

Rationale	Calculation	Ranking	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 (fewer than 25).) We aggregate these data to produce a rate for each patient 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>Data are from the CMS Hospital Compare dataset for the third quarter of 2012. This contains data from July 1, 2008, through June 30, 2011. For more information about this dataset, see Appendix C.</p>	<p>CMS does not calculate rates for hospitals where the number of cases is too small (fewer than 25). If a health system has no available hospital rates, we substitute the comparison group-specific median rate for the affected 30-day readmission measure.</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>Lower</p>

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

Rationale	Calculation	Ranking	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 (fewer than 25).) We aggregate these data to produce a rate for each patient 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>Data are from the CMS Hospital Compare dataset for the third quarter of 2012. This contains data from July 1, 2008, through June 30, 2011. For more information about this dataset, see Appendix C.</p>	<p>CMS does not calculate rates for hospitals where the number of cases is too small (fewer than 25). If a health system has no available hospital rates, we substitute the comparison group-specific median rate for the affected 30-day readmission measure.</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>Lower</p>

Severity-Adjusted Average Length of Stay

Rationale	Calculation	Ranking	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 using the observed-to-expected ratio for in-study health systems. We calculate separate normalization factors for each system 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 systems. 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 2011. 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	Ranking	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.</p> <p>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>Data are from CMS Hospital Compare third quarter 2012 database. This database contains the HCAHPS results for data period January 1 through December 31, 2011.</p>	<p>We rank health systems on their mean weighted HCAHPS score. 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 member 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>Higher</p>

Summary of Measure Data Sources and Data Periods

Scorecard Measure	Data Source/Data Period
Risk-Adjusted Mortality Index	MedPAR FFY 2010 and 2011
Risk-Adjusted Complications Index	MedPAR FFY 2010 and 2011
Risk-Adjusted Patient Safety Index	MedPAR FFY 2010 and 2011
Core Measures Mean Percent	CMS Hospital Compare, 3rd quarter 2012 release (January 1–December 31, 2011 dataset)
30-Day Mortality Rate (AMI, Heart Failure, Pneumonia)	CMS Hospital Compare, 3rd quarter 2012 release (July 1, 2008–June 30, 2011 dataset)
30-Day Readmission Rate (AMI, Heart Failure, Pneumonia)	CMS Hospital Compare, 3rd quarter 2012 release (July 1, 2008–June 30, 2011 dataset)
Severity-Adjusted Average Length of Stay	MedPAR FFY 2011
HCAHPS Score	CMS Hospital Compare, 3rd quarter 2012 (January 1–December 31, 2011 dataset)

Determining the 15 Top Health Systems

Ranking

We ranked health systems on the basis of their performance on each of the included measures relative to the other in-study systems, by comparison group. We then weighted each measure rank, as indicated in the table below, summed the weighted ranks, 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

We identified health systems with observed mortality that was statistically worse than expected (95-percent confidence). These health systems were excluded from consideration when selecting benchmark (winner) systems. Also, health systems with missing 30-day mortality or 30-day readmission data were not eligible to be named winners.

Truven Health Policy on Revocation of a 100 Top Hospitals Award

To preserve the integrity of the study, it is the policy of Truven Health 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 Truven Health, the circumstances under which a 100 Top Hospitals award could be revoked include, but are not limited to, the following:

1. Discovery by Truven Health 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 Years [†]				
			2008	2009	2011	2012	2013
Advocate Health Care	Oak Brook, IL	4	•	•	•		•
OhioHealth	Columbus, OH	4	•	•	•		•
Banner Health	Phoenix, AZ	3		•		•	•
Prime Healthcare Services	Ontario, CA	3	•			•	•
Cape Cod Healthcare	Hyannis, MA	2			•		•
Memorial Hermann Healthcare System	Houston, TX	2				•	•
Mission Health	Asheville, NC	2				•	•
Poudre Valley Health System	Fort Collins, CO	2				•	•
Scripps Health	San Diego, CA	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		•	•		
Spectrum Health	Grand Rapids, MI	2		•	•		
University Hospitals	Cleveland, OH	2	•	•			
Alegent Creighton Health	Omaha, NE	1					•
Asante	Medford, OR	1					•
Exempla Healthcare	Denver, CO	1					•
Mercy Health Southwest Ohio Region	Cincinnati, OH	1					•
Roper St. Francis Healthcare	Charleston, SC	1					•
TriHealth	Cincinnati, OH	1					•
Baptist Health	Montgomery, AL	1				•	
Baystate Health	Springfield, 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				•	
NorthShore University HealthSystem	Evanston, IL	1			•		
Partners HealthCare	Boston, MA	1			•		
Saint Joseph Regional Health System	Mishawaka, IN	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.

[†] Due to renaming of the studies to better align with the year in which they were produced, there was no "2010" study.

Appendix A: Health System Winners and Their Member Hospitals*

Health System/Hospital Name	Location	Hospital Medicare ID
Advocate Healthcare		
Oak Brook, IL		
Advocate Christ Medical Center	Oak Lawn, IL	140208
Advocate Condell Medical Center	Libertyville, IL	140202
Advocate Eureka Hospital	Eureka, IL	141309
Advocate Good Samaritan Hospital	Downers Grove, IL	140288
Advocate Good Shepherd Hospital	Barrington, IL	140291
Advocate Illinois Masonic Medical Center	Chicago, IL	140182
Advocate Lutheran General Hospital	Park Ridge, IL	140223
Advocate South Suburban Hospital	Hazel Crest, IL	140250
Advocate Trinity Hospital	Chicago, IL	140048
Brommen Healthcare	Normal, IL	140127
Alegent Creighton Health		
Omaha, NE		
Alegent Health Bergan Mercy Medical Center	Omaha, NE	280060
Alegent Health Community Memorial Hospital	Missouri Valley, IA	161309
Alegent Health Lakeside Hospital	Omaha, NE	280130
Alegent Health Memorial Hospital	Schuyler, NE	281323
Alegent Health Mercy Hospital	Council Bluffs, IA	160028
Alegent Health Mercy Hospital	Corning, IA	161304
Alegent Health Midlands Hospital	Papillion, NE	280105
Immanuel Medical Center	Omaha, NE	280081
Memorial Community Hospital	Blair, NE	281359
Asante		
Medford, OR		
Asante Rogue Regional Medical Center	Medford, OR	380018
Asante Three Rivers Medical Center	Grants Pass, OR	380002
Banner Health		
Phoenix, AZ		
Banner Baywood Medical Center	Mesa, AZ	030088
Banner Boswell Medical Center	Sun City, AZ	030061
Banner Churchill Community Hospital	Fallon, NV	290006
Banner Del E Webb Medical Center	Sun City West, AZ	030093
Banner Desert Medical Center	Mesa, AZ	030065
Banner Estrella Medical Center	Phoenix, AZ	030115
Banner Gateway Medical Center	Gilbert, AZ	030122
Banner Good Samaritan Medical Center	Phoenix, AZ	030002
Banner Heart Hospital	Mesa, AZ	030105
Banner Ironwood Medical Center	San Tan Valley, AZ	030130
Banner Lassen Medical Center	Susanville, CA	051320
Banner Thunderbird Medical Center	Glendale, AZ	030089
Community Hospital	Torrington, WY	531307
East Morgan County Hospital District	Brush, CO	061303
Fairbanks Memorial Hospital	Fairbanks, AK	020012

* Winning systems are ordered alphabetically. Member hospitals are ordered alphabetically.

Health System/Hospital Name	Location	Hospital Medicare ID
McKee Medical Center	Loveland, CO	060030
North Colorado Medical Center	Greeley, CO	060001
Ogallala Community Hospital	Ogallala, NE	281355
Page Hospital	Page, AZ	031304
Platte County Memorial Hospital	Wheatland, WY	531305
Sterling Regional MedCenter	Sterling, CO	060076
Washakie Medical Center	Worland, WY	531306
Cape Cod Healthcare	Hyannis, MA	
Cape Cod Hospital	Hyannis, MA	220012
Falmouth Hospital	Falmouth, MA	220135
Exempla Healthcare	Denver, CO	
Exempla Good Samaritan Medical Center	Lafayette, CO	060116
Exempla Lutheran Medical Center	Wheat Ridge, CO	060009
Exempla Saint Joseph Hospital	Denver, CO	060028
Memorial Hermann Healthcare System	Houston, TX	
Memorial Hermann Hospital System	Houston, TX	450184
Memorial Hermann Katy Hospital	Katy, TX	450847
Memorial Hermann Memorial City Medical Center	Houston, TX	450610
Memorial Hermann Northeast	Humble, TX	450684
Memorial Hermann Sugar Land Hospital	Sugar Land, TX	450848
Memorial Hermann Texas Medical Center	Houston, TX	450068
Mercy Health Southwest Ohio Region	Cincinnati, OH	
Mercy Franciscan Hospital Mount Airy	Cincinnati, OH	360234
Mercy Franciscan Hospital Western Hill	Cincinnati, OH	360113
Mercy Hospital Anderson	Cincinnati, OH	360001
Mercy Hospital Clermont	Batavia, OH	360236
Mercy Hospital Fairfield	Fairfield, OH	360056
The Jewish Hospital	Cincinnati, OH	360016
Mission Health	Asheville, NC	
Mission Hospital	Asheville, NC	340002
Spruce Pine Community Hospital	Spruce Pine, NC	340011
The McDowell Hospital	Marion, NC	340087
OhioHealth	Columbus, OH	
Doctors Hospital	Columbus, OH	360152
Doctors Hospital of Nelsonville	Nelsonville, OH	361305
Dublin Methodist Hospital	Dublin, OH	360348
Grady Memorial Hospital	Delaware, OH	360210
Grant Medical Center	Columbus, OH	360017
Hardin Memorial Hospital	Kenton, OH	361315
Marion General Hospital	Marion, OH	360011

* Winning systems are ordered alphabetically. Member hospitals are ordered alphabetically.

Health System/Hospital Name	Location	Hospital Medicare ID
Riverside Methodist Hospital	Columbus, OH	360006
Poudre Valley Health Care	Fort Collins, CO	
Medical Center of the Rockies	Loveland, CO	060119
Poudre Valley Hospital	Fort Collins, CO	060010
Prime Healthcare Services	Ontario, CA	
Alvarado Hospital Medical Center	San Diego, CA	050757
Centinela Hospital Medical Center	Inglewood, CA	050739
Chino Valley Medical Center	Chino, CA	050586
Desert Valley Hospital	Victorville, CA	050709
Encino Hospital Medical Center	Encino, CA	050158
Garden Grove Hospital Medical Center	Garden Grove, CA	050230
Huntington Beach Hospital	Huntington Beach, CA	050526
La Palma Intercommunity Hospital	La Palma, CA	050580
Montclair Hospital Medical Center	Montclair, CA	050758
Paradise Valley Hospital	National City, CA	050024
San Dimas Community Hospital	San Dimas, CA	050588
Shasta Regional Medical Center	Redding, CA	050764
Sherman Oaks Hospital	Sherman Oaks, CA	050755
West Anaheim Medical Center	Anaheim, CA	050426
Roper St. Francis Healthcare	Charleston, SC	
Bon Secours St. Francis Hospital	Charleston, SC	420065
Roper Hospital	Charleston, SC	420087
Roper St. Francis Mount Pleasant	Mount Pleasant, SC	420104
Scripps Health	San Diego, CA	
Scripps Green Hospital	La Jolla, CA	050424
Scripps Memorial Hospital Encinitas	Encinitas, CA	050503
Scripps Memorial Hospital La Jolla	La Jolla, CA	050324
Scripps Mercy Hospital	San Diego, CA	050077
TriHealth	Cincinnati, OH	
Bethesda North Hospital	Cincinnati, OH	360179
Good Samaritan Hospital	Cincinnati, OH	360134

* Winning systems are ordered alphabetically. Member hospitals are ordered alphabetically.

Appendix B: The Top Quintile: Best- Performing Systems*

Large Health Systems	
Health System Name	Location
Advocate Health Care	Oak Brook, IL
Avera Health	Sioux Falls, SD
Banner Health	Phoenix, AZ
Baptist Health South Florida	Coral Gables, FL
Baylor Health Care System	Dallas, TX
Carolinas HealthCare System	Charlotte, NC
Catholic Health Partners	Cincinnati, OH
Indiana University Health	Indianapolis, IN
Kaiser Foundation Hospitals	Oakland, CA
Mayo Foundation	Rochester, MN
Memorial Healthcare System	Hollywood, FL
Memorial Hermann Healthcare System	Houston, TX
The Methodist Hospital System	Houston, TX
OhioHealth	Columbus, OH
Saint Joseph Mercy Health System	Ann Arbor, MI
Scripps Health	San Diego, CA
Sisters of Charity of Leavenworth Health System	Denver, CO
Spectrum Health	Grand Rapids, MI
St Vincent Health	Indianapolis, IN
Sutter Health	Sacramento, CA

Medium Health Systems	
Health System Name	Location
Alegent Creighton Health	Omaha, NE
Baystate Health	Springfield, MA
Exempla Healthcare	Denver, CO
Franciscan Missionaries of Our Lady Health	Baton Rouge, LA
HCA Central and West Texas Division	Austin, TX
HCA Mountain Division	Salt Lake City, UT
John Muir Health	Walnut Creek, CA
Kettering Health Network	Dayton, OH
Main Line Health	Bryn Mawr, PA
Mercy Health Partners	Toledo, OH
Ministry Health Care	Milwaukee, WI
Mission Health	Asheville, NC
Northshore University HealthSystem	Evanston, IL
Ochsner Health System	New Orleans, LA
Prime Healthcare Services	Ontario, CA
Saint Thomas Health	Nashville, TN
Scott & White Healthcare	Temple, TX
Scottsdale Healthcare	Scottsdale, AZ
TriHealth	Cincinnati, OH

Note: Health systems are ordered alphabetically. This year's 15 Top Health System winners are in bold, blue text.

Small Health Systems

Health System Name	Location
Alexian Brothers Health System	Elk Grove Village, IL
Asante	Medford, OR
Baptist Health	Montgomery, AL
Baptist Health Care	Pensacola, FL
Cape Cod Healthcare	Hyannis, MA
Carondelet Health Network	Tuscon, AZ
Centra Health	Lynchburg, VI
Genesis Health System	Davenport, IA
Good Shepherd Health System	Marshall, TX
HealthEast Care System	Saint Paul, MN
Lakeland HealthCare	St. Joseph, MI
Lovelace Health System	Albuquerque, NM
Maury Regional HealthCare System	Columbia, TN
Mercy Health Network	Des Moines, IA
Mercy Health Southwest Ohio Region	Cincinnati, OH
Northern Arizona Healthcare	Flagstaff, AZ
Palomar Health	San Diego, CA
Parkview Health	Fort Wayne, IN
Poudre Valley Health System	Fort Collins, CO
Roper St. Francis Healthcare	Charleston, SC
Sacred Heart Health System	Pensacola, FL
Saint Joseph Regional Health System	Mishawaka, IN
St Charles Health System	Bend, OR
St Vincent HealthCare	Jacksonville, FL
Tanner Health System	Carrollton, GA
Trinity Regional Health System	Rock Island, IL

Note: Health systems are ordered alphabetically. This year's 15 Top Health System winners are in bold, blue text.

Appendix C: Methodology Details

Methods for Identifying Complications of Care

To make valid normative comparisons of health system outcomes, it is necessary to adjust raw data to accommodate differences that result from the variety and severity of admitted cases.

Truven Health Analytics™ is 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. 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.³⁰

Normative Database Development

For this study, Truven Health constructed a normative database of case-level data from the most recent three years of MedPAR data (2009, 2010, and 2011). The data include both fee-for-service Medicare claims and HMO encounters. Demographic and clinical data are also included: age, sex, and length-of-stay (LOS); clinical groupings (MS-DRGs), ICD-9-CM principal and secondary diagnoses*; ICD-9-CM principal and secondary procedures[†]; present on admission coding; admission source and type; and discharge status.

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 occurred during hospitalization. As a result, CMS now requires all inpatient prospective payment system hospitals to document whether a patient has these conditions when admitted. Truven Health proprietary risk-adjustment models for mortality, complications, and length-of-stay include present-on-admission (POA) data that was reported in the 2009, 2010, and 2011 MedPAR datasets.

Risk-Adjusted Mortality Index Models

Truven has developed an overall mortality risk model. From this model, we excluded long-term care, psychiatric, substance abuse, rehabilitation, and federally owned or controlled facilities. In addition, we excluded certain patient records from the data set: psychiatric, substance abuse, rehabilitation, and unclassified cases (MS-DRGs 945, 946, and 999); cases where patient age was less than 65 years; and where patient transferred to other short-term acute care hospital. Palliative care patients (v66.7) are included in the mortality risk model, which is calibrated to determine probability of death for these patients.

* We used 25 diagnostic codes in the 2011 MedPar data set and 9 in the 2009 and 2010 MedPAR data sets.

† We used 25 procedure codes in the 2011 MedPar data set and 6 in the 2009 and 2010 MedPAR data sets.

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 client 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).³¹⁻³⁵

Staff physicians at Truven Health have suggested important clinical patient characteristics that also were incorporated into the proprietary 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 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 Truven Health 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

Complication	Patient Group
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
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, and oxytocic agents)	All patients

A normative database of case-level data including age, sex, LOS, clinical grouping (MS-DRGs), and comorbid conditions was constructed using the most recent three years of available MedPAR data (2009, 2010, and 2011). Long-term care, psychiatric, substance abuse, rehabilitation, and federally owned or controlled facilities were not included. In addition, we excluded certain patient records from the data set: psychiatric, substance abuse, rehabilitation, and unclassified cases (MS-DRGs 945, 946, and 999); cases where patient age was less than 65 years and where patient transferred to other short-term acute care hospital.

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. 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.³⁶⁻³⁹

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. Patient Safety Indicators are a set of indicators providing information on potential in-hospital complications and adverse events following surgeries, procedures, and childbirth. 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 Patient Safety Indicators provide a perspective on patient safety events using hospital administrative data. Patient Safety Indicators also reflect quality of care inside hospitals, but focus on surgical complications and other iatrogenic events.⁴⁰

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 non-zero 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 generated rates that were too low for the AHRQ PSI software to generate provider-specific output. Due to the unreliability of E coding, we also excluded 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, death in low-mortality DRGs (PSI 2) no longer has risk values in the model.

Since the POA coding has become available with the MedPAR 2009 data set, pressure ulcer (PSI 3) and postoperative pulmonary embolism or deep vein thrombosis (PSI 12), which are highly impacted by POA coding, are included. The AHRQ model version used in this study was Version 4.3, published August 2011. 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 47 complications of care. 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).

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. They 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 care. Our composite core measures mean percent is based on the AMI, HF, pneumonia, and surgical care 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 third quarter 2012 database. This contains data from January 1 through December 31, 2011.

AMI Core Measures

AMI-8A*	Heart attack patients given percutaneous coronary intervention within 90 minutes of arrival
AMI-10*	Heart attack patients given a prescription for statin at discharge

HF Core Measures

HF-1	Heart failure patients given discharge instructions
------	---

Pneumonia Core Measures

PN-3B	Pneumonia patients whose initial emergency room blood culture was performed prior to the administration of the first hospital dose of antibiotics
PN-5C	Pneumonia patients given initial antibiotic(s) within 6 hours after arrival
PN-6	Pneumonia patients given the most appropriate initial antibiotic(s)

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-9	Surgery patients whose urinary catheters were removed on the first or second day after surgery
SCIP-INF-10	Patients having surgery who were actively warmed in the operating room or whose body temperature was near normal by the end of surgery
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 (third quarter 2012). The longitudinal data period contained in this analysis is July 1, 2008, through June 30, 2011. 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 come 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. Both rates are based on 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 non-acute-care setting with a principal diagnosis of heart attack, heart failure, or pneumonia. Patients may have been readmitted back to the same hospital, to a different hospital or to an 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).²⁶

CMS does not calculate rates for hospitals where the number of cases is too small (fewer than 25). If a health system has no available hospital rates, we substitute the comparison group-specific median rate for the affected 30-day mortality measure.

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' perspectives of hospital care. HCAHPS is a core set of questions that can be combined with customized, hospital-specific items 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.⁴¹

For this study edition, we used Hospital Compare data from the third quarter 2012 database. This database contains the HCAHPS results for data period January 1 through December 31, 2011. 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.

At the hospital level, patient responses fell into three categories, and the number of patients in each category was reported as a percent:

- 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)

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. Hospitals were then ranked by this weighted percent sum. The highest possible HCAHPS score is 300 (100 percent of patients rate the hospital high). The lowest possible HCAHPS score is 100 (100 percent of patients rate the hospital low).

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 Truven Health proprietary, severity-adjusted resource demand methodology. This model now includes POA data that was reported in the 2010 and 2011 MedPAR datasets. 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 their 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 clinical groupings, health systems, hospitals, product lines, geographic regions, physicians, etc. This regression model 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. Its associated LOS weights allow group comparisons on a national level and in a specific market area. This year, the LOS model has been recalibrated from three years of MedPAR data (2009, 2010, and 2011), taking into account present on admission (POA) coding.

POA coding allows us to determine appropriate adjustments based on pre-existing conditions versus complications of hospital care. We calculate expected values from model coefficients that are normalized to the clinical group and transformed from log scale.

Performance Measure Normalization

The mortality, complications, patient safety index, and LOS measures are normalized, based on the in-study population, by comparison group, to provide a more easily interpreted comparison among health systems. We assigned each health system in the study to one of three comparison groups based on the sum of member hospital's total operating expense. (Detailed descriptions of the comparison groups can be found in the Methodology section of this document.)

For the mortality and complications measures, we base our ranking on the difference between observed and expected events, expressed in standard deviation units (z-scores) that have been normalized. We normalize the individual health system z-scores by finding the difference between the health system z-score and the mean z-score for their comparison group. The difference is then divided by the standard deviation of the comparison group's z-scores to produce the normalized z-score for the health system.

For length-of-stay measure, we base our ranking on the normalized severity-adjusted LOS index expressed in days. This index is the ratio of the observed and the normalized expected values for each health system. We normalize the individual health system's expected values by multiplying them by the ratio of the observed to expected values for the comparison group. The health system's normalized index is then calculated by dividing the health system's observed value by its normalized expected value. We convert this normalized index into days by multiplying by the average length-of-stay of the in-study health systems (grand mean LOS).

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.⁴²

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 hospital data that are based on 11 or fewer patients. This affects 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 a rate when count is less than 25)
- 30-day readmission rates for AMI, heart failure, and pneumonia (CMS does not report a rate when count is less than 25)
- Average length-of-stay

Appendix D: All Health Systems in Study*

Health System Name	Health System Name
Abrazo Health Care	Phoenix, AZ
Adventist Florida Hospital	Orlando, FL
Adventist Health System	Winter Park, FL
Adventist Health West	Roseville, CA
Adventist Healthcare	Rockville, MD
Advocate Health Care	Oak Brook, IL
Affinity Health System	Menasha, WI
Alegent Creighton Health	Omaha, NE
Alexian Brothers Health System	Elk Grove Village, 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
Anderson Regional Medical Center	Meridian, MS
Appalachian Regional Healthcare (ARH)	Lexington, KY
Ardent Health Services	Nashville, TN
Asante	Medford, OR
Ascension Health	Saint Louis, MO
Atlantic Health System	Morristown, NJ
Aurora Health Care	Milwaukee, WI
Avanti Health System LLC	El Segundo, CA
Avera Health	Sioux Falls, SD
Banner Health	Phoenix, AZ
Baptist Health	Montgomery, AL
Baptist Health	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	Jackson, MS
Baptist Health System Inc	Birmingham, AL
Baptist Healthcare System	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
Bronson Healthcare Group	Kalamazo, MI
Broward Health	Fort Lauderdale, FL
Cape Cod Healthcare	Hyannis, MA
Capella Healthcare	Franklin, TN
Capital Division	Richmond, VA

* Winning health systems are listed in boldface blue text.

Health System Name	Health System Name
Capital Health System	Trenton, NJ
CareGroup Healthcare System	Boston, MA
Carilion Health System	Roanoke, VA
Carolinas HealthCare System	Charlotte, NC
Carondelet Health Network	Tuscon, AZ
Carondelet Health (MO)	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	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
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
Community Memorial Health System	Ventura, CA
Comprehensive Healthcare of Ohio	Elyria, OH
Conemaugh Health System	Johnstown, PA
Continental Division	Denver, CO
Continuum Health Partners	New York, NY
Cook County Bureau of Health Services	Chicago, IL
Covenant Health	Knoxville, TN
Covenant Health Systems	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 LifePoint	Durham, NC

* Winning health systems are listed in boldface blue text.

Health System Name	Health System Name
Duke University Health System	Durham, NC
East Florida Division	Ft. Lauderdale, FL
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
Essentia Health	Duluth, MN
Excela Health	Greensburg, PA
Exempla Healthcare	Denver, CO
Fairview Health Services	Minneapolis, MN
Far West Division	Las Vegas, NV
Franciscan Alliance	Mishawaka, IN
Franciscan Health System	Tacoma, WA
Franciscan Missionaries of Our Lady Health	Baton Rouge, LA
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
Gulf Coast Division	Houston, TX
Guthrie Healthcare System	Sayre, PA
Hawaii Health Systems Corporation	Honolulu, HI
Hawaii Pacific Health	Honolulu, HI
HCA	Nashville, TN
HCA Central and West Texas Division	Austin, TX
HCA Mountain Division	Salt Lake City, UT
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
Hillcrest HealthCare System	Tulsa, OK
Hospital Sisters Health System	Springfield, IL
Humility of Mary Health Partners	Youngstown, OH
IASIS Healthcare	Franklin, TN
Indiana University Health	Indianapolis, IN
Infirmity Health Systems	Mobile, AL
InMed Group Inc	Montgomery, AL
Inova Health System	Falls Church, VA
Integrated Healthcare Holding Incs	Santa Ana, CA

* Winning health systems are listed in boldface blue text.

Health System Name	Health System Name
INTEGRIS Health	Oklahoma City, OK
Intermountain Health Care	Salt Lake City, UT
Iowa Health System	Des Moines, IA
Jefferson Health System	Radnor, PA
John C Lincoln Health Network	Phoenix, AZ
John D Archbold Memorial Hospital	Thomasville, GA
John Muir Health	Walnut Creek, CA
Kaiser Foundation Hospitals	Oakland, CA
KentuckyOne Health	Lexington, KY
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
Lovelace Health System	Albuquerque, NM
Loyola University Health System	Maywood, IL
LSU Health System	Baton Rouge, LA
Main Line Health	Bryn Mawr, PA
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
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 Network	Des Moines, IA
Mercy Health Partners	Muskegon, MI
Mercy Health Partners	Toledo, OH
Mercy Health Southwest Ohio Region	Cincinnati, OH
Mercy Health System of Southeastern Pennsylvania	Philadelphia, PA
Meridia Health System	Independence, OH

* Winning health systems are listed in boldface blue text.

Health System Name	Health System Name
Meridian Health	Neptune, NJ
Merit Health Systems	Louisville, KY
Methodist Healthcare	Memphis, TN
The Methodist Hospital System	Houston, TX
Methodist Hospitals of Dallas	Dallas, TX
Mid Michigan Health	Midland, MI
Midamerica (North)	Kansas City, MO
Midamerica (South)	Kansas City, MO
Ministry Health Care	Milwaukee, WI
Mission Health	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 Florida Division	Tallahassee, FL
North Mississippi Health Services	Tupelo, MS
North Shore — Long Island Jewish Health System	Great Neck, NY
North Texas Division	Dallas, TX
NorthBay Healthcare System	Fairfield, CA
Northern Arizona Healthcare	Flagstaff, AZ
Northshore University HealthSystem	Evanston, IL
Northside Hospital System	Atlanta, GA
Novant Health	Winston Salem, NC
Nuetera	Leawood, KS
Oakwood Healthcare	Dearborn, MI
Ochsner Health System	New Orleans, LA
Ohio Valley Health Services & Education Corp	Wheeling, WV
OhioHealth	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 Health	San Diego, CA
Parkview Health	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

* Winning health systems are listed in boldface blue text.

Health System Name	Health System Name
Premier Health Partners	Dayton, OH
Presbyterian Healthcare Services	Albuquerque, NM
Prime Healthcare Services	Ontario, CA
Progressive Acute Care LLC	Mandeville, LA
ProHealth Care Inc	Waukesha, WI
ProMedica Health System	Toledo, OH
Provena Health	Mokena, IL
Providence Health & Services	Renton, WA
Regional Health	Rapid City, SD
RegionalCare Hospital Partners	Nashville, TN
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
Roper St. Francis Healthcare	Charleston, SC
Sacred Heart Health System	Pensacola, FL
Saint Joseph Mercy Health System	Ann Arbor, MI
Saint Barnabas Health Care System	West Orange, NJ
Saint Francis Health System	Tulsa, OK
Saint Joseph Regional Health System	Mishawaka, IN
Saint Lukes Health System	Kansas City, MO
Saint Thomas Health	Nashville, TN
Samaritan Health Services	Corvallis, OR
San Antonio Division	San Antonio, TX
Sanford Health	Sioux Falls, SD
Schuylkill Health System	Pottsville, PA
Scott & White Healthcare	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
Sisters of Charity Health System	Cleveland, OH
Sisters of Charity of Leavenworth Health System	Denver, CO
Sound Shore Health System	New Rochelle, NY
South Atlantic Division	Charleston, SC
South Jersey Healthcare	Vineland, NJ
Southeast Georgia Health System	Brunswick, GA
Sparrow Health System	Lansing, MI
Spartanburg Regional Healthcare System	Spartanburg, SC

* Winning health systems are listed in boldface blue text.

Health System Name	Health System Name
Spectrum Health	Grand Rapids, MI
SSM Health Care	Saint Louis, MO
St Alphonsus Health System	Boise, ID
St Charles Health System	Bend, OR
St Clares Health System	Denville, NJ
St Elizabeth Healthcare	Fort Thomas, KY
St John Health System	Tulsa, OK
St John Providence Health	Detriot, MI
St Joseph Health System	Orange, CA
St Joseph/Candler Health System	Savannah, GA
St Lukes Episcopal Health System	Houston, TX
St Luke's Health System	Boise, ID
St Peters Health Partners	Albany, NY
St Vincent Health	Indianapolis, IN
St Vincent Health System	Little Rock, AR
St Vincent HealthCare	Jacksonville, FL
St Vincent's Health System	Birmingham, AL
Steward Health Care System	Boston, MA
Success Healthcare	Boca Raton, FL
Summa Health System	Akron, OH
SunLink Health Systems	Atlanta, GA
Sutter Health	Sacramento, CA
Swedish	Seattle, WA
Sylvania Franciscan Health	Sylvania, OH
Tanner Health System	Carrollton, GA
Temple University Health System	Philadelphia, PA
Tenet California	Anaheim, CA
Tenet Central	Dallas, TX
Tenet Florida	Fort Lauderdale, FL
Tenet Healthcare Corporation	Dallas, TX
Tenet Southern	Atlanta, GA
Tennova Healthcare	Knoxville, TN
Texas Health	Arlington, TX
ThedaCare	Appleton, WI
TriHealth	Cincinnati, OH
Trinity Health	Novi, MI
Trinity Regional Health System	Rock Island, IL
Tristar Division	Nashville, TN
Truman Medical Center Inc	Kansas City, MO
UAB Health System	Birmingham, AL
UC Health	Cincinnati, OH
UMass Memorial Health Care	Worcester, MA

* Winning health systems are listed in boldface blue text.

Health System Name	Health System Name
United Health Services	Binghamton, NY
Universal Health Services Inc	King of Prussia, PA
University Hospitals Health System	Cleveland, OH
University of California Health System	Los Angeles, CA
University of Maryland Medical System	Baltimore, MD
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	Hemet, CA
Vanguard Health Systems	Nashville, TN
Via Christi Health System	Wichita, KS
Vidant Health	Greenville, NC
Virtua Health	Marlton, NJ
Wake County Hospital System	Raleigh, NC
Wellmont Health System	Kingsport, AL
WellSpan Health	York, PA
WellStar Health System	Marietta, GA
West Florida Division	Tampa, FL
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
Willis-Knighton Health Systems	Shreveport, LA
Wuesthoff Health System	Rockledge, FL
Yale New Haven Health Services	New Haven, CT

* Winning health systems are listed in boldface blue text.

References

1. Kaplan RS, Norton DP. The Balanced Scorecard: Measures that Drive Performance. *Harvard Bus Rev*, Jan–Feb 1992.
2. Foster DA. HCAHPS 2008: Comparison Results for 100 Top Hospitals Winners versus Non-Winners. Ann Arbor, MI: Truven Health Analytics Center for Healthcare Improvement. August 2008.
3. Foster DA. Risk-Adjusted Mortality Index Methodology. Ann Arbor, MI: Center for Healthcare Improvement, Truven Health Analytics. July 2008.
4. Griffith JR, Alexander JA, Foster DA. Is Anybody Managing the Store? National Trends in Hospital Performance. *Healthc Manag*. 2006 Nov–Dec; 51(6):392-405; discussion 405-6.
5. Griffith JR, Alexander JA, Jelinek RC. Measuring Comparative Hospital Performance. *Healthc Manag*. 2002 Jan–Feb; 47(1).
6. 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.
7. Shook J, Young J. Inpatient and Outpatient Growth by Service Line: 2006 Truven Health 100 Top Hospitals: Performance Improvement Leaders versus Peer Hospitals. Ann Arbor, MI: Center for Healthcare Improvement, Truven Health Analytics. August 2007.
8. Young J. Outpatient Care Standards Followed More Closely at Top-Performing Hospitals. Ann Arbor, MI: Center for Healthcare Improvement, Truven Health Analytics. March 2011.
9. Young J. Hospitals Increase Cardiovascular Core Measure Compliance. Ann Arbor, MI: Center for Healthcare Improvement, Truven Health Analytics. November 2010.
10. Foster DA. Top Cardiovascular Care Means Greater Clinical and Financial Value. Ann Arbor, MI: Center for Healthcare Improvement, Truven Health Analytics. November 2009.
11. Foster DA. Trends in Patient Safety Adverse Outcomes and 100 Top Hospitals Performance, 2000–2005. Ann Arbor, MI: Center for Healthcare Improvement, Truven Health Analytics. March 2008.
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*. 2008 Nov;77(11):745-53. Epub 2008 Jun 19.
13. Lee DW, Foster DA. The association between hospital outcomes and diagnostic imaging: early findings. *J Am Coll Radiol*. 2009 Nov; 6(11):780-5.

14. Shook J, Chenoweth J. 100 Top Hospitals CEO Insights: Adoption Rates of Select Baldrige Award Practices and Processes. Ann Arbor, MI: Center for Healthcare Improvement, Truven Health Analytics. October 2012.
15. Foster DA, Cheoweth J. Comparison of Baldrige Award Applicants and Recipients With Peer Hospitals on a National Balanced Scorecard. Ann Arbor, MI: Center for Healthcare Improvement, Truven Health Analytics. October 2011.
16. Chenoweth J, Safavi K. Leadership Strategies for Reaching Top Performance Faster. *J Healthc Tech*. January 2007. HCT Project Volume 4.
17. McDonagh KJ. Hospital Governing Boards: A Study of Their Effectiveness in Relation to Organizational Performance. *Healthc Manag*. 2006 Nov–Dec; 51(6).
18. 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.
19. Cejka Search and Solucient, LLC. 2005 Hospital CEO Leadership Survey.
20. HIMSS Analytics, Truven Health Analytics. 2012 HIMSS Analytics Report: Quality and Safety Linked to Advanced Information Technology Enabled Processes. Chicago, IL: HIMSS Analytics. April 2012.
21. Chenoweth J, Foster DA, Waibel BC. Best Practices in Board Oversight of Quality. The Governance Institute. June 2006.
22. 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.
23. Health Research and 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.
24. Foster DA. Hospital System Membership and Performance. Ann Arbor, MI: Center for Healthcare Improvement, Truven Health Analytics. May 2012.
25. 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 2011 begins in 2010 and ends in 2011). Datasets include patients discharged in the specified FFY.
26. See the CMS Hospital Compare website at hospitalcompare.hhs.gov.
27. See the Agency for Healthcare Research and Quality (AHRQ) website at ahrq.gov.
28. Iezzoni L, Ash A, Shwartz 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.

29. Iezzoni L, Shwartz 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.
30. Foster, D. Model-Based Resource Demand Adjustment Methodology. Truven Health Analytics (July 2012).
31. 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.
32. DesHarnais SI, et al. The Risk-Adjusted Mortality Index: A New Measure of Hospital Performance. *Medical Care.* 26, no. 12 (Dec 1988):1129-1148.
33. 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.
34. 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.
35. Iezzoni LI, et al. Chronic Conditions and Risk of In-Hospital Death. *Health Serv Res.* 29, no. 4 (Oct 1994): 435-460.
36. Iezzoni LI, et al. Identifying Complications of Care Using Administrative Data. *Med Car.* 32, no.7 (Jul 1994): 700-715.
37. Iezzoni LI, et al. Using Administrative Data to Screen Hospitals for High Complication Rates. *Inquiry.* 31, no. 1 (Spring 1994): 40-55.
38. Iezzoni LI. Assessing Quality Using Administrative Data. *Ann Intern Med.* 127, no. 8 (Oct 1997):666-674.
39. 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.
40. See the AHRQ website at qualityindicators.ahrq.gov/data/hcup/psi.htm. Retrieved in June 2004.
41. See the CMS Hospital Compare website at cms.hhs.gov/hospitalqualityinits/30_hospitalhcahps.asp.
42. *The Wall Street Journal*, New York, NY, Online Help: Digest of Earnings (online.wsj.com/public/resources/documents/doe-help.htm).



FOR MORE INFORMATION

Visit 100tophospitals.com
or send us an email to
100tophospitals@truvenhealth.com



ABOUT TRUVEN HEALTH ANALYTICS

Truven Health Analytics delivers unbiased information, analytic tools, benchmarks, and services to the healthcare industry. Hospitals, government agencies, employers, health plans, clinicians, pharmaceutical, and medical device companies have relied on us for more than 30 years. We combine our deep clinical, financial, and healthcare management expertise with innovative technology platforms and information assets to make healthcare better by collaborating with our customers to uncover and realize opportunities for improving quality, efficiency, and outcomes. With more than 2,000 employees globally, we have major offices in Ann Arbor, Mich.; Chicago; and Denver. Advantage Suite, Micromedex, ActionOI, MarketScan, and 100 Top Hospitals are registered trademarks or trademarks of Truven Health Analytics.

truvenhealth.com | 1.800.366.7526

©2013 Truven Health Analytics Inc. All rights reserved. All other product names used herein are trademarks of their respective owners. HOSP 12636 0213